Conceptions of Environmental Education in Mexican Primary Education: Teachers' Views and Curriculum Aims

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The candidate confirms that the work submitted is her own and that appropriate credit has been given where reference has been made to the work of others.

To my loving and devoted parents. By giving me support, trust, compassion, and challenge in different measure, you have become the most fantastic teachers I have ever had.

Also… you were right, education is my thing.

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Abstract

This thesis is about how Mexican primary school teachers conceptualise environmental education (EE) and talk about its practise. Teaching EE or EE-related content is often not a straightforward and unproblematic task for educators. Formal education still faces persistent gaps between EE theory, policy, curricula, and practice in schools. Additionally, EE is often eclipsed by crowded curricula and busy schedules. In fact, in the 2011 Mexican basic education curriculum, EE is one of eleven socially-relevant themes (i.e. cross-curricular themes) to be embedded in multiple aims and statutory subjects, suggesting important teaching challenges for EE.

Through a qualitative study, this thesis presents EE in Mexican primary education as a case study situation. It investigates references to EE in 2011 curriculum documents for primary school, then it focuses on the views from 11 Year 6 teachers of 6 schools located around Monterrey, Mexico. After five months of fieldwork, this study collected audio-recordings of three individual semi-structured interviews and non-participant classroom observations per participant.

The thematic analysis of the data revealed that the curriculum documents faintly outline EE and stress anthropocentric and participatory aims. Then, using Sauvé's (2005) EE typology, it was found that teachers' conceptions about EE concentrate on fostering students' environmental awareness, hoping it would translate into pro-environmental behaviour. Their views relate EE to management and conservation of the immediate environment and in relation to the sustainability of current and future lifestyles. Socio-scientific issues and other elements of human lifestyles, like health and environment, were not emphasised. Additionally, typical factors of the contemporary educational climate and schools' cultures were related to difficulties in teaching EE-related content.

These findings suggest inviting a democratic outline of the desired/necessary EE approach in schools and classrooms might be a substantial step forward to closing gaps. The results also showcase the need for training teachers in cross-curricular pedagogies, shared leadership, and effective communication of the goals and approach to EE.

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List of Abbreviations

DESD	Decade of Education for Sustainable Development 2005-2014
EE	Environmental Education
EES	Environmental Education for Sustainability
ESD	Education for Sustainable Development
IEEP	International Environmental Education Programme
ISATT	International Study Association on Teacher Thinking
IUCN	International Union for Conservation of Nature and Natural Resources
LAC	Latin America and the Caribbean
NAEE	United Kingdom's National Association for Environmental Education
NAAEE	North American Association for Environmental Education
PISA	Programme for International Student Assessment
RQ	Research Question
SD	Sustainable Development
STS	Science, Technology, and Society
STSE	Science, Technology, Society, and Environment
UN	United Nations
UNEP	United Nations Environmental Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization

Introduction

In the face of the contemporary environmental crisis, two fundamental goals of environmental education (EE) are: to encourage understanding of the implications in human-environment interrelations (Sauvé, 1996; Orr, 1992) and to cultivate a sustainable lifestyle through people's pro-environmental behaviour (Krasny, 2013; Palmer and Neal, 1994). Today the relationship between humans and their environment is constantly under stress because our anthropocentric ways of perceiving and acting in the world predominate across human cultures.

The increasing demands of human populations have led to severe degradation of multiple ecosystems (Hassan, et al., c2005). This have caused severe difficulties to the well-being of humans and the balance of ecosystems, which has caused what is called an 'environmental crisis'. As academics like Cutter and Smith (2001) and González-Gaudiano (2000) indicate, the environmental crisis phenomena is not globally accepted, however, the research supporting its existence is overwhelming. As such, this study aligns with claims of much contemporary research on the existence of an environmental crisis, which involves the recognition of social and environmental problems such as: an alarming loss of biodiversity and ecological balance, and the subsequent implications of this on human health and other forms of life on Earth.

The environmental crisis is one of social and ecological nature (González-Gaudiano, 2006). An example of this is how the use of fossil fuels (a social activity) have had an impact in the geological features of our planet (an ecological event) to the point we are now considered to be living in an 'Age of Humans' the Anthropocene (Trischler, 2016). In this sense, EE is a response to the need of educating populations to understand and address these problems by fostering a pertinent system of values or ideology. EE has also been shaped around social and ecological phenomena, having different ideological emphases according to the period in history and culture. For instance, Benítez-Esquivel's, an academic of EE and a basic education teacher trainer, considers the social and ecological aspects of EE but in defining EE she highlights sociological and psychological constructs:

> *Environmental education is a process of social and cultural identification that emerges from inquiries related to the global environmental crisis and which aspires to the construction of a sustainable and equitable planetary society in its diversity (Benítez-Esquivel, 2007, no pagination).*

The years of history outlining EE have emphasised the ecological and social nature of the environmental crisis in different proportion. Recently, the social nature of the environmental crisis has been stressed by introducing new approaches to EE such as education for sustainable development (ESD) or environmental education for sustainability (EES). The emphases on the social or ecological features of the environmental crisis and the cross-disciplinary character of EE have produced various approaches to this field. González-Gaudiano (2006) asserts that EE has repeatedly been reduced to a curricular process (instead of a multi-sectorial and life-long learning process), keeping EE from moving beyond towards the reformation of social systems which feed the environmental crisis. The latter is a call to involve EE beyond the confines of formal education; however, the role of EE in formal education has problems that have not been resolved despite the concentration of efforts in this area. Furthermore, the issues of EE in formal education are relevant to the social reformation processes demanded by the environmental crisis.

An important issue of EE in schooling, is the existence of persistent 'gaps' between EE theory and school curricula or between EE curricula and teaching practice (Edwards, 2016; Hart, 2008; Grace and Sharp, 2000; Orr, 1992; Palmer, 1998; Saylan and Blumstein, 2011; Stevenson, 1987; 2007). These gaps are usually widened by the traditional structures of the basic education systems around the world and a lack of agreement regarding the approach to EE. For example, EE programmes are usually embedded in mainstream subject-led syllabi and assessment-based accountability practices. These are factors that often diverge from the reformative, collaborative, problem-oriented, eclectic, and cross-disciplinary nature of EE.

The disjointed spaces between EE theory and practise in formal education are relevant to the focus of this research. Section 3.1, Chapter 3 offers details of the research focus, but, for now, the attempt is only to present the research questions (RQ.1, 2, and 3) this thesis is asking and think how they might be relevant to the environmental crisis and EE in schools:

RQ. 1 *How do key curricular documents for the Year 6 of Mexican primary school education represent environmental education?*

RQ. 2 *What are the conceptions about environmental education that Mexican primary school teachers have?*

RQ. 3 *What factors impact environmental education teaching in Year 6 of Mexican primary school education?*

As the questions above suggest, exploring how an official document o teacher portray EE is important to how it is represented in the classroom, besides these portrayals are key to unveil

ecological literacy (Orr, 1992; Cutter-Mackenzie and Smith, 2003).Those mainly responsible of promoting EE in schools, such as teachers, have a seminal role in finding ways to mend those gaps in their context by planning thoroughly their approach and strategy to EE (Palmer, 1998). Correspondingly, this thesis discusses in Section 2.3 the role of curricula and teachers in EE for primary school through a set of research studies on different aspects of teachers' cognitions about EE. The research on EE and primary school teachers is, despite the existing research literature, limited and scattered. This suggested the potential to pursue a study on teachers' conceptions about EE and the factors in their context impacting EE teaching.

EE has existed and evolved in the basic education curriculum of Mexico since 1993. Nowadays, the National Development Plan 2013-2018 for Mexico indicates to continue 'with the incorporation of sustainability criteria and environmental education in the National Education System and strengthen environmental education in strategic sectors' (Poder Ejecutivo Federal 2013, p.91). Despite the decades of encouragement, the peripheral adoption of EE in the Mexican basic education curriculum has had significant setbacks (Barraza and Walford, 2002; González-Gaudiano, 2007; 2012; Peza-Hernández, 2013). For instance, in a recent study of EE in the contemporary Mexican primary school curriculum, Paredes and Viga-de Alva (2017) and Peza-Hernández (2013) suggest that there is a lack of methodological and pedagogical guidelines for teachers to implement EE. These claims further stress a need to work with teachers to understand their conceptions about EE, grasp their interpretation of the curriculum and identify how their views on these matters are relevant for them and the needs in their context.

In line with the previous arguments, this thesis concentrates on contributing to the study of EE rhetoric-reality gaps in schools by analysing how curriculum documents represent EE and what are the conceptions of primary school teachers about EE (the research questions are detailed in Section 3.1, in Chapter 3). The investigation of these aspects was conducted through a qualitative research design that includes a documentary research of curriculum documents and data collection of 11 in-service teachers working at six urban schools located in Monterrey and its metropolitan area, Nuevo Leon, Mexico. Monterrey is the largest city and capital of Nuevo Leon; this area of Mexico is also one of the most industrialised states out of the 31 entities forming the federal republic. Chapter 1, Section 3.3 and across Chapter 4, 5, and 6 the reader will find more information about the settings where the field activities were conducted.

Distribution of the thesis

The various stages of the investigation in this thesis are narrated through eight chapters, and each provides important information of the different stages of the research.

Chapter 1 focuses on providing information that is relevant to understand the mainstream reality of Mexican primary school teachers working at state-regulated schools. The chapter describes general aspects of teachers' education and training in relation to EE in addition to describing the main centralised and standardised characteristics of the Mexican basic education system.

Chapter 2 includes a report of relevant literature that was used during the different stages of this study. The first half of this chapter includes main events in the political and academic development of EE, which carries a statement about the importance of becoming familiar with the origins and evolution of the field in order to illuminate the scope in EE. The second half of this section includes a review of empirical studies relevant to the focus of this research.

Chapter 3 describes the methodological decisions involved in designing this investigation. This part of the thesis includes important details of the data collection stage and the participants involved in the project. However, this chapter offers more than a report of resolutions and field activities: it encompasses a reflection of the researcher's understanding of her own role in the research and her curiosity for becoming deeply involved in developing careful and ethically-sound qualitative research.

Chapter 4 presents the outcomes of analysing three curriculum documents in search of EE notions. Besides elucidating the role and place of EE in the curriculum documents, these outcomes convey contextual information about the educational aims and learning content of the primary school level.

Chapter 5 presents the cross-participant analysis of the teachers' conceptions about EE, using Lucie Sauvé's (2005) EE typology as the main analytical framework. The chapter presents a general outlook of the teachers' conceptions, which is followed by a report of teachers' conceptions on aims associated with EE, the concept of environment, and examples of EE teaching and learning activities. Throughout the chapter these three parameters are correlated with relevant EE currents from Sauvé's EE typology.

Chapter 6 presents the results of analysing the main factors influencing EE-related practices in Mexican primary schools. The factors are concentrated in how teachers interpret EE in curricular guidelines and other factors such as the influence of school policies on teachers' autonomy and the allocation of teaching time. These factors are relevant to the context of the

participants in this study, however, the problems they communicate are relevant to any teacher working in an educational system that is heavily influenced by standardization and accountability practices.

Chapter 7 discusses six main findings identified from the results presented in Chapter 4 to Chapter 6. This chapter explains the relevance of the findings in consideration of the literature consulted throughout the development of this research study. The findings are significant to the context of the study, yet they are aimed to stimulate discussion about EE at an international level and across various subject areas.

Finally, Chapter 8 presents two concluding discussion points in relation to the key findings discussed in Chapter 7. Additionally, the chapter offers the researcher's reflections on the implications of the findings, a methodological remark and the limitations of the project.

Chapter 1. Key contextual aspects of the study

In a qualitative study understanding the context of its research site is crucial to make sense of the background, results and findings. Context can be studied from two major and interacting dimensions: human cultures and place (Wedell and Malderez, 2013). The contextual aspects addressed in this chapter include details from both dimensions, focusing more prominently on cultural and organisational aspects of teaching in contemporary Mexican state-regulated primary schools. This section introduces general demands for Mexican primary school teachers and teacher training options in relation to EE. Sections 1.1 and 1.2 present crucial aspects of teaching in the Mexican primary school system. After this, Section 1.3 introduces three documents which are relevant for the Mexican primary school curriculum[1] at a national level. Additionally, throughout this thesis, the reader will find contextual cues and paths inviting him or she to imagine what the evidence presented means for both local and international dimensions.

1.1 A portrait of Mexican primary school teachers' job

This section presents basic information regarding training and classroom work of in-service primary school teachers. It includes general aspects about their education and the recent training opportunities they have for EE.

1.1.1 Teachers' initial and continuous training

In Mexico, initial teacher training schools are regulated by the State or private institutions. State-regulated training schools for teachers generally follow centralised practises like having a national curriculum, however, they are managed by local institutions. State-regulated teacher schools offer three types of degrees: preschool education; primary education; and secondary education. The primary school education degree, for instance, lasts eight semesters. Between the years 2004 and 2011, as part of the last educational reform for basic education, the initial teacher education curriculum was updated (Peza-Hernández, 2013). The reform to teachers' initial education curriculum now includes activities and paths to facilitate meaningful learning of pre-service teachers. In the framework of this reform, a significant development for EE during this reform was the creation of an EES course; this becoming one

[1] In this thesis, the term 'curriculum' is used in two ways: a) to generally refer to a pedagogical model or proposal; and b) to refer to a learning programme (e.g. the EE curriculum).

of the four optional subjects that pre-service teachers can take (SEP, no date). This development, however, does not solve the potential need of training in-service teachers in EE and its cross-curricular treatment.

The continuous professional development of in-service teachers is managed by institutions external to the initial teacher training schools through teacher learning centres. Regarding continuous professional development for in-service teachers interested in EE, secondary school level teachers have more options than primary school teachers. Peza-Hernández (2013) reports only a few relevant courses for primary school teachers. According to this author, at the national-level course 'Natural Sciences teaching in primary school'—released in 2001—is where most training related to EE content was addressed (see the relationship between EE and science education in Section 2.2.6). Peza-Hernández (2013) narrates that this course only included one lesson (called 'environmental care, preservation, and improvement') directly related to EE and recommended readings; however, the information was basic and lacked pedagogical guidance to teaching EE (p.85).

Since the 'Natural Sciences teaching in primary school' course, the EE-related training offers for the professional development of in-service teachers has slowly spread across the nation. Recent additions of in-service teacher education include the incorporation of continuous development courses explicitly addressing EE. Currently, teacher learning centres across the country offer diploma courses and postgraduate degrees (Peza-Hernández, 2013) and these are not generally short courses (e.g. a one or two-day course). At state level, the annual offer of EE training courses ranges from zero to three options. This indicates that the continuous professional development of EE for in-service teachers is still scarce across the country.

1.1.2 General structure of primary education and responsibilities of in-service teachers

Mexican primary schooling is comprised of six grades or school years (for students of 6 to 11 years old). Primary school teachers, especially at the onset of their teaching career, teach a different grade every new school year; often, experienced teachers (those having more than five years of teaching experience) are assigned with the upper grades of primary school (from Year 4 to and Year 6). In Mexico, having to teach all school years has two opposing implications. On the one hand, it is likely that primary school teachers have wide-ranging knowledge of the learning content across primary school education and about the students' physical and psychological development. On the other hand, having teachers changing from one school year to another can cause feelings of being unspecialised and unfamiliarised with

the specific content of a year's programme (this was, in fact, indicated by Luz from School A and Betty from School B, who participated in this study).

It is well known that a teaching job involves more than classroom activities. This is no different for Mexican primary school teachers since they are generally pushed to crowd their work routines by having to combine teaching, paper work, and extra-curricular activities. For Mexican primary school teachers, sometimes the administrative work is increased by the work that school boards require. Officially, the school boards are a relative new practice that was encouraged through the programme called 'School Improvement Route'. This programme encourages school autonomy and efficient management, giving the opportunity to school authorities and teachers to decide on the critical direction(s) the school needs to take. The school boards in all schools gather once a month mainly to discuss aspects of the 'improvement route' of the schools. These meetings are included in the national school calendar and, on the day they are held, students do not attend classes. This programme was mentioned by a few teachers participating in this project, like Luz and José (see an example of José's reference to this programme in Section 6.4.1).

The work load of Mexican primary school teachers includes school-level activities which are usually derived from official programmes and initiatives. For instance, the National Safe School Programme or 'Safe School' (as it is commonly known) encourages the state-regulated primary and secondary schools to create an environment that is conducive to the broader wellbeing and development of students (Gobierno de Nuevo León, no date 1). This programme is promoted in schools that are located within the 150 municipalities with the highest crime rates in Mexico. The program seeks to offer schools technical and economic support in order to promote the prevention of drug addiction and violence and it also aims at strengthening links between schools and the municipal councils (Zorrilla-Fierro, 2008). This programme includes all sorts of activities from creating student committees to attending training courses on crime prevention.

Furthermore, primary school teachers in Mexico, in comparison to how preschool and secondary school operate, face significant challenges to manage their teaching time. Preschool teachers can distribute their planning throughout the day and in whichever manner that suits their teaching goals. Secondary school teachers have pre-determined schedules outlining the subject schedule and length of lessons. Classroom teachers in Mexican primary schools combine the general modes of instruction in preschool and secondary education by planning subject schedules that are flexible enough to respond to the needs of a student-

centred education. Hence, the teaching challenges for primary school teachers is not a trivial matter.

1.2 Teaching schedules for upper primary school

Basic education schools in Mexico belong to either the state-level system or the federal educational system (the schools participating in this study belong to the former). These systems are similar and have links between them; yet, they have slightly different operating schedules for schools. There are various types of formats for delivering basic education in Mexico; they include school-based and distance education. The educational system and school formats determine school schedules.

Currently in Mexico, primary education has three options of school schedules: part-time school, full-time school, and extended-schedule schools (SEP, 2011a). Part-time schools are the conventional format for primary school education in Mexico (see the proposed teaching schedule in Table 1.1). However, part-time primary schools in Mexico will eventually become obsolete and, gradually, they are being turned into full-time schools (SEP, 2011a, p.72). During a school cycle, the number of hours allocated for part-time schools is a minimum of 900, that is 22.5 hours per 40 weeks (SEP, 2011a, p.83). The morning schedule for state-level schools in Nuevo Leon (state where the fieldwork took place) starts at 7.30 and ends at 12.30—slight variations in this schedule take place during summer or winter time. The afternoon schedule starts at 13.00 and ends at 18.00.

Distribution of disciplinary subjects in part-time primary schools (Years 4, 5 and 6)*		
SUBJECTS	MINIMUM WEEK HOURS	MINIMUM ANNUAL HOURS
Spanish (i.e. Literacy or English)	6	240
Second Language: English	2.5	100
Mathematics (i.e. Numeracy)	5	200
Natural Sciences	3	120
Geography	1.5	60
History	1.5	60
Civics and Ethics Education (i.e. Citizenship Education)	1	40
Physical Education	1	40
Arts Education	1	40
TOTAL	**22.5**	**900**

*SEP, 2011a, p. 74, researcher's emphasis: grey font colour

Table 1.1 Official time allocation for part-time primary schools

The subjects written in grey are not the responsibility of the classroom teacher since part-time teachers, who are specialists in these fields, teach those subjects. This chart does not include the information and communication technology subject which was later incorporated to the curricula and is not part of the classroom teacher's timetable. In summary, classroom teachers in Mexico are responsible for teaching seven subjects every week. The same number of subjects is taught by the teachers working at full-time schools, albeit having more teaching time and without having to share the building with another school administration—as is often the practice for part-time schools. Table 1.2 presents the proposed schedule for fulltime schools:

Distribution of disciplinary subjects in full-time primary schools (Years 4, 5 and 6)*		
SUBJECTS	MINIMUM WEEK HOURS	MINIMUM ANNUAL HOURS
Spanish (i.e. Literacy or English)	8	320
Second Language: English	5	100
Mathematics (i.e. Numeracy)	7	280
Natural Sciences	4	160
Geography	2.5	100
History	2.5	100
Civics and Ethics Education (i.e. Citizenship Education)	2	80
Physical Education	2	80
Arts Education	2	80
TOTAL	**35**	**1400**

*SEP, 2011a, p. 74, researcher's emphasis: grey font colour

Table 1.2 Official time allocation for fulltime primary schools

This table provides a general outlook of the teaching time defined for each disciplinary subject in full-time schools at the time this study was conducted. Taking the 2011 curriculum as a base, a new curricular proposal is being implemented for the first time in the school cycle 2017-2018 (SEP, 2016). This adds to the significance of studying the previous curriculum as a way to understand the novel direction suggested for primary school education.

1.3 Influential curriculum documents

The National Curriculum, study programmes (there is one per year) and textbooks are statutory documents. These documents are core to the pedagogical structure and learning content of basic education in Mexico (SEP, 2011a; 2011b; Cervera-Cobos et al., 2014). They are centralised documents, meaning they are designed, created, published, and distributed free of charge to schools and students across the nation by the federal Ministry of Education and its state departments. Nowadays there are digital and open access versions of these documents, yet the physical distribution of them is still dominant. The National Curriculum and Study Programmes are edited and curated versions of public policy documents defining basic education—these are mentioned in section 3.3.1. Ryder and Banner (2011, p.711) identify policies with a context of influence, text production, and practice; of the three levels the policy the context of practice is relevant to the teachers participating in this project.

The National Curriculum, Study Programmes and textbooks have various potential users, mostly within the educational system. Generally, students and teachers use the textbooks. The National Curriculum and Study Programme are expected to be regularly used by school authorities and teachers, however, parents can also use them to become informed about the educational system. The National Curriculum and Study Programme provide guidance for teaching; therefore, teachers are strongly advised to become acquainted with these guidelines. Nevertheless, using these documents for lesson planning is not a straightforward decision for teachers since internal and external factors to the classroom influence how they are prioritised.

After the last reform, a lack of congruency in educational aims and learning content was common between the Study Programme and textbooks. In addition, sometimes the distribution of these documents had not been equal across the country, unduly stressing teachers due to the impending standardisation practices. These issues and the pressure of student tests have motivated the creation of school and district policies which prioritise either the Study Programme or textbooks as guides for teaching. Having digital versions of curricular guidelines tried to tackle the distribution issues, however, this was a partial solution as gaining access to digital technology is still problematic in some parts of Mexico. These issues of the educational system and its publications were mostly resolved by the time this study was conducted.

The 2011 versions of the National Curriculum and Study Programme were in use in between the school cycles from 2011 to 2017 (i.e. these are contemporaneous of when this study was conducted). These versions describe the curricular changes produced by the last educational

reform in the Mexican basic education system. The Integral[2] Reform of Basic Education (RIEB by its acronym in Spanish) involved curricular, pedagogical, and administrative changes to the educational system. A result of the reform was creating a basic education curriculum that integrates preschool, primary, and lower-secondary education. The 2011 National Curriculum describes twelve pedagogical principles amongst which inclusive and student-centred approaches are emphasised (SEP, 2011a, pp. 26-37). Currently, the state-regulated basic education in Mexico is led by the promotion of a set of key competences in students. Regarding this approach and EE, Paredes-Chi and Viga-de Alva (2017) assert the competence-based focus on the basic education curriculum can be a discursive barrier to EE teaching because there is lack of teacher training in these matters (p.10).

The National Curriculum, Study Programmes, and Natural Sciences textbook have various sets of aims oriented at strengthening social and personal aspects of the students' lives. Overall, the post-reform and aim-based pedagogical project for basic education attempts to provide students with an education that is conducive to leading a fertile and full life. This study understands *educational aims* as ranging from a single to a cluster of statements that describe expectations of students' attainment regarding factual knowledge, cognitive and practical skills, desired attitudes and values[3], and so on.

In the official documents, the educational aims are grouped in accordance to their reach and purpose. There are those groups of educational aims that describe the purpose and expectations of a successful learning process in basic education, and these are more common in the National Curriculum and Study Programmes. There are also sets of aims having more specific reach and purpose, like the expected learning outcomes in the official textbooks. Finally, as official documents become more explicit about the teaching methods and learning (e.g. from National Curriculum to textbooks), the detail of educational expectations increases. A further description of these documents is provided, ahead, in Sections 3.3.1 and 4.1.

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[2] The word 'comprehensive', and not integral, might suit the meaning in English better, yet the official website of the Ministry of Education translated it as 'integral'.

[3] Kogan (1986) described that values 'need not to rely upon facts or evidence, thought can be supported or challenged by knowledge propositions' (p.95). Sterling (2001) suggests that educational ideologies are informed by two different types of values: intrinsic values (where education is a good by itself) and instrumental values (where education is a means to an end). From psychology and in relation to EE, Kollmuss and Agyeman (2002) observed values are significant for intrinsic motivation.

Chapter 2. Conceptual background and empirical literature

This chapter aims to introduce reader to EE and present important concepts for this thesis. First, Section 2.1 narrates the search processes involved in the production of this literature review and lists the main theoretical frameworks. Then, in Section 2.2, the chapter presents an account of how EE became an emerging field and the relevant themes across its contemporary history. Following this, in Section 2.3, the chapter discusses relevant recommendations to EE research, and it reviews a list of empirical studies which are relevant for the thesis. After discussing the review of empirical studies, the last sections of the chapter describe the main points of teacher cognitions, a research area that has an informative role in the thesis.

2.1 Literature review procedure

The literature review included the search of literature for two different purposes. Finding significant literature in the field of EE was a continuous activity practised throughout the development of this thesis. This type of literature search was a core action in delineating the conceptual background of the study and refining the researcher's knowledge of the field. Additionally, the search for relevant empirical research literature supported the design of this research study. The details of both searches are described below in this section. Then, the section continues to allow a brief definition of the way the theoretical framework informs this thesis.

2.1.1 How the conceptual framework was gathered

The present conceptual background combines the work of key scholars in EE and intergovernmental reports, declarations, and similar internationally-relevant documents for the history and development of the field. Locating the literature for the conceptual framework was an ongoing process throughout the development of this investigation. The literature searches for both the conceptual and empirical reviews were conducted in Spanish and English. This means the body of knowledge used in thesis considered work from Anglo-Saxon and Hispanic cultures; and, from developed and developing countries (mostly from Latin America)—which is a rather important notion in the study of EE.

All the policy-related documents used for the conceptual framework were open to public and available in digital format, thus, these documents were easy to find by performing Boolean searches in Internet search engines.

The scholastic work used in the conceptual framework was mainly identified by performing Boolean searches in various search engines. The searches were conducted through the University of Leeds online library services, Web of Science and Web of knowledge (databases of scholastic work), and during physical visits to relevant sections in the libraries of the University of Leeds. To locate key materials, the researcher perused the lists of references in the academic literature reviewed. Finally, quotations and commentary from scholars were often selected and used to provide an alternative analysis, evaluate or complement a point, and/or to introduce a topic.

2.1.2 How the empirical studies were collected

The empirical literature presented here and elsewhere in the thesis was located through the same means that were used to find the material for the conceptual background. As for the conceptual framework, the search of empirical work was carried out using the same sources and performed during the conceptualization of the project, the analysis of data, and before writing the discussion of the study's results.

The search of empirical work in research databases was mostly guided by combining key words and terms such as: environmental education; primary or elementary school, primary or elementary school teachers, in-service teachers. The main filters used during the Boolean searches were title and keywords or topic. The search was thorough, yet not exhaustive since there are other languages, databases, and unpublished work that were not used in this literature review. More information about the search parameters and results of the literature search is offered in Section 2.3.2, later in this chapter.

The main journals visited during the search of empirical and conceptual work were: Environmental Education Research; Journal of Environmental Education; The International Journal of Science Education; The Australian Journal of Environmental Education; The Canadian Journal of Environmental Education; Journal of Teacher Education, Applied Environmental Education and Communication; and some others.

2.1.3 Theoretical frameworks drawn upon across the thesis

To address the research questions guiding this investigation, the thesis draws upon a range of different theoretical frameworks (see the research questions in the introduction and in Section 3.1). There are four theoretical frameworks running across this chapter; these define the conceptual underpinnings of the thesis and highlight important assumptions for this investigation:

a) the political and academic development of EE as a field
b) the existence of multiple ways to approach EE in research and teaching
c) a core conflict between EE and formal education
d) the importance of teacher cognition to understand teaching

Firstly, 'the political and academic development of EE' mainly found in Sections 2.2.1 to 2.2.4 is a purposely broad framework that attempts to illustrate the nature of EE and make the implicit socio-cultural, political, economic, and ecological interactions of EE manifest. The political and academic outline in the framework stresses the complexity that is embedded in EE, because this is an important assumption to consider when delivering EE-related content in teaching. Additionally, this framework was helpful to inform the discussion of the findings in Chapter 7, for instance, to broadly recognise in teachers' conceptions the degree of awareness and complexity about EE.

Secondly, 'the existence of multiple ways to approach EE in research and teaching' is a notion mainly delimited through the work of Lucie Sauvé (1996; 2005; 2008) in Section 2.2.5 of this chapter. Later, in Section 3.4.3 of Chapter 3, this theoretical framework is reiterated when using Sauvé's (2005) EE typology to analyse the data relevant to RQ.2. Besides emphasising the inherent complexity of EE, this theoretical framework aims to underscore the diversity of EE ideologies and pedagogies. In Sauvé (2005), the multiple approaches to EE are not delimited to a type or level of education neither to a research area, but the proposal in this article is useful to explore pedagogical conceptions of EE.

Thirdly, 'a core conflict between EE and formal education' is a framework addressed in Section 2.2.6 of this chapter, and it briefly explains the historical and recurring relationship of EE and formal education. The latter involves, for instance, neglecting the interdisciplinary and cross-curricular nature of EE because, traditionally, formal education concentrates EE in science education curricula. This framework was useful to the researcher's reflexivity of the initial assumptions she had about this investigation and to study this project's data in relation to curriculum policy, which is pertinent to the RQ.1.

Finally, 'the importance of teacher cognition to understand teaching' is a framework addressed across Section 2.3 of this chapter; although, a summary about teacher cognition theory is presented in Section 2.3.5. This framework is important to support the assumption that curriculum representations of EE and teachers' conceptions about EE are two phenomena (implicitly or explicitly) related to teaching and learning EE-related aims. To illustrate this theoretical framework, the researcher mainly draws upon the work of Simon Borg (2006; 2015) and other relevant academics of this research area.

After an extensive investigation on 'the mental lives of teachers', Simon Borg (2006; 2015) presents a meta-analysis of the area and proposes a model of teacher cognition for the study of second (or foreign) language teachers and their classroom practices. In his theory of teacher cognition, Borg (2006; 2015) emphasises the interrelation of the factors forming teachers' cognitions. Similarly, this thesis focuses on teachers' conceptions about EE, and these are considered in relation to the teachers' experiences beyond the limitations of a classroom by addressing factors such as school cultures and the national curriculum. Nevertheless, the use of Borg's theory in this thesis is discrete and limited when this is compared to the potential of its original purpose. Instead, Borg's analysis and theory were used to refine the analysis and discussion of the RQ.3 because through this framework the researcher was more alert to the factors potentially influencing the cognitions of the research participants.

Further aspects and contribution of the theoretical frameworks are conveyed in the following sections of this chapter.

2.2 An overview of environmental education's trajectory

Introducing oneself to EE can be a bewildering task, as EE is a field characterised by complexity and difficult to define. Hence, the first purpose of this section is introducing the field and its relevant concepts by presenting a wide and historical perspective of EE. This wide perspective of the field is attained by reflecting and discussing both the contributions of global policy and scholastic work. The second purpose of this section is to address concepts and key words which flag important ideas in EE. Introducing these events and ideas intend to help in understanding and assessing the work presented in the chapters ahead.

Important themes and principles in EE characterise the following sections, and it is important to highlight them here because they are addressed across this thesis—for instance, ahead in Chapter 4 and the findings in Section 7.12. Considering opposite notions, EE is concerned with the built, social and natural environments and the emphasis on either depend on the EE approach. The EE can emphasise a local or/and a global perspective; likewise, EE can be aimed to address environmental problems or the understanding of the human-environment relationship[4]. Likewise, EE can be differentiated from its anthropocentric or eco-centric principles (i.e. human-centred or nature-centred endeavours). As a pedagogic project, EE can be practised in schooling or informally through other community initiatives. EE can also be

[4] In the context of EE, the words *relationship* and *interrelation* are used to emphasise the two-way connections we have with the natural and built environments that humans have created.

influenced by lightly engaged ideologies or by socially-critical ideologies; it could be aimed to produce individual to collective reformation, focusing its attention to improving the environment or social circumstances. Finally, EE can target immediate or future issues; similarly, in a pedagogic project, EE can be considered a life-long learning process or be reduced to being no more than a curricular subject.

2.2.1 Environmental education: an emergent field

With almost 50 years of history, EE is considered an emerging academic field (Benítez-Esquivel, 2007; González-Gaudiano, 2008; Fernández-Crispín, 2013). EE has congregated a variety of stakeholders and users from many different geographical and subject areas. This has instigated a wide diversity of EE *approaches or currents*, each shaped by specific emphases, diverse theories and practices (Cutter and Smith, 2001; Scott, 1999); each approach involves an ideology[5] regarding the ways to define and practice EE (see an EE typology in Section 2.2.5). Hence, EE is also interpreted according to the ideologies that its stakeholders chose and the stakeholders in EE are people from diverse groups and disciplines. Because of the latter, the transitions in EE (changes in the concepts, aims, methodologies, and terms or slogans) have rarely had a clear-cut divide; more often a prominent event, a policy document or a piece of scholastic work have been the ones setting milestones and definitions for the field.

Contemporary EE has been promoted and changed over time by the influence of intergovernmental policies, scholastic work, educational endeavours, and community projects (Scott, 1999). For instance, it is believed that in the United States of America primary school teachers were those who launched EE, whereas in Spain EE was launched by ecologists and in Mexico by scholars of Biology (González-Gaudiano, 2000). Therefore, no matter which approach taken to narrate it, the history of EE tells the story of a social movement that became institutionalised (Gough, 2013). A leading publication for EE in Spain, The White Book of Environmental Education, suggests naming the history of EE as: ‘a theory with good intentions and bad strategies’ or ‘a necessary learning for the ambitious project of changing society’ (Ministerio de Medio Ambiente, 1999, p.4).

In her Master’s study on the field properties of EE, Benítez-Esquivel (2007) emphasises that

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[5] The meaning of *ideology* or *worldview* change according to the context and there is vast discussion on the topic. Here ideology or *worldview* are considered to be substained by a system of values, beliefs, and attitudes . An ideology is related to personal and group identity, guides moral behaviour, and it describes an understading of the what the world should be like and how to work on that view (Fien, 1993a, p.16).

EE is heavily guided by social interactions and tensions—a less impacting phenomenon in fields related to the natural sciences. In fact, EE is perceived as a field in permanent construction because it depends on social change (Stevenson et al., 2013b) and, through tensions or agreements, its many approaches keep nurturing it (González-Gaudiano and Buenfil-Burgos, 2009). Hart and Nolan (1999) and Benítez-Esquivel (2007) support that the diversity of views is a sign of moving towards a maturity in the field. This is because having various approaches to EE encourages critical reflection of the ideologies embedded in each approach (Sauvé, 1996). This is how scholastic work has produced scope, sophistication, and richness in the methods, results, and reflections of EE research (Stevenson, et al., 2013a).

Even after three decades, the restless and classical definitional problem of EE (i.e. 'what is EE?') progressed, yet the recognition of already existing agreements and functional structures in EE did not feature strongly (Disinger, 1998). Although, that is not entirely accurate since Hart (1981) found 25 key characteristics in EE when he conducted a state of the art review focused on finding common elements across EE literature. This shows that in the early days of post-intergovernmental recognition of EE there was, indeed, a degree of cohesion and agreement in the area, but perhaps the tensions and the diversity of views in EE—although helpful for its evolution—might have also been a stronger obstacle than its confluences. This suggests that studying the conceptions and ideologies of stakeholders in EE has the purpose of moving the field forward, soften tension, and make the best of commonalities across EE.

2.2.2 Intergovernmental foundations of environmental education and environmental policy

Any chronicle of contemporary EE tells a story of changing educational strategies and concerns about the environment and human sustainability (Tilbury, 1995, p.197). Since the 1970s and for almost 50 years, EE has been formally addressed and outlined in international policy forums, conferences, and other legislations across the world (Dillon, 2014; Gough, 2013). In fact, the United Nations and its sibling the United Nations Educational, Scientific, and Cultural Organization (UNESCO) majorly shaped the public image of EE (Hart, 2008, p.26). See in Table 2.1, some of the important developments of EE through intergovernmental policy and important discussion forums:

YEAR	PLACE	EVENT	RELEVANT DOCUMENT	MAJOR CONTRIBUTIONS/ THEMES COVERED
1968	Paris, France	Scientific basis for Rational Use and Conservation of the Resources of the Biosphere (the Biosphere Conference)	Final Report	First intergovernmental meeting to address environmental issues and recommend EE programmes. International integration of the word "biosphere" to the terminology of the field.
1972	Stockholm, Sweden	United Nations' Conference on the Human Environment.	Stockholm Declaration	Stated education in environmental matters is essential for enlightened opinions, responsible conduct, and protection of the environment.
1975	Belgrade, Yugoslavia	International Workshop on Environmental Education	The Belgrade Charter: A Global Framework for Environmental Education.	Global agreements on goals and application of EE whilst intertwined with social development. First time EE definitions are free of sexist language (Gough, 2013, p.16)
1977	Tbilisi, Georgia, USSR	Intergovernmental Conference on Environmental Education	Tbilisi Declaration	Reoriented EE to *knowledge, aptitude, attitude, skills*, and *determination to act*. Focus on environmental problems and working on solutions. Advocated for EE to be integrated into whole system of formal education, at all levels.
1982	New York, USA	General Assembly, 48th plenary meeting	World Charter for Nature	It offered general principles, functions, and implementation strategies for the conservation of nature.
1987	Moscow, USSR	International Congress on Environmental Education and Training	International Strategy for Action in the Field of Environmental Education (i.e. Moscow Declaration)	Promoted EE as a life-long learning process and suggested education in EE for teachers.
1987	Oxford, UK	900-day international exercise in search for a sustainable development path.	Our Common Future (i.e. Brundtland Report)	The UN's World Commission on Environmental and Development set a conceptual landmark for sustainable development (SD) and interdisciplinary EE.
1992	Rio de Janeiro, Brazil	Earth Summit – United Nations' Conference on Environment and Development	Agenda 21, the Rio Declaration on Environment and Development, etc.	Chapter 36 of Agenda 21 accentuated the importance of education, public awareness, and training, for EE and ESD.
1994	Cairo, Egypt	International Conference on Population and Development	Chapter XI. Population, Development and education.	Connected the impacts of the population on the natural environment, human health, and education in a programme.
1996	Paris, France	International Commission on Education for the 21st Century	Final Report	Re-affirmed the fundamental role education has in personal and social development.

1997	Thessaloniki, Greece	International Conference on Environment and Society: Education and Public Awareness for Sustainability	Final Report and Thessaloniki Declaration	Called for reorienting education to include sustainability. All subjects must include issues of sustainability; a greater emphasis on interdisciplinary education.
2002	Johannesburg, South Africa	United Nations World Summit on Sustainable Development	Plan of Implementation of the World Summit on Sustainable Development	Addressed eradication of poverty, changing consumption/production patterns, natural resources basis, sustainable development, and the need for public awareness achieved through education.
2002	Sao Paulo, Brasil	XIII Meeting of the Forum of Ministers of the Environment of Latin America and the Caribbean	Latin American and Caribbean Initiative for Sustainable Development	SD was an overarching goal in the initiative, which set EE as means to introduce the *environmental dimension* in economy and society. Clear separation of economy and society in the document's rhetoric.
2004	Paris, France	UN's Decade of Education for Sustainable Development (DESD)	DESD (2005-2014): International Implementation Scheme	Implemented a decade of international engagement for learning values, behaviour, and lifestyles towards SD. EE loses emphasis in DESD.
2007	Ahmedabad, India	4th International Conference on Environmental Education (Tbilisi+30)	The Ahmedabad Declaration 2007: A Call to Action	Focused on encouraging sustainable lifestyles embedded in ecological integrity, economic and social justice, and respect for life on earth. EE ought to advocate for education for sustainable development (ESD).
2009	Bonn, Germany	UNESCO's World Conference on ESD	The Bonn Declaration	Lifelong learning and formal education are reaffirmed as ways to achieve more sustainable lifestyles.
2009	Montreal, Canada	5th World Environmental Education Congress	Congress report "Earth Our Common Home"	International discussions in the "Earth our common home" reconsidered the role of EE.
2014	New York, USA	The 2010 United Nations Summit on the Millennium Development Goals (MDGs)	The Millennium Goals Report	Targeted to reducing poverty and unsustainable lifestyles. Environmental sustainability is still recognised as a pressing issue.

Table 2.1 Significant international events in the history of EE

Overall, Table 2.1 shows that EE was conceived as a pedagogical tool to address, with different emphasis and depending on the period, environmental and social issues. Identifying key international and policy-related documents (i.e. intergovernmental reports and declarations) was helped by consulting the work of experienced scholars in the field (i.e. Gough, 2013; Palmer, 1998; Peza-Hernández, 2013; Sauvé et al., 2008). However, the researcher conducted her own search to corroborate the date and place of the events in Table 2.1, the organisations involved, the main documents produced and key themes and contributions for the history of EE.

Despite the hegemonic and general nature of rhetorical recommendations in intergovernmental reports (Sauvé et al., 2008), the documents and meetings showcased in Table 2.1 contributed to globally recognising that educational strategies are necessary to alleviate environmental and social problems (Cutter and Smith, 2001; Landorf, Doscher, and Rocco, 2008; Peza-Hernández, 2013). EE has increasingly become part of learning agendas in mainstream educational programming (Hart, 2008). A potentially negative aspect of the way the UN's and UNESCO's intergovernmental reports promote EE is considering education simply as a problem-solving tool because this is a contradictory notion to basic humanistic and anti-utilitarian ideologies in EE (Sauvé et al., 2008).

Policy statements and intergovernmental events were not celebrated in a vacuum, just like 'our thinking systems are not independent of their history' (Dolors et al., 1995, p.8). This is because the historical moments and knowledge of a period have determined much of what was emphasised in EE. Thus, the influences of EE range from environmental and social movements to academic fields of study, for instance: nature study in the 1960s; nature, outdoor, conservation, and urban education in the 1970s; global, development, and action education in the 1980s; empowerment and sustainable futures in the 1990s; and, sustainable development—and perhaps communities of practice—in the 21st century (Disinger, 1998, p.18; Palmer, 1998, p.23). Recent developments in the intergovernmental policies of EE are concentrated on promoting universal and future-oriented environmental ethics and morals (Sund and Öhman, 2013). The proceeding sections expand upon important themes in the trajectory of EE by presenting global policy recommendations in combination with commentary from scholars in the field.

2.2.3 Initial 'configurations' of environmental education

Recurrent, and therefore general, themes in the initial and global 'configurations' of EE are: desired outcomes of EE focused on behavioural change[6] and environmental quality; emphasis on the relationship between humankind; and the environment and the onset of the first aims for EE. These themes are both of definitional and operational content, hence, the paragraphs below include contributions from scholars in the field, policy statements and actions taken or suggested in the first decades of EE by the UN, UNESCO, and the United Nations Environmental Programme (UNEP).

The predominance of outcomes focused on behavioural change and environmental quality

The foundational definitions of EE analysed by Disinger (1998) suggest the influence from areas such as conservation and nature studies, environmental management and environmental sciences. These areas of study were the foundation for what is known as the ecological and scientific approaches to EE (as suggested in Dillon, 2014; Gough, 2013; Peza-Hernández, 2013; Sauvé, 2005). Generally, initial approaches to EE targeted environmental quality by attempting to foster pro-environmental behaviour in societies. Pro-environmental behaviour (also related to pro-environmental actions) refers to behavioural patterns which seek to minimise the negative impact of one's actions (e.g. reduce one's solid waste production) on the natural and built world and, if possible, improve it (Kollmuss and Agyeman, 2002). Although, pro-environmental behaviour is not a direct product of providing knowledge about the environment and conservation strategies as the initial models of EE suggested (Kollmuss and Agyeman, 2002).

An important difference to highlight at this point of the literature review, is that 'nature' or the natural world and 'the environment' are not synonyms. Gough (2008) explains that nature is 'something that exists independently of people' whereas the environment can refer to settings or situations that involve humans or not (p.90). For instance, the environment can be identified, like the environmental crisis, as socially-constructed; this means originating from personal values and social systems (Hart, 2008). Initial configurations of EE refer to nature or the environment in similar ways (i.e. concentrating on natural resources and biodiversity). There are two popular EE definitions which reflect these initial notions: Stapp's and the

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[6] In this thesis agrees with Kollmuss and Agyeman (2002) in that attitudes are 'enduring positive or negative feeling about some person, object, or issue' (p.252). This concept will often be seen in this thesis with terms such as *pro-environmental attitudes and behaviour*.

International Union for Conservation of Nature and Natural Resources (IUCN)'s definition of EE. The former says the following:

> *Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution. (Stapp, 1969, p. 31)*

Stapp's definition of EE shows that from an early stage, EE was considered a process for the education of citizenship. The premise sustaining that more knowledge about the environment equals pro-environmental attitudes and behaviour (Kollmuss and Agyeman, 2002) is evident in this definition of EE. Stapp's definition stresses the creation of citizenry knowledgeable of the biophysical environment and related problems, but it says little about the creation of aware and motivated people. According to Stapp, educating the general population about the interrelations between them and the biophysical environment was a crucial matter for society (ibid., p. 30); but his definition lacked emphasis on the role of the socio-cultural dimension in EE—a criticism provided by Roth (1970, in Disinger, 1998).

The focus of Stapp's definition responds to the inhabitancy transition from rural to urban environments in the United States of America at that time, yet it was broadly adopted as one of the first and concise definitions of EE (Disinger, 1998; Gough, 2013). The environmental problems that are addressed in Stapp's definition of EE respond to a contextual need and outlook of the environment in that time, mainly, stressing problems related to conservation and management of natural resources. In a similar period, the *International Working Meeting on Environmental Education in the School Curriculum*, organised by the IUCN and taking place in U.S.A, promoted the following definition for EE:

> *Environmental education is the process of recognising values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man [sic.][7], his culture and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behavior about issues concerning environmental quality. (IUCN, 1970, p.26)*

The IUCN's definition of EE was one of the first widely accepted by Britain's National Association for Environmental Education (NAEE) and other similar organisations across the world (Palmer and Neal, 1994, p.12); also, it was replicated in later definitions and

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[7] Gough (2013) expresses that terms such as 'man' or 'man-made' reflect the science groundings of initial approaches to EE and are exclusionary or ambiguous about the role of women. The scientific sense of these terms is meant to be inclusive of both genders, yet these days more inclusive and neutral terms are preferred considering the necessary awareness of gender-balance issues.

programmes of EE. Like Stapp's definition and many other created during the first stages of EE, the IUCN's definition describes EE as a learning process and focuses on internal aspects of an individual (to develop attitudes, behavioural change, and decision-making skills). It was also foundational to the association of EE with the human-environment interrelations (i.e. 'the interrelatedness among man, his culture and his biophysical surroundings'). Yet, despite the notions of interrelatedness, the IUCN's definition neglects demographic and external factors which are significant for pro-environmental behaviour (Kollmuss and Agyeman, 2002).

The first definitions of EE included terms like 'man', 'biophysical', 'ecosystems', 'total environment' (Gough, 2013, p.15) which are male-centred and concentrated ecological and scientific approaches to EE. Eventually, the intergovernmental reports and later recommendations for EE moved beyond these initial ideas as they began to include the socio-cultural dimension. Although the focus on behavioural learning theories and environmental quality remained prevalent in decades to come.

The relationship between humankind and the environment in environmental education

According to Sauvé (2004a), the interactions between humans and the environment are actual focus of EE. Therefore, it is common to find that a core theme of contemporary EE is the study and improvement of the relationship between humans and the environment (either with natural or urban landscapes); but the current prevalence of this theme took time to progress from the initial emphases on environmental science and ecology. The emphasis on the human-environment relationship was important to our current understanding of environmental problems.

Academic research, like the definitions discussed above, also took part in shaping EE's emphasis on the relationship between humans and the environment. In early 1970s, the doctoral theses of Lucas (1972) and Harvey (1977), both scholars from North-eastern Universities in the United States of America, contributed to outlining EE. On the one hand, Lucas outlined three possible educational models[8] of EE: education about, in, and for the environment. On the other hand, Harvey reviewed multiple definitions of EE, concluding EE was a vague term and needed more emphasis on the human-environment relationship.

[8] The education *about*, *in*, and *for* the environment are often described as approaches, dimensions, or foci to EE. For instance, Tilbury (1995) refers to them as 'approaches' and Robottom (2008) as 'dimensions' and 'foci'. In this thesis, the researcher preferred using 'model', which is a broad and representative term of the various ways to envision EE programmes.

In his doctoral thesis, Lucas discriminated between education *in, about,* and *for* the environment and said each could describe a type of educational programme in EE (*op cit.*, p.99) by targeting specific knowledge and outcomes. Lucas's proposition is now basic knowledge of EE; for instance, education in, about, and for the environment prominently feature in the introduction of *the environmental curriculum: opportunities for environmental education across the National Curriculum for England*—this is a handbook created by the United Kingdom's NAEE (Green, 2015). Lucas' (1972) model for EE programmes has been repeatedly being explained over time. Here is an example taken from Tilbury (1995), she uses Lucas' model to inform her insights on environmental education for sustainability (EES):

> *Education **about** the environment is concerned with developing awareness, knowledge, and understanding about human-environment interactions.*
>
> *Education **in** the environment favours pupil-centred and activity-based learning. This approach usually takes the form of outdoor education.*
>
> *Education **for** the environment regards environmental improvement as an actual goal of education by developing a sense of responsibility and active participation in the resolution of environmental problems. (p.207, Tilbury's emphasis: bold format)*

Lucas' proposal for EE programmes highlights a specific aspect of the human-environment relationship: how we teach and learn about the environment. Lucas' thesis was elucidating for EE practices of the time, however, the relevance of the interactions between humans and the environment are—paradoxically—de-emphasised in this model. This is because Lucas' proposal is mainly pedagogical, and it makes the environment the central focus of EE, instead of stressing the interrelations between humans and the environment.

In contrast with the first two models (education abou*t* and in the environment), education for the environment is the most reformative one because it challenges the approach to economic development and the so-called reproductive functions of education (Fien, 1993a, p.5). Moreover, education for the environment is often associated with participatory principles of social reformation, targeting the mobilisation of pro-environmental actions across communities (Hart, 2008). This approach is often associated with socially-critical or social action approaches of education (e.g. Fien, 1993a). This is how education about and in the environment, are subsidiary in contrast to the expectations set in education for the environment; for instance, education about the environment has somewhat passive stance to environmental problems (Fien, 1993a). Yet, Lucas indicated that, despite the differences between the three models, is possible to combine them all in an EE programme.

Further ahead in developments of EE, there is Harvey's doctoral thesis; in his thesis, Harvey contrived that the term 'environmental education' was inappropriate and suggested the descriptor 'man-environment [sic.] relationship education' (1977, p. 216). This indicates a clear emphasis on the study of the relationship between humans and the environment in EE. He described the man-environment relationship education as follows:

> *The process of developing an environmentally literate, competent, and dedicated citizenry which actively strives to resolve values conflicts in the man-environment [sic.] relationship, in a manner which is ecologically and humanistically sound, in order to reach the superordinate goal of homeostasis between quality of life and quality of environment. (Harvey, 1977, p. 216)*

The human-environment relationship depicted by Harvey goes beyond biophysical links. Harvey's definition of the man-environment [sic.] relationship associates aspects of the cultural and political dimensions by including values (see an explanation of the concept in Section 1.3) for social coexistence in civil societies and quality of life. The man-environment [sic.] relationship education did not thrive as a field of study per se, but the contributions in Harvey's thesis were later taken by other prominent scholars in EE (Hart, 1981; Disinger, 1998) who used it to discuss the structure of EE.

In early EE, the human-environment relationship was often studied through the lenses of ecology and environmental sciences, finding its place in concepts such as the 'total environment'. Rugumayo (1987) explains that 'total global environment' as the convergence of ecological studies with the effects of 'key forces' in society; such as, the effects of industrialisation, the improvement of communication technologies, and the influence of international economic order (p. 30). This explanation of the total environment has the human-environment relationship in its core.

In policy statements, the human-environment relationship was also addressed. For example, the Tbilisi Declaration in 1977 (see Table 2.1 for more information) advised taking a holistic approach[9] to EE. The suggestion was to change EE from concentrating on environmental sciences to considering knowledge from other fields like sociology, economy, psychology, and so on. Furthermore, the Tbilisi Declaration described *the complexities of the environment* as ecological, social and cultural problems and *the modern world* as one of economic, political and ecological interdependence (UNESCO, 1978, p.12). These changes and discrimination of

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9 Roughly, holism is a system of belief supporting the study of whole systems, instead of looking at their parts and in a disconnected manner (Popper, 2002)

terms invited more chances for EE to comprehensively explore the human-environment relationship and contemporary environmental problems.

From 1980s, the emphasis on human-environment relationships in the framework of conservation and ecology was significantly left behind for sustainability and social-based notions of the environmental crisis. In fact, the broadening of EE to holistic approaches and other disciplines became prominent during the 1980s (Tilbury, 1995), it was especially supported by scholars from Australia, Canada, and South Africa (Stevenson et al., 2013a, p.513). From this time, environmental problems were increasingly seen as the product of social issues; albeit, these new emphases in international discourses often overlook the role of the economic and political dimensions in such problems (Sauvé et al., 2008).

The environmental education lead by objectives and basic education programmes

The work done in the first decades of EE was concentrated on prescribing educational objectives and embed EE-related content in K-12 curricula (Disinger, 2001). To provide an illustration of this claim, the following paragraphs describe the role and contribution of events (i.e. the Belgrade Charter, the Tbilisi Declaration, and the Moscow Declaration) in the framework of the International Environmental Education Programme (IEEP).

The recommendation no. 96 of the United Nation's Conference on the Human Environment (held in Stockholm in 1972) asks that the 'Secretary-General, the organizations of the United Nations System, especially UNESCO […] to take the necessary steps to establish an international programme in environmental education' (UNEP, 1972, p.24). As a response, UNESCO and the UNEP created the IEEP to promote conceptual and praxis development of EE across nations (UNESCO, 1984, p.1).

The IEEP was a first effort to consolidate and promote EE in schools and at an international level. The activities of the programme were active from 1975 to 1995 (Union of International Associations [UIA], no date). During its first decade, the IEEP was conducted in three phases (UNESCO, 1984). Phase 1 (1975-1977) promoted global awareness of the need of EE, and by organising events such as the Belgrade Charter and the Tbilisi Declaration. Phase 2 (1978-1980) focused on developing concepts and methodological aspects, which supported cross-disciplinary and problem-solving approaches to EE. Phase 3 (1981-1983) focused on practices and training of environmental educators—and teachers—to facilitate the introduction of EE in formal and informal schooling. In addition, the programme included dissemination of EE through teaching resources, publications, and the creation of databases for institutions and projects working on EE.

Other events, the Belgrade Charter and the Tbilisi Declaration (both events of the IEEP, see in Table 2.1) also provided goals and principles for EE that became important worldwide and for an extended period. As a matter of fact, Gough (2013) indicates that the results of these conferences formalised EE from being a movement to becoming a field (p.13) and they significantly helped in defining EE (Braus, 1995). The Belgrade Charter lists five goals for EE which became the focus of research studies in the following two decades:

1. *environmental awareness among individuals and social groups;*
2. *fostering responsibility among society by encouraging basic concepts of the environment;*
3. *cultivating positive attitudes towards the environment and its protection; helping people to acquire skills for solving environmental issues;*
4. *promoting interdisciplinary and critical thinking skills to evaluate environmental measures and programmes;*
5. *and, ensuring participation of society in solving environmental problems. (UNESCO and UNEP, 1975, p.4).*

Environmental awareness is an important and popular concept in EE, Kollmuss and Agyeman (2002) define it as 'knowing the impact of human behaviour on the environment' (p. 253). These authors claim environmental awareness includes both cognitive and affective components (e.g. knowledge-based and perception-based views of our impact on the environment). Similarly, the EE goals for EE from the Belgrade Charter focus on internal aspects of the individual, yet they do not emphasise the influence of external factors in the achievement of pro-environmental behaviour and environmental improvement. In a later time, the Tbilisi Declaration adopted Lucas' (1972) proposition of education about, in, and, for the environment and it outlined that EE is aimed at promoting *knowledge, skills,* and *attitudes* that would help to ameliorate the environmental crisis (UNESCO, 1978, p. 12). The Tbilisi Declaration presented three major goals for EE:

1. *to foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;*
2. *to provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;*
3. *to create new patterns of behaviour of individuals, groups and society as a whole towards the environment. (UNESCO, 1978, p.26)*

The EE goals from the Belgrade Charter and Tbilisi Declaration became important guidelines for the creation of EE programmes and K-12 curricula. In fact, a decade later, The Moscow

Declaration (another event of the IEEP) reproduced the principles and goals of EE from Belgrade and Tbilisi, restating their outline of EE. The Moscow Declaration, however, emphasised the life-long role (also called a permanent educational process) of EE in aiming to solve environmental problems; additionally, it promoted further teacher training on EE.

In an analysis of the work done in the framework of the IEEP, González-Gaudiano and Arias-Ortega (2009) observe the IEEP contributed to formalising EE, albeit, these authors identified some limitations in the activities promoted by the IEEP:

- It promoted EE mostly in formal schooling, thus, neglecting other sector in society.
- It operationalised EE as subject or content in curricula, instead of considering EE as a comprehensive and life-long learning process.
- It often reduced EE to content of science education curricula, which, at the time, it was more in tune with developed nations (p.5).

These limitations happened in combination with two principal challenges faced by the programme: spreading EE worldwide and reforming spaces for EE in formal education. Regarding the first challenge, the IEEP was intended to have an international reach, nevertheless, its worldwide application was somewhat asymmetrical. For example, the IEEP had impact in Latin America and the Caribbean (LAC) approximately a decade after being launched (González-Gaudiano, 2012). Secondly, both the curricular structure of formal education and the way the IEEP promoted EE mostly allowed developing programmes of education *about* the environment (Disinger, 1987; Robbottom, 1984; and Stevenson, 1987 republished in 2007), which did not effectively contribute to ameliorating the environmental crisis (González-Gaudiano and Arias-Ortega, 2009) or recognising the diversity of approaches in EE (Sauvé and Berryman, 2005). Nevertheless, the results and activities of the IEEP allowed the identification of challenges and deficiencies of EE (Fien, 1993b, p.22).

2.2.4 Environmental education and sustainable development

Sustainable development (SD) and EE have had a relationship that is analogous to constructive and destructive interferences in the study of waves. Just like two waves colliding; in this phenomenon, their clash can either reinforce (constructive interference) or cancel each other (destructive interference) out. Similarly, it seems that EE and SD have impacted each other and have had both constructive and destructive results. The paragraphs ahead do not explain the difference between the EE, SD and education for sustainable development (ESD), instead the purpose of this section is to emphasise that the contemporary climate insisting on ESD created tension and more approaches to EE.

In the framework of EE international developments, SD was globally introduced in the 1980s through several events and studies discussing the environmental crisis. Nevertheless, SD was embedded in the intergovernmental suggestions for EE and, gradually, SD became the spotlight of reports and events discussing solutions for the environmental crisis. Part of the rationale for introducing SD and, eventually ESD, contest that EE narrowly considered the economic dimension of environmental and social issues. This claim is debatable, because the Belgrade Charter, the Tbilisi Declaration and the Moscow Declaration proposed goals for EE that fostered the understanding of environmental, social, and economic interdependence (Hart, 2008, p.27). These historical developments of EE are narrated in three subheadings: from present to future concerns in the environmental crisis; from conservation to the SD of societies; and the momentary suppression of environmental education

From present to present and future concerns in the environmental crisis

The initial 'configurations' of EE generally targeted immediate environmental problems mainly in relation to natural resources. The Belgrade Charter and Tbilisi Declaration, two important and foundational policy documents in EE (see Table 2.1), placed emphasis on the solution of immediate environmental problems. In the next decade, during 1980s, EE was meant to contribute in solving both present and future environmental problems. The Moscow Declaration is an example of promoting EE as framework for solving present and future environmental problems:

> *Environmental education (EE) is regarded as a permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, values, skills, experience, and also the determination which will enable them to act—individually and collectively—to solve present and future environmental problems. (UNESCO and UNEP, 1987, p.11)*

This definition of EE shows prevalent notions that have already been mentioned in the initial 'configurations' of the field: EE being a permanent learning process; the desired acquisition of awareness, knowledge, values, skills because of that learning process; and what these gains can do for environmental issues. However, solving present and future environmental problems features more strongly than in previous definitions of EE. The focus from immediate to present and future environmental problems meant broadening the environmental aims attributed to EE. In parallel, the broadening of environmental aims (to present and future environmental problems) was the threshold of sustainability and SD in EE.

Ever since, sustainability has often been overshadowed by SD in policy documents and international reports; this has not been helped by the fact that the differences between

sustainability and SD are not often clear. For instance, Fien and Tilbury (2002) distinguished two interpretations of sustainability among its stakeholders: those that prioritise sustainable economic growth or those that stress sustainable human development. They added that all interpretations of sustainability serve specific social and economic priorities and are value-laden, therefore they should always be critically assessed (ibid., p.3). The point is that a similar interpretation could be given to SD as well. Although, SD carries the notion of development and links it directly with economy, which have raised critical opinions of its values and aims. The following paragraphs study the introduction of SD, allowing the reader to grasp the main characteristics of SD and its political relation with EE.

From conservation to the sustainable development of societies

The broadening of environmental aims to future environmental problems expressed an initial concern for the sustainability of humankind in a world of limited natural resources. Henceforth, economic and social development were often associated in intergovernmental documents discussing global environmental and social issues. SD changed from emphasising the conservation of 'natural resources' to focusing on broad socio-economic factors. The Belgrade Charter, for instance, underscored expectations on development; and the UN's Declaration for a *New International Economic Order* that makes a call for development…

> *which takes into account the satisfaction of the needs and wants of every citizen of the earth, of the pluralism of societies and of* ***the balance and harmony between humanity and the environment****. What is being called for is the eradication of the basic causes of poverty, hunger, illiteracy, pollution, exploitation and domination. The previous pattern of dealing with these crucial problems on a fragmentary basis is no longer workable. (UNESCO and UNEP, 1975, p.1, researcher's emphasis: bold format)*

In contrast to the example above, future definitions (from the 1980s and onward) of development in environmental and educational policy stressed the significance of economic and social development in understanding and tackling environmental problems. Therefore, previous claims concentrating on the promotion of balanced human-environment relationships started to fade and they started being replaced for pragmatic and anthropocentric interests. Sometime later, sustainability and development were often found together in definitions and recommendations for EE, especially promoting SD. Two crucial documents in the global development of SD are the reports from the World Conservation Strategy (1980) and the World Commission on Environment and Development (1987).

The World Conservation Strategy introduced SD; it re-emphasised the conservation of natural resources in combination with the development of societies (IUCN, 1980, p.19). Nevertheless,

the World Conservation Strategy was criticised for being narrow because it solely promoted the conservation of the biophysical environment (Palmer, 1998). Seven years after the World Conservation Strategy (also known as the Brundtland Commission) contributed to the evolution of SD. The commission considered multiple aspects of the interrelatedness between the environment and societal dimensions, but especially the economic dimension. The Brundtland Commission included economic viability, environmental integrity, and social welfare as main targets of achieving a sustainable future. In *Our Common Future*, the Brundtland Commission defining SD as follows:

> ***Sustainable development*** *seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future. Far from requiring the cessation of economic growth,* ***it recognizes that the problems of poverty and underdevelopment cannot be solved unless we have a new era of growth*** *in which developing countries play a large role and reap large benefits. (UN, 1987, p.34, researcher's emphasis: bold format)*

This definition of SD is nowadays well-known, perhaps in the same measure of Lucas' model of EE (education *about*, *in* and *fo*r the environment). The popularity of this definition has not, however, impeded the rise of definitional debates in the area and related disciplines. According to Dresner (2008), SD is a contestable term just like justice or liberty (p.2) because is highly value-laden and hard to consolidate among its different stakeholders. This author asserts that beyond successfully defining SD the real challenge of its users has been generating an operational definition (perhaps one that is not rhetorical, context- sensitive, and it leads to solving sustainability issues).

Two important stakeholders of SD are the UN and UNESCO; and for three decades, these organisations have promoted the interrelation of the economy, environment, and society when devising SD strategies. Their approach to SD (considering previous EE developments) has been widely contested and discussed by EE scholars (e.g. Berryman and Sauvé, 2016; Bonnet, 1999; 2013; González-Gaudiano, 2006; 2016; Hart, 2008; Palmer, 1998; Robottom, 2008; Sauvé, 1996; Stevenson, 2008). This is partly because a comprehensive approach that separates economy from society is problematic. Sauvé (2008) observed that the UN's and UNESCO approach to SD promote 'an exogenous economy, situated outside of society, that imposes its rules on society-environment relationships' (ibid., p.142). For instance, the SD strategies in *Our Common Future* (UN, 1987) are overwhelmingly focused on economic demands, overlooking that, historically, the economic development of dominant nations has often lead to poverty in other areas of the world—as Stavenhagen (1972) explains for the case of the LAC region—which challenges the feasibility of achieving SD evenly across nations.

The momentary suppression of environmental education

After a decade of its introduction, SD became a main theme in intergovernmental events discussing the environmental crisis—this is visible in Table 2.1. During 1990s the place of sustainability and SD in EE—and vice-versa—seemed ambiguous overall. Intergovernmental reports and declarations showed a tendency to weaken EE by highlighting SD instead, undermining the status of EE and the previous work done for its construction (Jickling, 1999; Jickling and Wals, 2008; Jickling and Wals, 2012; Sauvé, 2008; Sauvé and Berryman, 2005). As a result, the following two decades of developments for EE are mostly characterised by shifts in: terminology (e.g. from EE to ESD), emphasising anthropocentric aims of economic and social sustainability, and showing higher interest in community projects. For instance, intergovernmental reports such as Agenda 21, the Rio Declaration, the Thessaloniki Declaration, the Plan of Implementation of the World Summit on SD, and the work of academics, which all together collect multiple terms combining EE, sustainability and SD.

In the policy arena, Agenda 21, a global action plan created 20 years after the Tbilisi Intergovernmental Conference in 1977, plainly accentuated SD (UN, 1992, p.320). Later, the Thessaloniki Declaration used the terms: education for the environment and sustainability and ESD (UNESCO, 1997), but without explaining the differences between them. In the decade following 1990s, the UN's Decade of Education for Sustainable Development (DESD) from 2005 to 2014 promoted ESD (UNESCO, 2005). Therefore, the terminology used in the intergovernmental reports changed in a relatively short period, giving the general impression that EE was replaced for ESD (Dillon, 2014, p. 508). ESD was promoted to encourage better and sustainable human-environment relationships (Edwards, 2016), however, some authors believe this changed the balance of that relationship towards humans and specific economic interests (González-Gaudiano, 2006; Sauvé et al., 2008).

Many terms were proposed and supported in this stage of development for EE. The following are some of those terms: environmental education for sustainability (EES) (Ahlberg and Leal-Filho, 1998; Tilbury, 1995); education for sustainability (Bonnett; 2002; 2013); education for the environment in a sustainability framework (Fien, 1993a; 1993b); education for sustainable human development (Landorf, Doscher, and Rocco, 2008); ecological literacy for a sustainable world (Orr, 1992); sustainable education (Sterling, 2001); and environmental and sustainability education (Sund and Öhman, 2013).

In Mexico, ESD and EES are broadly used terms, yet academics of EE in Mexico have opted for EES (Peza-Hernández, 2013; SEMARNAT, 2006). In fact, the National Strategy of Environmental Education for Sustainability (SEMARNAT, 2006) explains Mexico is not in

the same political and economic stage of development as developed nations, thus, adopting standardised and prescribed notions of SD is not pertinent. Accordingly, the last DESD report recognised the following:

> *In the majority of countries in this region [LAC], the term EE continues to be used more widely than ESD. However,* ***there is a growing emergence and use of both EE and ESD*** *in policy-related documents […] For those who continue to emphasize EE outside of an ESD framework,* ***UNESCO is working to*** *strengthen contacts and communication to reduce this tension and shift* ***focus to the communalities of EE and ESD****, promoting a broader vision of transformative, quality education for a sustainable present and future. (UNESCO, 2014, p.46, researcher's emphasis: bold format)*

During the DESD, various intergovernmental meetings were celebrated, creating biannual reports. A significant result from these meetings was acknowledging the inadequacy of promoting a global approach to SD and abandoning EE approaches (Wals, 2009). After the second half of the DESD, EE re-emerged in the DESD reports (González-Gaudiano, 2016). Hence, after the DESD, EE was somewhat reconsidered by UNESCO, incorporating it into ESD. For instance, the conference report of Tbilisi+35 appeals for the support of EE in ESD:

> *The United Nations system and governments* ***need to support EE within sound ESD*** *policy frameworks. (UNESCO et al., 2012, p.1, researcher's emphasis: bold format)*

Today, intergovernmental policy documents keep promoting SD, but it welcomes the opportunity to combine various EE approaches. In fact, it seems EE has regained some ground in recent policy statements of UNESCO:

> ***Environmental education is key for respecting nature and for achieving international agendas****, including the Millennium Development Goals (MDGs); the Convention on Biological Diversity (CBD); the United Nations Convention to Combat Desertification (UNCD); and the United Nations Decade of Education for Sustainable Development (UNDESD, 2005-2014). (UNESCO, 2016, researcher's emphasis: bold format)*

In conclusion, the developments in EE show that this field is formed by the inputs of many spheres (e.g. international policy arenas, academic forums, non-profitable organisations, and so on), and shaped by the needs, priorities, and realisations of specific periods. The field is characterised by a complex combination of key concepts (e.g. the environment, sustainability, etc.), approaches and methods (e.g. socially critical, mechanistic, etc.), aims (e.g. achieve SD, achieve ecological awareness, etc.), dimensions (e.g. political, cultural, ecological, etc.), and areas of application (e.g. formal education, governmental institutions, non-lucrative organisations, and so on). The multiple variables to consider in EE constitute the complexity

of the field and efforts have been made to organise some of these variables into similar categories. The next section concentrates on discussing a typology that categorised EE into approaches or currents—a relevant part of the empirical analysis in this thesis.

2.2.5 Multiple approaches in environmental education

EE is a multifaceted field concentrated in our sociocultural interactions with the environment, aiming to encourage and develop responsible societies (Sauvé, 2008; 2004a; 1996). In this endeavour, EE involves a broad scope of disciplines, stakeholders, and, therefore, multiple purposes and approaches to EE (see *approaches* in Section 2.2.1) (Scott, 1999). Accordingly, Lucie Sauvé, a long-career scholar in EE, designed a typology of EE approaches based on confluences and gaps that she identified in EE literature. Sauvé expressed the following:

> *[D]espite their shared concern for the environment and their recognition of the central role of education in enhancing human-environment relationships various authors (researchers, professors, educators, facilitators, associations, organisations, etc.) adopt widely differing discourses on environmental education[.] (Sauvé, 2005, p.11)*

As a result, Sauvé's (2005) EE typology has turned into a significant influence in the field; simply typing a few keywords in a public search engine displays more than 200 citations in scholar work and original research of *Currents in Environmental Education*, the article where Sauvé's typology was published.

Initially, Sauvé proposed a typology encompassing six conceptions about the environment (1996). Later, she complemented this study using a typology for concepts of education (Bertrand and Valois, 1992 Sauvé, 1996) and sustainable development (the Calgary Latin American Studies Group, 1994 in Sauvé, 1996). In her work, these typologies aimed at helping educators to locate pertinent EE theories by clarifying their concepts and challenging axiomatic positions. Sauvé expanded her work and introduced a typology for EE which she published in Spanish (2004b) and English (2005). In *Currents*[10] *in Environmental Education: Mapping a Complex and Evolving Pedagogical Field* (Sauvé, 2005). In this typology, she insists on the significance of recognising the diversity of views in EE and clarifying the understanding of EE in pedagogical activities.

In the EE typology, Sauvé identifies 15 different and related EE currents, and, these represent

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10 Sauvé employs words such as *plurality, diversity, angles, overlaps, ramifications* to elaborate on her choice of the word *current* in her typology. In addition, a *current* in the Spanish speaking world refers to a tendency of opinion or action, which also makes the word suitable for the purposes intended.

some of the diverse ways in which EE can be approached in educational projects and learning. She identified the EE currents based on the arguments and influences from pedagogical practices and programmes reported in several EE studies (see the full EE typology in Appendix A.1; presented with Lucie Sauvé's authorisation). Every EE current in the typology has four *fields* or *parameters* that distinguish each current from one to another: (1) the concept of environment; (2) aims of EE; (3) dominant approaches (dominant epistemologies is perhaps more accurate); and (4) examples of teaching activities in relation to the current or approach. Table 2.2 displays how the parameters in the typology are used to characterise the 'praxic' current:

EE Current	Concept of environment	Aims of EE	Dominant approaches	Examples of strategies
Praxic	Locus of action/reflection	Learn in, by and for environmental action. Develop reflexive skills.	Praxic	Action-research; Reflexive posture in activities or project.

Table 2.2 Extract from the EE typology proposed in Sauvé (2005).

Sauvé maintained that EE should not be reduced to only being a tool for solving environmental problems or encouraging the modification of desirable behaviour in civil society (2004, p. 221). Thus, the creation of an EE typology did not intend to reduce EE into a set of labels. She insisted on recognising the complexity embedded in EE, hence, the typology aimed for diversity and inclusion of views. Sauvé saw her typology as an exploration and a mapping of the many EE discourses, but 'not as a classification yoke imposing a rigid and all-encompassing categorization' (Sauvé, 2005, p.12). In fact, Steele (2014) observes the term 'current' is a metaphor describing the flow in a river; this intends to remind the typology's users that EE changes over time. Steele comments Sauvé's typology 'describes considerable flow and mingling between the principles and practices in many of the identified paradigms' (p.242).

Sauvé invites readers to engage in the analysis of her typology, suggesting the typology is not a finished product, let alone indisputable. The typology, nevertheless, provides a useful guide for identifying the potential approaches to EE. Additionally, the typology represents an attempt to safeguard the position of EE as a field by using it as an umbrella that shelters a manifold of pertinent approaches.

Furthermore, the typology is a useful tool to analyse individual and collective conceptions of EE and create instructional designs of EE teaching. In scholastic literature, Sauvé's EE

typology has been used in three principal fashions: mostly, as conceptual background (e.g. Barrett, 2006; Jickling and Wals, 2008; Kronlid and Öhman, 2013); as an analytical framework (e.g. Calafell-Subirà and Bonil-Gargallo, 2014; Steele, 2014; Viteri et al., 2013); and, as a model to design other typologies (e.g. McGregor, 2013; Pedretti and Nazir, 2011).

Barrett (2006), Jickling and Wals (2008), and Kronlid and Öhman (2013) used Sauvé's typology to recognise that there are different approaches to EE and/or to distinguish between the different currents. Whilst Calafell-Subirà and Bonil-Gargallo (2014), Steele (2014) and Viteri et al. (2013) fully or partially adopted the fields in the typology to analyse the conceptions of her research participants about EE. Finally, the typology has also influenced scholars to create other similar exercises; for instance, McGregor (2013) was inspired by Sauvé's EE typology and reflects on seven scholastic approaches to the problem of unsustainability (p.3564). Finally, in this thesis the typology was also adopted, but as an analytical framework. These details are provided in Section 3.4.3, Chapter 3.

2.2.6 Environmental education and science education

Historically and starting in the developed world, EE has been connected to science education by two principal circumstances: a) by directly incorporating EE content in science education curricula for basic education, and/or b) by addressing the environment and environmental problems in Science, Technology and Society (STS) education—a movement within science education (Pedretti and Nazir, 2011). In the now classical book *Environmental education in the 21st century*, Palmer (1998) affirmed that EE 'is grounded in and often perceived as 'the child of' science education' (p. 250). A relationship which Gough (2002) framed in biological terms as: distant, competitive, predator-prey and host-parasite (p.1203). This section reflects on the adoption of EE in formal education through SE, highlighting how this relationship was originated, the main conflicts, and views for future developments of EE in SE.

Underpinnings of the environmental education and science education relationship

Initially, EE was heavily funded in environmental science and related areas. The 1960s' research and scientific discoveries from environmental movements in developed nations. For instance, the work of Rachel Carson and Paul Ehrlich, two prominent scientists of conservation biology, is often cited in early literature of EE. Henceforth, traditionally, EE-related content (e.g. environmental sciences) was integrated to Geography and science programmes (Simmons, 1996). This was, for instance, the case of the English basic education curricula of late 1980s and 1990s (Grace and Sharp, 2000). Throughout this period, the IEEP was responsible for internationally disseminating the scientific treatment of EE in formal education (González-Gaudiano, 2012); this overlooked the sociological implications in

environmental problems and founded the relationship between science education and EE in formal schooling. Today EE is still—if considered in curricular aims at all—concentrated in Geography and science education programmes. In fact, in 'the first comprehensive international comparison of what students know about *the environment and environment-related issues*', the Programme for International Student Assessment (PISA) 2006, concentrate on assessing the competence of 15-year-old students in environmental science and geoscience (OECD, 2009, researcher's emphasis: italics).

Curricular changes are often the result of educational reforms intending to respond to the social revolutions, needs, and demands of social realities (Fensham, 1988 in Aikenhead, 2003). Such is the case of the claims from the 1960s conservation scientists and UN's intergovernmental reports regarding environmental concerns, since they were influencing factors for curricular reforms around the globe during the second half of the 20th century. From this period and on, formal education was often called upon to include EE, which usually resulted in adding environmental content to the science education curriculum. At a similar time, science education had its own revolution within. Science education scholars and other stakeholders in the field suggested it was necessary to move on from teaching traditional and canonical science to a more critical and socially and context-relevant science education. Subsequently, the Science, Technology, and Society (STS) movement was introduced in discussions about SE.

The STS movement aimed at humanising science and re-orienting science education for the education of informed and responsible societies—an aim that shares similarities with the general purpose of EE. The STS movement asked for including knowledge about the environment and environmental problems as part of the societal concerns to addressed in science education. In his study about the development of STS, Aikenhead (2003, p.6) narrates that in Canada, Australia, and Israel the word 'environment' was included to STS, then promoting a Science, Technology, Society, and Environment (STSE) education. Pedretti and Nazir (2011) define STSE education as: 'an umbrella term that supports a vast array of different types of theorising about the connections between science, technology, society, and environment' (p. 603).

The differences that distinguish science education from STSE or STS education seem rather fuzzy. STS and STSE have been described as student-oriented pedagogies in contrast to science education (Aikenhead, 1992), albeit current practices of science education might disagree. Yet, what is important to stress is that either science education or STSE education included the environmental dimension in their curricular content, but was this a fair

representation of the general EE aims and methods? Nevertheless, the STS and STSE movements in science education encouraged the further developments in the relationship between science education and EE research like the recent tendencies to study: socio-scientific issues, environmental science literacy, and climate change (Dillion, 2014).

EE and STSE education are, despite sharing a similar global purpose, inherently different. The latter was evinced in a study conducted by Steele (2014), where she compared the EE typology proposed by Sauvé (2005) and the STSE typology offered in Pedretti and Nazir (2011). To study the application of both typologies, Steele used them both as analytical frameworks to study the work of secondary school teachers in a science education food-themed programme at a Canadian school. Through the typologies, Steele's indicates that STSE education has a much smaller scope than EE. She concluded the EE typology was useful for educators to better understand the assumptions in their practice, since she found that different EE currents were addressed in the lessons. The STSE typology, Steele comments, seems a more convenient tool to analyse operational aspects of science education lessons more specifically (2014, p.248). Even though both typologies are based on the same design (i.e. from Sauvé, 2005), Steele's recognises they are inherently different frameworks. Still she suggests that is possible to adapt knowledge from both frameworks and improve each other in the analysis of science education lessons, which a representative claim in the current tendency to cultivate more effective relations between EE and science education that respond to contemporary societal challenges.

Main issues of adopting environmental education in formal education systems

As mentioned in the introduction of this thesis, traditional formal education systems around the world (e.g. Edwards, 2016; Palmer, 1998; Stevenson, 1993; 2007) and in Latin America (e.g. González-Gaudiano, 2000; 2007; Peza-Hernández, 2013) insist on the 'gaps' between EE theory and practice in schools. This is because formal education systems usually prescribe objectives in behavioural terms, define subject matter and is disciplinary, and assesses factual knowledge. Furthermore, contemporary curricular reforms have generally failed to account for teachers' views and own perception of their values and understandings about EE (Stevenson, 1993). These aspects are problematic for the cross-disciplinary character and goals of EE (e.g. see the EE goals of the Belgrade Charter in Section 2.2.3). Palmer and Neil (1994) and Green (2015) are examples of how for decades scholars have created teaching handbooks that attempt to ameliorate the breaches theory and practise in schools.

For decades, the attempt to include EE in formal education has involved making it part of science programmes. Palmer (1998) observed that science-based content lists fail to

emphasise the cross-disciplinary nature of environmental understanding; neglecting the interactions of people, their culture, and context. In formal education, one way of dealing with the cross-disciplinary nature of EE is by embedding it in a cross-curricular design, using cross-curricular teaching and learning strategies. Barnes (2011) differentiates between five cross-curricular teaching and learning types that can be used to address cross-disciplinary or cross-curricular content in school: hierarchical, multi-disciplinary, inter-disciplinary, opportunistic, and double focus. No matter the cross-curricular type, Barnes (ibid.) argues that 'good cross-curricular learning' is managing to study a single theme or problem by using the skills, knowledge, and attitudes of different disciplines (p.53). Cross-curricular content is meant to integrally permeate teaching and learning by being present in various and pertinent subject areas (Dolors et al., 1995). However, when 'poured' over subjects instead of creating a cross-curricular design, content cross-curricular content tends to saturate curricula (ibid.)

The incorporation of EE in science education has also presented limitations because, traditionally, EE in science education concentrates on learning about the environment and environmental problems. This has overlooked, for example, the importance of social participation in EE. Participatory and collaborative learning[11] are important strategy of some EE approaches, like in ESD (UNESCO, 2012). In science education, this type of learning is often the means to achieve a task of any practical-work activity; in EE, participatory learning is both the means and the end of learning activities. Additionally, environmental goals in formal education and science programmes are generally broad (e.g. pupils should become environmentally aware) and often need interpretation. However, teachers' worldviews, position about the environmental crisis and EE are generally neglected in curriculum development and implementation (Fien, 1993b; Palmer, 1998). Palmer (1998) suggests that teachers ought to evaluate the EE goals in their school's curriculum and adapt them to the needs of the context; although, Stevenson (1993, p.6) cautioned that sometimes teachers are unaware of their own values, theories, and intentions, which might make it difficult for them to recognise the implicit messages in EE content.

Synergy: a contemporary recommendation to combining environmental education and science education.

In these days, the awkward relationship between science education and EE has, at least in the scholastic discussion, progressed to a more harmonious and productive state. Scholars from

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11 Participatory learning involves actively engaging when working with others in solving a task (UNESCO, 2012).

both fronts science education and EE are now increasingly emphasising the opportunities to develop the EE and science education relationship. In fact, educational journals of science education are nowadays publishing special issues on EE and ESD (Stevenson et al., 2013b). From the field of EE, Gough (2002) and Sauvé (2010) assert that there is room to nurture a relationship of mutual benefit for EE and science education. Likewise, science education scholars continue to promote an education that combines knowledge from EE, science education and, now, health education.

Gough (2002) suggested that both EE and science education need each other, claiming EE needs science education 'to underpin the achievement of its objectives and to provide it with a legitimate space in the curriculum to meet its goals' (p.1210-1211). Furthermore, Gough suggests a problem-oriented and analytical *environmental science education* that is nurtured by the political history of EE, which embraces post-positivist perspectives (like feminism and post-colonialism) and considers the differences between students before and today. Later, Dillon (2012) suggests creating a risk or problem-based science education curriculum that is significant for students and in which health education is included. Similarly, Kyburz-Graber (2012) observes studying socio-scientific issues (which frequently include science, environment, and health) is an approach that helps in questioning the status of science and illuminate it as field of social action.

Like Gough (2002), Sauvé (2010) analyses the junction and breaches of science education and EE. She adds a column to her EE typology and includes the potential bridges between these two educations for each of the EE currents she proposes. Sauvé indicates science education can more optimally offer knowledge about the biophysical phenomena in the environment and reinforce decision-making processes in students; whilst EE offers a process (involving ethics, philosophy, and environmental management) for transforming our individual and collective relationship with the environment.

She goes as far as suggesting an *eco-scientific education* is visible for future synergies between EE and science education. She envisions an eco-scientific education would mainly aim at empowering populations to participate in environmental governance and transform the problematic aspects of our relationship with the environment.

As it might be evident from the text above, some of the principles promoted in STS and STSE are still relevant to science education. Supporting a science education that is socio-culturally relevant for students and teachers is still a request. The scholastic work presented above seems to indicate that the (ill or not) bonds between science education and EE will persist, however, changes in their curricular representation are necessary. The new tendencies seem to indicate

that science education in formal education is still a common place to study issues that correlate science, environment, and health. The form the future science education curricula might take (from emphasis on socio-scientific issues to science/environment/health literacy) will surely depend of the context and regional circumstances of classrooms. Finally, chances are that science education and EE in formal education will continue having a pragmatic end, yet more inclined to promote citizenship values and risk precaution.

2.3 Environmental education research and teacher cognition

The conceptual background of the previous sections sets the scene to understanding the development of EE, guiding the reader across three of the main theoretical frameworks used in this thesis. Similarly, this section conveys the research advice and empirical work which led to finding a gap in EE research and an emphasis on teachers' cognitions in EE research. Hence, the various parts encompassed in this section constitute one of the thesis' frameworks: 'the importance of teachers' cognitions to understand teaching' (see a summary of the theoretical frameworks in Section 2.1.3 of this chapter). First, Section 2.3.1 introduces relevant advice from experienced EE scholars on contemporary EE research. Following this, Section 2.3.2 to Section 2.3.4 describe and analyse a review of empirical work on EE and in-service primary school teachers.

Teacher cognition is an area of educational research that is also known as 'teacher thinking' or 'teacher knowledge'. The main focus of this research area is finding ways to support the training of pre-service and in-service teachers by studying the psychological constructs[12] and concepts that shape teachers' thinking. Today, this research area explores the potential links of teacher cognition with learning, teaching, educational change, and the sociocultural aspects which influence teaching contexts (Borg, 2006; 2015; Craig et al., 2013; Fullan, 2007). Teacher cognition is presented in further detail in Section 2.3.5. This section emphasises the work of Simon Borg (2006; 2015) and other scholars (e.g. Fullan, 2007; Li, 2017; Kagan, 1992; Richardson, 1996) to describe the general developments of teacher cognition in educational research. To conclude the section and the chapter, Section 2.3.5.1 presents this thesis's emphasis in relation to teachers' cognitions and the relevant psychological constructs.

[12] Psychological constructs (e.g. identity, beliefs, attitudes, etc.) derive from the personal construct theory associated with the educational psychologist George Kelly, which attempted to interpret behaviour through cognition (Cohen and Manion, 1981).

2.3.1 Advice to environmental education research from scholars: teachers and teaching

Research on EE has seen various transitions, broadly, from a behavioural and large-scale predominance of studies to a psychological and sociological focus in small-scale research. Additionally, the reorientation of EE research included studying environmental learning and ideologies of EE in the interpretations of various stakeholders. Stevenson (2013) and Stevenson et al. (2016) suggest that EE research saw a reorientation because its researchers grasped three key lessons:

1. Both environmental and educational issues are ideological
2. People's worldviews and identities shape their understanding of socioecological issues.
3. Learning rather than educational systems should be the focus of research, as the latter has constrained the potential of EE in schools.

The last point suggests that researchers have learned about the gap between EE theory and its practice in formal education, albeit discarding research on education for learning appears needlessly discouraging and counter-intuitive because research can still contribute to analyse the problems of a marginalised EE and the better understanding of these issues. In a commentary of Mark Rickinson's report on learners and learning, Sauvé and Berryman (2003) indicated that investigating EE curricula and teaching processes seemed more crucial than researching learners and learning, because they judged that curricula development and teacher training—especially of local programmes—was a first and logical step before examining learning processes (p.172). Similarly, Grace and Sharp (2000) recommend considering the cognitions of teachers and their context when attempting to design realistic EE programmes because teachers hold rich knowledge about their learners' needs and background. EE programmes are bound to become more complex and challenging, since recent tendencies suggest the forthcoming combination of science, environment-related content, and health issues. This is a matter that Dillon (2012) considers will ask teachers to recognise and address the values and beliefs underlying in the educational programmes they teach, in other words teachers will be encouraged to look at their cognitions more closely.

Since the 90s, forecasts and recommendations for EE research on formal education identified a need to study EE ideologies in educational policy in combination with teachers' cognitions. For instance, in a meta-analysis of EE research, Hart and Nolan (1999) proposed that XXI research on EE should consider exploring teachers' thinking and challenging the taken-for-granted assumptions of EE or beliefs about EE. Richardson (2003) asserts that beliefs are

'psychologically held understandings, premises, or propositions about the world that are felt to be true…these systems are not necessarily logically structured.' (p.2). Teacher beliefs is an allusive concept because is difficult to distinguish where they begin and what conforms them (Pajares, 1992); however, they are said to have an important and informing role in teaching and learning (Skott, 2015). As such, Hart and Nolan (ibid.) identified the relevance of teachers' cognitions because in their review they counted a prominent number of quantitative research studies that were not addressing the underlying assumptions of teachers; additionally, the majority of the studies were focused on science lessons and in high-school levels. This suggested the need to expand research to small-scale studies which could address teachers' cognitions in a cross-disciplinarily manner.

Since the demise of the behaviourally-focused EE research around the 90s (e.g. Kollmuss and Agyeman, 2002) and Hart's and Nolan's (1999) prognosis, EE research has gradually reoriented its course to the study of ideologies in the cognitions of multiple stakeholders and users of EE. This was supported by the insistence of many other scholars in the field (e.g. Hart, Jickling, and Kool, 1999; Sterling, 2001) to develop reflective approaches in EE teaching, which has created a path for research on teacher cognition and teaching in EE inquiry. At a global scale, as Reid and Scott (2013) assert, EE inquiry of teacher cognition focus has substantial reports, and is even considered a saturated area of research; however, it is also the opinion of these authors that more innovative or less explored research areas are not necessarily what will further EE, indicating that the persistence of a common tread in research can also produce fruitful results. Stevenson, in three-fold narrative of Stevenson et al. (2016), affirmed that 'we [researchers] also need to understand how educators' professional and environmental identities shape their curriculum and pedagogical practices' (ibid., p.7).

2.3.2 Parameters and results of searching for empirical studies

The empirical search is both a test of parameters and a way to know how research on in-service primary school teaching of EE has been developed. The identification of empirical work relevant to this study was guided by the question: In relation to EE in formal education, what empirical studies have been published addressing the work of in-service primary school teachers? Since the initial conceptualization of this study, it was clear to the researcher that the general features and context of in-service primary school teachers (i.e. classroom teachers) are different from other areas of teaching in formal education, and are in a different stage from, for example, initial teacher's education.

The screening of literature excluded empirical work on basic education students, pre-service teachers, and secondary school teachers. First, although students are key agents in any educational endeavour, this research is focused on teachers and their perspectives on teaching EE content. Second, pre-service teachers are at an initial stage of development in their career. Beijaard et al., (2000, p.753) suggest that, in general, 'expert knowledge is more extended and better organized in memory than knowledge of a novice', and the interest of this research is exploring the cognitions of experienced teachers. Third, there are several studies on EE and in-service secondary school teachers, however, the teaching and organisational characteristics of secondary education are inherently different from those in primary school. Secondary school teachers differ from primary school teachers in the specificity level of the domain of a subject matter, such as history, physics, or biology. In this sense, secondary school science teachers are 'subject matter experts' compared to the 'Jack of all trades' role that primary school teachers play.

The search for empirical literature was also limited to studies published in research journals since the 1990s, considering this is a period when research in EE markedly turned to exploring the cognitions of educators and other stakeholders. This was also the time in which researchers increased the presence of qualitative methods in EE research (Hart and Nolan, 1999). In addition, important technological and sociological revolutions have taken place since this time, which overall shapes the context of contemporary research.

There is a myriad of relevant themes for EE, therefore, not all the studies the researcher found concentrate on EE; in different ways, some studies discuss EE through other approaches. For instance, Hovardas (2016) studies the leadership of primary school teachers in outdoor education. This author indicates that outdoor learning activities are a core component of EE. The degree of importance or 'rank' given to EE was not an excluding factor in this review, albeit searching for empirical studies explicitly linked to EE was prioritised.

After applying the aforesaid parameters, 21 studies were identified. From the sample of 21, five studies were discarded, leaving a final number of 16 studies to review (see Table 2.3 at the end of this section). The discarded studies (i.e. Armstrong, 2005; De León-Rodríguez and Infante-Bonfiglio 2014; Penwell et al., 2002; Robertson and Krugly-Smolska, 1997; Viteri et al., 2013) were discounted for reasons related to the context of the study (e.g. about a private or non-governmental education programme) and sampling issues with participants (e.g. evidence of primary school teachers was not explicit or prominent). Nevertheless, some of the discounted studies provided insights about EE and, were appropriate, are cited in this thesis.

The studies in Table 2.3 are discussed in more detail in Section 2.3.3. This section describes the motivation of the research studies, the participants' profile, the methods of analysis, and a summary of their findings. The report of the empirical studies, in the following section, does not include a detailed description of these studies' findings because they are particular of their context and mostly distinct to the research focus of this thesis. The diversity of foci and findings in the empirical studies of Table 2.3 were, in fact, findings of this thesis' literature review. The relevant findings of these studies are newly addressed in Chapter 7, where the researcher discusses the key findings of this thesis. In Section 2.3.3, the articles are categorised in two themes according to their focus: a) Teacher cognitions of environmental education in relation to curricula; and b) Teacher cognitions of specific concepts or topics relevant to environmental education.

AUTHOR(S) & YEAR	INQUIRY	PLACE	METHODS
Simmons, **1996**	Urban teachers' **perceptions** of the use of various natural settings for EE teaching.	*Chicago, U.S.A.*	Open-ended interview and questionnaire
Clark and Harrison, **1997**	Teacher's **understanding** and **use** of outcomes of EE.	*Various places, Australia*	Questionnaire
Agyeman, **1998**	Teachers' **views** of flora in relation to rural and urban areas.	*UK*	Questionnaire
Chi-Kin Lee, **2000**	Teachers' **receptivity** to new EE guidelines.	*Hong Kong, China*	Questionnaire and semi-structured interview
Summers, Kruger, Childs, and Mant, **2000**	Teachers' **understanding** (knowledge) of four topics: biodiversity, the carbon cycle, ozone and global warming.	*UK*	Semi-structured interview and questionnaire.
Cutter and Smith, **2001**	Teachers' **knowledge** and **beliefs** about environmental concepts and EE	*Queensland, Australia*	Unstructured interview
Cutter and Smith, **2003**	Teachers' **knowledge** and **beliefs** about environmental education	*Queensland, Australia*	Unstructured interview and questionnaire
Summers, Corney, and Childs, **2003**	Teachers' **conceptions** of ESD and issues whilst planning and teaching ESD.	*England, UK*	Action-research, structured interview
Summers and Kruger, **2003**	Teachers' **conceptions** of ESD and its translation into classroom.	*England, UK*	Action-research, structured interview
Chatzifotiou, **2005**	**Awareness** of EE through teachers' **concerns** and **opinions.**	*Greece*	Semi-Structured Interview
Chatzifotiou, **2006**	**Awareness** of EE through teachers' **concerns** and **opinions.**	*England, UK*	Semi-Structured Interview
Larijani and Yeshodhara, **2008**	Comparative study between Indian and Iranian teachers. Teachers' **attitudes** towards the environment.	*India and Iran*	Questionnaire
Fernández-Crispín, **2009**	Teachers' **conceptions** of contemporary civilization model and EE	*Puebla, México*	Questionnaire
Fernández-Crispín and Benayas-del Álamo, **2012**	Teachers' **social representations** related to the impact of nature.	*Puebla, México*	Open-ended questionnaires and teachers' narratives.
Edwards, **2016**	Teachers' **understanding** of their experience implementing a sustainable programme	*Victoria, Australia*	Action-research, semi-structured interview and observation
Horvadas, **2016**	Teachers' **leadership** in outdoor education.	*Volos, Greece*	Questionnaire and semi-structured interview.

Table 2.3 List of studies composing the empirical literature review

2.3.3 Studies on in-service primary school teachers and teaching

In this section, the empirical studies of Table 2.3 are discussed in further detail and separated in two groups. One group studies teachers' cognitions of EE (often in relation to their programmes) in relation to external, internal and classroom level factors. The studies in this group describe links between EE and curriculum. The second group explores teachers' cognitions about specific topics or concepts related to EE (i.e. Agyeman, 1998; Summers et al., 2000; Fernández-Crispín, 2009; Fernández-Crispín and Benayas-del Alamo, 2012). These studies place less emphasis on EE or EE programmes and focus on science education topics that are related to EE. Nevertheless, the general narrative across both groups of studies is similar: what shapes EE teaching? And how does it shape it? The studies in both groups tell different stories of EE teaching around the world, yet they all coincide in supporting that teachers are crucial actors in the process of enacting EE programmes or EE-related content.

Teachers' cognitions of environmental education in relation to curricula

The focal interest of the studies in this category contribute to studying the persistent rhetoric-reality gap of practising EE in traditional formal education (Edwards; 2016, Grace and Sharp, 2000; Hart, 2008; Palmer, 1998; Stevenson, 1987; 2007). Stevenson (1987; 2007) contributes to explain these gaps; he argued the structure of current schooling cannot stimulate prominent approaches of EE such as activism and problem-solving; this suggests profound structural changes in political and economic systems are necessary to ameliorate the rhetoric-reality gaps of EE and formal education.

Stevenson's analyses address the rhetoric-reality gap between EE theory and EE in schools from a macro-system perspective (i.e. correlations with education, politics, and economy). However, the rhetoric-reality gaps in formal education also show symptoms at a micro or local level—this was often observed in the studies reviewed. For instance, a gap as such could be the occasional distance between formal educational aims and teachers' goals. Although Stevenson's analysis suggests the reformation of these issues at a macro level, studying the rhetoric-reality gaps of EE and formal education at a micro level is also a way of working with this issue.

The rhetoric-reality gaps are not only concentrated in problem and action-centred approaches of EE and formal education. The gaps related to EE teaching and school programmes have various dimensions and levels, since there is more than one approach to EE (not all are action-oriented) and the gaps can be of other nature, involving the dynamics in schools. For instance, Stevenson (1987; 2007) discusses the presence of broader and general gaps between EE and formal educational systems. Other authors, like Grace and Sharp (2000), study the rhetoric-

reality gaps with more specificity. These authors indicate that there are actual and potential (i.e. potential gaps in an ideal scenario for teaching EE) gaps between EE and formal education. They suggest that the rhetoric-reality gaps between EE and formal education can be related to curriculum guidelines, teaching resources, teacher training, etc. This suggests that the rhetoric-reality gaps include actual and potential gaps in different dimensions and at macro and micro levels.

The studies range from having a small number (between two to twenty) of primary school teachers (Chi-kin Lee, 2000; Cutter and Smith, 2001; Edwards, 2016; Summers et al., 2003; and Summers and Kruger; 2003) to studying the views of mid-range (Chatzifotiou, 2005; 2006; Cutter-Mackenzie and Smith, 2003; Hovardas, 2016; Simmons, 1996) and large populations of teachers (Chi-kin Lee, 2000; Clark and Harrison, 1997; Larijani and Yeshodhara, 2008). Mostly, the studies which presented a case study or an ethnographic approach often assigned the participant-teachers as units of analysis for their study. Additionally, this type of studies invited participants who had a predisposition towards or had expressed an interest for environmental matters, had been identified as such by others informing the researcher, or were already involved in some sort of EE-related initiative. This indicated that the small-scale in this literature review mostly included opportunistic methods or a criterion-based selection when recruiting their participants (Cohen et al., 2000).

Generally, the articles in this group arose from the demands of a curricular innovation or unexplored curricular recommendations linked to EE. Clark and Harrison (1997), Cutter and Smith (2001), Cutter-Mackenzie and Smith (2003), Hovardas (2016) and Simmons (1996) investigated what teachers knew and were doing about existing environment-related programmes in their schools and how this responded to curricular demands. In some of the studies the link between EE and curriculum guidelines was not explicitly commented. For example, Larijani and Yeshodhara (2008) report on Indian and Iranian teachers' attitudes towards various topics related to EE (i.e. health and hygiene, wildlife, forests, polluters, population explosion, and environmental concern), but they do not mention EE, instead they talk about 'environment-related concepts' in their programmes for national primary school.

Other studies, in contrast to the research conducted by Larijani and Yeshodhara (2008), were motivated by specific events such as reforms or projects for teachers and students. Chi-kin Lee's (2000) investigated EE teaching during a nation-wide implementation stage of the 1990s National Curriculum for primary education in Hong Kong. Summers, Corney, and Childs (2003) and Summers and Kruger (2003) report the results of an action-research project that was motivated by the inclusion of SD in the National Curriculum for primary schools in

England and Wales. The studies of Chatzifotiou (2005; 2006) were respectively influenced by official claims of the European Union about the need to incorporate EE in formal education and the introduction of SD in the National Curriculum for English primary schools. A decade later, yet following similar reasons, Edwards (2016) reports her work on teachers' classroom experiences in the context of the Australian Sustainable Schools Initiative. As said above, the backgrounds and motivations of these studies implicate a set of curricular guidelines and expectations of EE, hence, the apparent interest on how these are shaped in real-world situations in schools. Consequently, most of these studies include an analysis of relevant curricular guidelines and EE goals.

Some studies have a combination of qualitative and quantitative data (Chi-kin Lee, 2000; Cutter-Mackenzie and Smith, 2003; Hovardas, 2016; Simmons, 1996) or analyse semantic data using both paradigms (Chatzifotiou, 2005; 2006; Cutter-Mackenzie and Smith, 2003; Summers et al., 2003; Summers and Kruger, 2003). The mix-methods studies usually combined a type of thematic analysis for the qualitative part and statistical analysis for the numerical data. For instance, Chatzifotiou (2005; 2006) categorised her data thematically, but since she had a mid-range sample of almost 50 participants in each study, she calculated the percentages of teachers' responses in relation to the emerging themes.

In these studies, the combination of methodological strategies aimed to obtain comprehensive responses and data for subsequent research methods. For instance, Chi-kin Lee (2000) first applied a large-scale survey oriented to investigate teacher's receptivity to change. After carrying out this survey, he used the questionnaire data to select eight schools as cases studies, which he included data from head and classroom teachers. The results of the survey were helpful to select cases for a later stage in the study, yet, more importantly, Chi-kin Lee observed that the qualitative part of his study unravelled an important finding (i.e. the impact of organisational aspects in teacher's receptivity to curriculum change) that was not captured in the surveys.

The analyses in these studies were generally data-driven (Schreier, 2012), which involves prioritising the information from data corpus and letting the results be guided by what the participants stressed. In the case of the studies in this group, it means the researchers let the participants' responses guide the analysis and presentation of results. Chatzifotiou (2005; 2006) and Chi-kin Lee (2000) let their data guide their findings. Whilst Cutter-Mackenzie and Smith (2003) and Simmons (1996) used the interview data from previous studies with primary school teachers (Cutter and Smith, 2001; Simmons, 1993 in Simmons 1996) to develop their large-scale surveys addressing EE in primary school education.

Another feature found across these studies is the use of previous literature and existing theories to create research instruments (Chatzifotiou 2005; 2006; Chi-kin Lee, 2000; Clark and Harrison, 1997; Edwards, 2016; Hovardas, 2016). For instance, Clark and Harrison (1997) used some Australian curriculum guidelines to extract 'knowledge and understanding outcomes' of EE and create a survey for in-service teachers. Likewise, many of the authors in these articles used previous literature or existing theories to create analytical frameworks (Cutter and Smith, 2001; Cutter-Mackenzie and Smith, 2003; Edwards, 2016; Hovardas, 2016; Summers et al., 2003; Summers and Kruger, 2003), which they applied to interpret their data. A few examples of the analytical frameworks proposed in these studies are discussed below.

Among the various authors that created and applied analytical frameworks are Summers et al., (2003) and Summers and Kruger (2003). These authors used a publication of the Council for Environmental Education (CEE)—a non-profit educational organization that no longer exists in the UK—called *Education for Sustainable Development in the Schools Sector* as a base for analysis because their participant-teachers were familiar with it. At a similar time, Cutter and Smith (2001) and Cutter-Mackenzie and Smith (2003) adapted the work of various scholars in EE to create an analytical framework to study the ecological literacy[13] of research participants. Likewise, Hovardas (2016) assessed teacher leadership through a typology based on previous scholarly work on leadership. Similarly, Edwards (2016) designed an analytical framework based on various pieces of Giddens' work on the theory of structuration. Edwards' framework facilitates analysing the rhetoric-reality gaps between socially-critical pedagogy (closely related to education *for* the environment) and traditional schooling.

In relation to Lucas' (1972) tripartite model for EE (i.e. education *about*, *in*, and *for* the environment), Their overall findings of the studies in this group suggest that most teachers focus on the transmission of information and increasing students' awareness through education *about* the environment (Edwards, 2016; Chatzifotiou, 2005; 2006; Cutter and Smith, 2001; Cutter-Mackenzie and Smith, 2003; Summers et al., 2003; and Summers and Kruger, 2003), despite that some of the programmes were explicitly oriented to education *for* the environment (e.g. Edwards, 2016). It was also identified that this level of teachers' literacy in EE-related topics is related to anthropocentric beliefs of the environment, that is beliefs about the environment centred on satisfying the needs of the human kind. Although, it must

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[13] Based on the work of Orr (1992), Cutter and Smith (2001) defined 'ecological literacy' as 'developing a rich knowledge base, in turn allowing for the development of beliefs and/or philosophies about the environment and therein consequent action in the environment' (p.52).

be considered that researching teachers' literacy is not as straightforward as research ideals might picture. For instance, Clark and Harrison's (1997) survey findings indicated that primary school teachers in their study were 'substantially' addressing EE outcomes, but perhaps not calling the teaching EE or linking this teaching to EE (ibid., p.33-34). The latter suggests that teachers might be environmentally or ecologically literate, but unaware of the terminology and features of the field; hence clarifying levels of literacy is an important job for the EE researcher.

Findings in the studies reviewed also included what teachers thought it was appropriate to teach children about EE (Chatzifotiou, 2005; 2006; Simmons, 1996; Summers et al., 2003). The teachers in these studies expressed that, age-wise, EE (also SD and ESD) is suitable for young learners and Key Stages 1 and 2. For instance, the English teachers studied by Chatzifotiou (2006) emphasised ESD should be included as early as possible in children's education. Teachers were also concerned about adapting either local or global dimensions of the EE-related topics in their lessons. Most Greek teachers in Chatzifotiou's study (2005) emphasised global environmental issues, whereas the English teachers in Chatzifotiou's later study (2006) stressed teaching children about local environmental issues.

In addition, the role of environmental and educational ideologies seemed correlated to gaps between rhetoric and school practices, as demonstrated especially in the work of Cutter-Mackenzie and Smith (2003), Edwards (2016), Hovardas (2016), Simmons (1996), Summers et al. (2003). For instance, Simmons (1996) claims that it is a priority to explore teachers' understanding of nature and the pedagogical opportunities they associate with it: her participants linked specific natural spaces to specific subjects (e.g. deep woods were associated with teaching science or teaching social studies or art in county parks). Larijani and Yeshodhara's (2008) findings indicate that cultural (e.g. religion) and contextual circumstances (e.g. legal frameworks protecting biodiversity meshed in the educational system) ought to be considered when analysing teachers' attitudes towards the environment (p.98). Overall, these findings suggest there is valuable knowledge in finding out what teachers understand of EE; what they know of basic concepts and topics related to EE. Yet, as Clark and Harrison (1997) suggest in the quotation above, the EE ideologies, knowledge, beliefs, and attitudes involved in teaching are only a portion of the factors involved in EE teaching and learning.

Chi-kin Lee (2000), Edwards (2016), and Hovardas (2016) studied EE-related curriculum and the impact of external, school, and classroom levels factors; overall, they claim these factors influence teachers' understanding, receptivity and leadership of EE. A common outcome of

these studies is that teachers struggle with finding time to teach EE. For instance, Chi-kin Lee (2000) found that teachers' attitudes towards promoting EE were dependent of cost-benefit perceptions of curriculum change, workload and support for other organizational aspects in schools—such as timing and scales of programmes. According to this author, his participants' receptivity to EE was strongly influenced by issues related to organizational aspects in schools. In this sense, Hovardas (2016) concluded that overcoming organizational challenges (like the allocation of teaching time) for outdoor learning activities relies on teachers' leadership—a result echoing the importance of teaching autonomy in EE (Edwards, 2016).

Teacher cognitions of specific concepts or topics relevant to environmental education

The studies in this second group (i.e. Agyeman, 1998; Summers et al., 2000; Fernández-Crispín, 2009; Fernández-Crispín and Benayas-del Alamo, 2012) emphasise the gap between EE theory and teachers' cognitions of EE. In this group, the attention of the studies is set on what teachers know and understand—as suggested by Summers et al. (2000)—of concepts and topics related to EE. Agyeman (1998) and Summers et al. (2000) concentrate on English primary school curricula from late 1990s and they study biodiversity and environmental issues. A decade later, Fernández-Crispín (2009) and Fernández-Crispín and Benayas-del Alamo (2012) both address relevant topics for EE from the science education programme for Mexican primary schools that was in effect during the first decade of the 21st century. These studies remind us of the ever-long connection between EE and science education (see Section 2.2.6) and they seem to stress a model of education *about* the environment in EE programmes.

First, Agyeman (1998) studied the influence of traditional ecological knowledge in teachers' beliefs about rural and urban nature. Agyeman asserted that a dominant feature of EE in the English primary school curriculum (the one in effect during late 1990s) is that 'nature' and 'conservation' are concepts originally influenced by traditions of the rural life in England. She argued that solely stressing the importance and goodness of the rural ecosystem can disregard the importance of urban biodiversity and motivate xenophobic views in learners (i.e. she refers to native plants being considered 'good' in comparison to the 'undesirable' alien plants). Two years later, Summers et al. (2000) published their work on teachers' knowledge about core topics in the science curriculum, which they believed are important for EE. Their study investigates their participants' knowledge of biodiversity, the carbon cycle, global warming, and ozone. A distinctive feature of this study is that the researchers designed their probes considering the level of specialization required from primary school teachers to explain these topics to young learners.

The other two studies in this group, Fernández-Crispín (2009) and Fernández-Crispín and Benayas-del Alamo (2012), both study the 'social representations' of Mexican primary school teachers about science, technology and the relation of these areas to the environment. Fernández-Crispín and Benayas-del Alamo (2012) reported that social representations are conceived in their work as a collective construction of meanings and 'a population of ideas in which various discourses interact' (p. 1073). Fernández-Crispín and Benayas-del Alamo (ibid.) affirm learning about social representations of science and technology is a foundational aspect to achieve environmental change. The studies also include an exploration on what the participant-teachers' believe and understand of technological and scientific progress, a set of information which these authors use to theorise about the global models of civilization held in teachers' ideas.

The methods of analysis employed in the studies of the second group vary greatly between them—see the data collection methods in Table 2.3. To analyse the results of the questionnaires, Agyeman (1998) used a form of statistical analysis, although this is not specified in the article. In Summers, et al. (2000) study, the members of the research team created a set of 'explanation components' to outline the knowledge required about the issues under study and in a measure considered by the research team as optimal for a primary school lesson. The explanation components elicited teachers' responses, which were then judged and categorised using four parameters: scientific, partially scientific, non-scientific, or absent. Both studies of Fernández-Crispín (2009) and Fernández-Crispín and Benayas-del Alamo (2012) combine data of qualitative and quantitative nature; they statistically analysed questionnaires and conducted a qualitative content analysis of documents generated during a participatory research exercise.

The main findings of Agyeman (1998) uncover that 'traditional' ecological views of plant biodiversity were evident in most of the teachers; this means that most of the participants considered native plants were more attractive examples for teaching. Additionally, more than half of the teachers in the sample did not use the native/ alien plant distinction in their classroom; hence, Agyeman (ibid.) proposes a 'multicultural city ecosystem' approach to teaching about biodiversity. Whilst the study of Summers, et al. (2000) identified that most of their participants talked about the interdependence of humans with biodiversity. The participant-teachers of Summers, et al. (2000) communicated having basic scientific ideas about various topics, yet in other topics (e.g. the loss of biodiversity) they had a precarious understanding.

Both studies from Fernández-Crispín (2009) and Fernández-Crispín and Benayas-del Alamo (2012) indicate that the population of Mexican primary school teachers consulted for this study convey a model of civilization inspired by the tenets of modernity (i.e. indicating the rise of rational thought and industrial development). The authors explain a modern vision of the world often includes the separation of the humankind and nature, which usually implies that nature is to be managed by us and for our benefit. Their findings show that the participant-teachers expressed various concerns over environmental issues and the way that nature is currently managed; however, the teachers displayed a lack of understanding about these matters. Overall, their participants' social representations of science and technology support that solving environmental issues requires social participation at various levels, rather than exclusively relying on scientific and technological progress.

2.3.4 Highlights of the studies reviewed

The review of relevant empirical studies indicates that research concentrating on in-service primary school teaching of EE would be beneficial to this area of inquiry because: there is a paucity of studies addressing this area and because adding different contexts of research to the studies in the area involves increasing the intellectual richness currently available. Furthermore, the list of studies reviewed (see this in Table 2.3, Section 2.3.2) do not include a detailed discussion of the representation of EE in curricula, except Clark and Harrison's work (1997). This suggests that combining analyses of curricula, teachers' cognitions and practical experiences of teaching is an opportunity to increase the robustness of EE inquiry in basic education and contribute to the available knowledge about EE teaching. The latter reasons are indicators of a research opportunity that has not been exhausted and needs attention.

Additionally, the literature review suggested important learning points for designing and conducting EE research with in-service primary school teachers. Firstly, the variety of contexts visible in the research articles act as a reminder of how important it is to consider that the structural aspects of an educational system shape EE experiences differently. Despite the similarities existing throughout the breadth of challenges that formal basic education systems generate for teachers, the singularities of these systems greatly matter greatly in research. The studies in this review showed that a comprehensive understanding of the issues in this research area also depend on knowing of the way educational systems, schools and curricula are organised, administered and prioritised. Although, none of the empirical articles reviewed for this thesis appear to stress the influence of contextual classroom factors, school cultures, and internal policies. This is significant, since context-bound and school level factors

are expected to influence classroom-level cultures, teaching, and student learning (Ball et al., 2012; Creemers and Kyriakides, 2010; Wedell and Malderez, 2013). For instance, poorly negotiated external and school-level policies can be factor contributing to teaching constraints and lack of teaching autonomy (Ball et al., 2012).

Secondly, the review revealed an absence of small-scale research studying the views of classroom teachers who were not engaged or had openly expressed interest on EE—this was not the case of the quantitative studies which had randomised groups of teachers. The studies that investigate teachers' cognitions about EE and the influencing factors for EE teaching preferred a case studies design (e.g. Edwards, 2016; Summers et al. 2003; Summers and Kruger, 2003). The reviewed publications generally constructed the case study from an existing strategy or training project focused on EE. Often, the participants recruited by these studies were teachers who had expressed an interest on the topic, were already involved in the programme under study or/and had a science background. This suggested that research designs in this area of EE research would benefit from formulating inquiries that obtain findings from ordinary and unspecialised teaching cases that happen in day to day school realities.

Thirdly, the studies reviewed reminded the researcher about the importance of explicitly addressing the underlying assumptions of research designs. These assumptions could include the EE approach under study (why this approach and not others) or the analytical framework. For instance, Hovardas (2016) adapted a leadership framework to study the competence of Greek teachers to conduct outdoor education activities. He categorised his teacher participants as 'strugglers', 'domesticators', and 'succeeders'. The opposite of 'succeeders' was 'strugglers', a group characterised by teachers who displayed poor engagement with outdoor education. The second group, 'domesticators', shares some of the characteristics from the other two categories. The framework is to an extent useful; however, the categories have unaddressed assumptions that might misrepresent teachers: a) the fact that conforming to curriculum standards is perceived by the researcher as a lack of leadership, or b) that lacking engagement with outdoor education activities is perceived as a struggle. Conceptual and analytical frameworks shape the way findings are discussed and presented, therefore, claims made from them should be cautious.

Finally, the research instruments used in the studies reviewed provide a wide array of ideas for research designs. In the case of this thesis, the questions used by Chatzifotiou (2005; 2006) in her interviews present a good starting point for an exploratory study researching teachers' cognitions of EE (e.g. What do you think environmental education is and what should its aims

be?). Similarly, useful advice and examples for research tools investigating the theory-reality gap of EE practice in schools are found in the studies of Chi-kin Lee (2000), Clark and Harrison, (1997) and Edwards (2016). In summary, these authors assert that some of the important topics in studying the challenges of teaching EE-related content are: teachers' cognitions along with their autonomy, agency, and decision-making competence.

2.3.5 A quick walk through teachers' cognitions

Besides the highlights of the empirical literature review learned in the previous section, the empirical studies of Table 2.3 seem to converge in studying teachers' cognitions about EE-related topics and EE teaching. There are two premises permeating across the studies that are summarised in Table 2.3 of Section 2.3.2 in this chapter:

1. Teacher cognition seems to be significantly considered by the researchers studying EE teaching and learning in primary education.
2. Teachers' cognitions about EE and its curricula can better inform the research community about how to improve teaching of EE in formal education.

Additionally, in the targeting teachers' cognitions, the research studies of Table 2.3 display scope of psychological constructs and concepts such as: teachers' beliefs, teachers' conceptions, and teachers' knowledge, and so on. These cues in the review of empirical studies suggested that addressing scholarly literature on teacher cognition research was relevant to this thesis. As a consequence, the following paragraphs describe key aspects of teacher cognition research and invite the reader to understand how this literature created a framework for the role of teachers' cognitions in this case study.

A general background of teachers' cognitions

The 'internal world of teachers' or the 'mental lives of teachers' have been given various terms, perhaps most frequently is found under the labels 'teacher thinking' (e.g. Hart and Nolan, 1999), 'teacher knowledge' (e.g. Verloop et al., 2001), or 'teachers' cognitions' (e.g. Borg, 2006; 2015). In the context of second or foreign language education, Borg (2006; 2015) conducted a significant historical account and meta-analysis of research studying the 'mental lives of teachers'. As a result of this investigation, he proposed the term 'teachers' cognitions' to encompass the many psychological constructs, concepts, and factors potentially influencing teachers and teaching. According to Borg (2006; 2015), the psychological constructs and concepts related to teacher cognition are, to some extent, hard to separate and define because they seem to be interrelated in the minds of teachers.

Following the work of Borg and others on teachers' cognitions, Li (2017) explains that the study of teachers' cognition is crucial to understanding: teaching and learning from the teachers' perspective, classroom dynamics, and 'practical pedagogical principles which are context-bound' (p.14). Li (ibid.) conveys, through the words of Speer (2005), that teachers' cognitions are essential 'factors shaping teachers' decisions about what knowledge is relevant, what teaching routines are appropriate, what goals should be accomplished, and what important features of the social context of the classroom' (p.365). Nevertheless, it has been discussed, especially in the study of teachers' beliefs, that what teachers know or believe do not straightforwardly follow a behavioural display or a change in behaviour when teaching (Fullan, 2007, Kagan, 1992; Richardson, 1996).

Borg (2006; 2015) counts 39 psychological constructs and concepts related to the study of teachers' cognitions; for instance, teachers' beliefs, teachers' knowledge, and teachers' conceptions amongst others. These constructs and concepts are neither fixed or part of an unchanging phenomenon; teachers' beliefs and identity can change over time (Pajares, 1992; Coldron and Smith, 1999), they are not necessarily part of a conscious process (Pajares, 1992), and they are influenced by the context in which teachers develop their practice (Ben-Peretz et al., 2003). Despite the definitional issues in teachers' cognitions, Borg (2006; 2015) observed a number of recurring ideas in this research area: teachers' cognitions are personal, practical, tacit, systematic, and dynamic phenomenon.

According to Li (2017), the emphasis on teachers' cognition originated from cognitive psychology and ethnography. Since the 1970s, teacher cognition, like in the case of EE inquiry, progressed from having an emphasis on teachers' behavioural practices in the classroom to the growth and use of teachers' mental lives (Borg, 2006; 2015). Behavioural models about teachers' decision-making routes in teaching eventually were considered incomplete and unrepresentative of the complexities involved in teaching. Hammersley (1977) which is discussed in Cohen and Manion (1981), is an example of initial work on teacher cognition research that seems to neglect the influence of schools' contexts (i.e. the social situation of a community, culture, and a specific period in history). As suggested in Craig et al., (2013), throughout decades, the International Study Association on Teachers and Teaching (ISATT) significantly pushed the study of teachers' cognitions forward by critically assessing the claims of prescriptive models on teacher decision-making in class. Nowadays is generally accepted that:

> *[U]nderstanding teachers and teaching requires insights into the thinking process and the cognitive basis of decision-making rather than purely describing behaviours. (Li, 2017, p. 15)*

From both psychology and sociology, research on teacher cognition has studied the links between teaching and teacher attitudes and beliefs (e.g. Nespor, 1987; Pajares, 1992; Richardson, 1996); teacher perceptions (Hammersley, 1977 in Cohen and Manion, 1981), teacher knowledge (e.g. Clandinin, 1985; 2013; Shulman, 1987); teachers' professional identity (e.g. Beijaard, 1995; Coldron and Smith, 1999; Gee, 2000); and other similar concepts. For instance, Levin (2015) explains that authors like Pajares (1992), Calderhead (1996), and Richardson (1996), and this thesis adds Verloop et al. (2001), all delivered a discussion on the distinction between teacher beliefs and knowledge, claiming that the former are more personal, whereas the latter is based on 'facts agreed upon by member of particular communities' (p.49). However, Borg (2006; 2015) observes that the compartmentalization of teacher cognition in numerous psychological constructs and concepts have tended to 'obscure' the importance of the recurrent characteristics (i.e. teacher cognition as personally-bound, practical, systematic, tacit, and interactive) in teacher cognition (p.35; p.40).

In the research literature, some of the constructs like teacher beliefs, professional identity, and knowledge have a frequent association to certain educational situations and research purposes. In rather simplistic terms, the impact of educational change in teachers is usually studied by examining the professional beliefs and identities of teachers. This is probably due to the nature of educational change and its relation to conceptual change and its implications. Educational change is a complex process involving the confirmation or alteration of attitudes, values, and beliefs (elements in teacher's professional identity), which are said to play a role in shaping teachers' practice (Beijaard et al., 2000; Davis, 2002; Gee, 2000; Li, 2017). The professional identity of teachers, as Beijaard et al. (2000) explain, includes the combination of didactical and pedagogical skills with subject matter expertise; they emphasise the following:

> *Teachers' perceptions of their own professional identity affect their efficacy and professional development as well as their ability and willingness to cope with educational change and to implement innovations in their own teaching practice. (p.750)*

Teacher efficacy is a predictor of productive teaching practices and related to feelings of trust, openness, and job satisfaction; and, it has been found to be related to student achievement (Goddard, 2003). Correspondingly, Kagan (1992) explains that teacher self-efficacy are beliefs of their professional performance and the expectancy to be able to influence students with their teaching (p.67). Teacher knowledge is also a latent element of teacher perceptions about their self-efficacy and other related cognitions. In fact, it was asserted by Pajares (1992) that teacher knowledge 'represents efforts to make sense of experience, and thus knowledge, not belief, ultimately influences teacher thought and decision making' (p.312).

In her narrative of the development of teachers' beliefs, Levin (2015) asserts that contemporary research acknowledges the close relation of teachers' beliefs and teacher knowledge in teaching, especially in relation to personal and practical knowledge. Teachers' personal and practical knowledge suggest a description and conceptualisation of the knowledge that teachers hold and use in teaching, involving the interactive decision-making processes that happen in class (Clandinin, 2013; Elbaz-Luwish and Orland-Barak, 2013). In educational research on teachers' cognitions, teachers' knowlege has mainly been studied as: teachers' personal and practical knowledge (e.g. Clandinin, 2013) teacher pedagogical content knowledge (Hashweh, 2013; Shulman, 1987). Additionally, research on teacher knowledge often explores the source of teacher knowledge and how teachers used it in lessons—like some of the studies reviewed here: Cutter and Smith, 2001; Cutter-Mackenzie and Smith, 2003; and Summers, et al., 2000.

In conclusion, the research scope in teachers' cognitions has blurred lines throughout its development, but as Borg (2006; 2015) reminds us, there are a few prevent ideas which are prevalent: the personal, practical, tacit, systematic, and dynamic character of teachers' cognitions. A further review of teachers' cognitions than what this section has attempted to do is out of the scope of this research, and there is already a substantial amount of scholastic work reviewing the area. Instead, the inquisitive reader could benefit from carefully reading the work of Borg (2006; 2015); as said earlier, he offers an ample overview of how teacher cognition developed in educational research. Also, in the international scene, the ISATT recently published a large compilation of prominent articles and essays which offer valuable insights on the trajectory of research into teacher cognition until present times (Craig et al., 2013).

A contemporary model of teachers' cognitions

According to Borg (2006), teachers are active decision-makers who play a central role in shaping classroom events, which, in parallel, develop the cognitions teachers through learning and teaching experiences (p.10). Correspondingly, contemporary research on teachers' cognitions indicates that these can comprise knowledge from both personal and social dimensions of teaching, suggesting the importance of interactive and multifactorial approaches in context (Li, 2017). This means that the study of teachers' cognition can include the personal cognitions of teachers, the cognitions of teachers as a group, their display through behaviour, and the interaction of it with contextual elements involved in education (proximal community, school culture, classroom environment, etc.). Newer approaches to teacher

cognition are represented in holistic models of teaching. In this sense, Borg's (2006; 2015) presents a comprehensive model of teacher cognition and teaching:

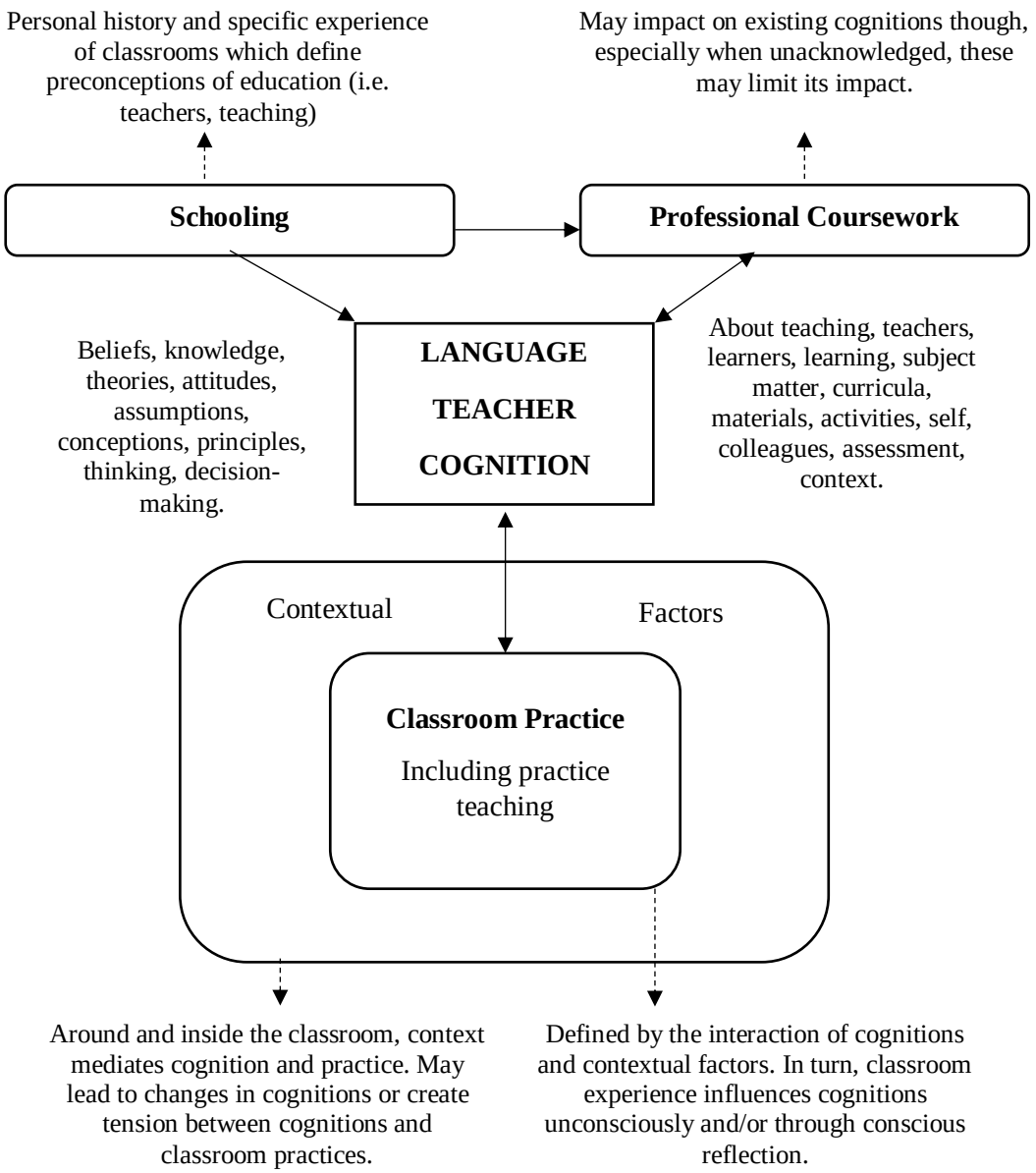

Figure 2.1 Illustration of Borg's (2006; 2015) teachers' cognitions model

The model above was mainly designed for the study of second language teachers' practice, however, Borg's model is certainly useful and illuminating for general research in education. Borg's model focuses on indicating that teacher cognition is a key aspect shaping practices in the classroom. As explained earlier, his model uses 'teacher cognition' as a collective term that encompasses many psychological constructs and concepts (e.g. conceptions, beliefs,

knowledge, attitudes, and so on), which are interrelated between them and to internal and external factors in the context of schooling.

Borg's model suggest teacher cognition is informed and influenced by previous learning and professional experiences. Furthermore, the model acknowledges the cognitions of teachers do not exist in a vacuum or isolated from their context in the classroom. However, Borg fails to emphasise the (often) strong influence of factors external to the classroom like school cultures, internal policies, and the general educational climate—as illustrated in Section 6.4, in Chapter 6 of this thesis. Finally, Borg recognises 'teacher cognition and practices are mutually informing, with contextual factors playing an important role in mediating the extent to which teachers are able to implement instruction congruent with their cognitions' (ibid., p.284).

In this study, the Borg's model was helpful to the researcher's understanding of the many variables involved in the cognitions of teachers and their teaching. The model was helpful to reflecting on methods selected for the collection of data and their areas of emphasis (see Sections 3.2.2. and 3.3). The model also provided analytical lenses for revisiting the literature review with a renewed perspective and illuminated the search of relevant factors in RQ.3 (see this research question in Section 3.1). Overall, Borg's (2006; 2015) teacher cognition framework was elucidating for the researcher and her work in putting the puzzle of this thesis together. The next section continues discussing teachers' cognitions but with the attempt to outline what are the relevant psychological constructs and concepts of this thesis.

2.3.6 The emphasis on teachers' conceptions in this thesis

This thesis agrees with Borg (2006; 2015) and supports that research in teacher cognition has: a) recurrent characteristics; b) teacher cognition, although individual, is not an isolated phenomenon as it develops in a social setting; hence, c) the background and context of teaching has prime relevance for the cognitions of teachers about teaching and learning. In accordance to the researcher's interpretation of Borg's theory, this thesis uses the collective term *teacher cognition* to refer to the views, perceptions, knowledge and beliefs of teachers about teaching and their work context, although the construct *teacher conceptions* is frequently used in this thesis to refer to their understanding of EE (the dichotomy is further explained at the end of this section).

The study of conceptual frameworks was conceived upon social constructivism theories of learning, which proposes that 'learners create their own understanding through interaction with their environment' (Hohenstein and Manning, 2010, p.74). This area of research is also closely related to the study of defining concepts and assigning categories to understand

phenomena (Chi, 2008). The study of conceptual frameworks derives from science and mathematics education research on the study of conceptual change in students (e.g. Driver and Erickson, 1983), teachers (e.g. Thompson, 1992), or both students and teachers (e.g. Lederman, 1992). The focus of this type of research was to devise strategies to close the gaps in between scientific conceptions of knowledge and alternative conceptions (Chi, 2008). Furthermore, the studies on teacher and/or student conceptual frameworks often involved studying conceptual change regarding subject matter or other relevant aspects of educational practice. This is related to what Kagan (1992) identified as 'content-specific beliefs' in her study about the implications of research on teacher belief, where, through the work of Grossman, Wilson, and Shulman (1989), she observed that these include:

> *The teachers' epistemological conceptions of the field to be taught, as well as, his or her judgements about appropriate instructional activities, goals, forms of evaluation, and the nature of student learning (p.67).*

In the case of EE research, studies have concentrated on differentiating between conceptions about the environment (e.g. Sauvé, 1996); investigated teachers' conceptions about EE (e.g. Reid et al., 1997); and, analysed teachers' conceptions of EE-related topics in basic education programmes (e.g. Summers et al., 2003; Summers and Kruger, 2003). However, selecting any of the psychological constructs related to teacher cognition is a decision that mostly depends on the following: the philosophical position of the researcher, the type of inquiry, and an aspect of teacher cognition in which the researcher desires to focus on (Creswell, 2013). In the present study, the rationale for using 'conceptions' is connected to the constructivist approach of the study, the exploratory purposes of the inquiry, and the role of EE in Mexican primary school education.

The insider knowledge of the researcher—which is a result from being a native of the fieldwork site and being informed of the educational context—helped her understand EE does not usually have a prominent role in Mexican primary schools. These initial expectations indicated the pertinence of approaching teacher cognition about EE through a flexible framework, focusing on how they conceptualise this area of education. This implied using a broad and encompassing psychological construct (i.e. teacher conceptions) that could guide the research without significantly limiting or dissecting the complexity involved in cognitions of EE. The possibility that the research participants could have been either unfamiliar with EE or have limited knowledge of it, indicated that it was best to adopt a broad, but situated notion to study the cognitions of the participant-teachers.

The delimitation adopted here for teacher conceptions agrees with the one used in Thompson (1992). In conducting a review of teachers' beliefs and conceptions about mathematics

education, Thompson describes teacher conceptions in a similar fashion to Borg's model for teacher cognition. Like in Borg's model, Thompson's description of teacher conceptions identifies various constructs, teaching components, and influencing factors; additionally, she considers that teacher conceptions can be conscious or unconscious, as well as articulated or underdeveloped. In addition, Thompson considered both teacher conceptions of subject matter and teaching include beliefs, meanings, rules, mental images, personal preferences (ibid., 132-135). In her view, these aspects constituting teacher conceptions are the foundation of teachers' philosophy about mathematics and the teaching of it.

Similar to Thompson's description of teacher conceptions, in this thesis, teacher conceptions about EE involved considering a combination of beliefs, knowledge, learning and teaching experiences, reflecting different degrees of articulation and awareness about the matter in question. In addition, teacher conceptions in this thesis consider the social and context-dependent factors highlighted by Borg's (2006; 2015) model of teacher cognition. Finally, in this thesis, *teacher conceptions* is used specifically when addressing the focus of RQ.2 (i.e. conceptions about EE) and the more general term *teacher cognition* is used when referring to focus of RQ.3 (i.e. factors influencing EE teaching). This is because the former is an epistemological quest about a particular field and learning content (like the background of conceptual change in science suggest) and the latter is a search for interrelated factors that are significant to various aspects forming the cognitions of teachers. In RQ.3, the focus was to concentrate on the messages, meanings, and factors embedded in the cognitions of teachers and how these seem to inform their relationship, envisioning and practice of EE in teaching.

In the next chapter, the focus and design of the investigation is explained in detail.

Chapter 3. The research design

This chapter introduces the research questions and it comprises the details of the methodology and research design. Overall, this is a research study based on constructivist grounds and focused on an exploratory multiple case study of EE in Mexican primary education. The multiple case study involved the participation of 11 teachers from six different schools located in Monterrey and nearby metropolitan areas of Nuevo León, Mexico. The case was constructed by collecting data from various sources: curricular documents, three different sessions of semi-structured interviews, non–participant observation of Natural Sciences lessons, and other data documents generated and collected during the fieldwork of this project. Thematic analysis is the main analytical strategy of a systematic process of qualitative content analysis.

Section 3.1 and Section 3.2 each introduce the research focus and the methodology. After these sections, Section 3.3 describes the data collection process and the ethical scrutiny of the study; this includes the documentary search of key curriculum documents for Mexican primary education and the planning, testing and development of data collection instruments and protocols. The following, Section 3.4, reports how the empirical data was organised, treated and analysed. To conclude, Section 3.5 narrates the actions that were taken to maximise the quality and robustness of this qualitative study.

3.1 Research focus

This thesis attempts to understand EE in Mexican primary education further by looking at its representation in curriculum documents and teachers' cognitions on this topic. Additionally, this research was outlined to investigate the factors impacting EE teaching in the context of the participant-teachers. In accordance to this, the investigation was focused and guided through a set of descriptive and exploratory research questions:

RQ. 1 *How do key curricular documents for the Year 6 of Mexican primary school education represent environmental education?*

RQ. 2 *What are the conceptions about environmental education that Mexican primary school teachers have?*

RQ. 3 *What factors impact environmental education teaching in Year 6 of Mexican primary school education?*

As the first and third research questions show, this thesis studies EE in Year 6. Choosing to study only Year 6 was decided to ensure a feasible and manageable collection and analysis of data. More importantly, Year 6 was selected because this is the last grade of primary school in Mexico, thus, teachers working in this year often have more internal and external demands to fulfil than teachers working in other years of the primary level. This suggested that, potentially, in Year 6 the relationship between EE theory, EE curriculum, and its enactment in schools could be significantly stressed. Finally, Year 6 is a pivot in the introduction of students to secondary education, where students will become further acquainted with more advanced EE-related content, like socio-scientific issues.

3.1.1 Research question one

The first research question (RQ.1) is an attempt to identify how curriculum documents for Year 6 of primary school level represent and approach EE. In preliminary readings to the conceptualisation of this project, the researcher identified that EE is mostly addressed in educational aims of curriculum guidelines for the primary school level. This exercise led the researcher to include a formal investigation of references to EE in curriculum's aims in the elaboration of this thesis.

Studying the way EE is represented and approached in key curriculum documents is important because 'text is not a neutral purveyor of knowledge; rather, it acts to construct a particular view of reality' (Chambers, 2009, p.131). Therefore, this thesis assumes that, explicitly or implicitly, an EE approach is outlined in the curriculum documents and this is revealed by the way they describe and represent it. Additionally, the way EE is presented in the curriculum might influence teachers' cognitions and teaching of EE-related content.

3.1.2 Research question two

The second research question (RQ.2) explores from a small group of Mexican primary school teachers how each conceptualises EE through a context-dependent combination of their beliefs, knowledge, learning and teaching experiences. In relation to teachers' conceptions about EE, the literature discussed in Section 2.3 of Chapter 2 suggest that teachers' cognitions are often correlated to teaching and learning; correspondingly, studying the conceptions of teachers about EE can provide evidence on how embedded ideologies and approaches are crucial to the way EE is delivered to students. The RQ.2 does not target 'Year 6 teachers', but primary school teachers working in Year 6, because primary school teachers in Mexico teach all years of primary school education throughout their career; hence, officially, there are no Year 6 specialists.

3.1.3 Research question three

From the same small group of Mexican primary school teachers, the third research question (RQ.3) explores teachers' cognitions about teaching EE-related content in Year 6 and in general throughout their teaching careers. The purpose of this question was to understand teachers' cognitions about personal and professional factors (from the external, school, and classroom levels) which influence the teaching of EE-related content in their classes. Similarly, some of the empirical studies discussed in Chapter 2 (i.e. Chi-kin Lee, 2000; Edwards, 2016; and Hovardas, 2016) suggested the correlation between teachers' cognitions about EE and the influence of external, school, and classroom levels in teaching EE. Therefore, this enquiry was focused on factors surrounding Year 6 teaching, and it considered influential circumstances from inside and outside the classroom. This question was included in this investigation to explicitly address potential gaps between teachers' cognitions, the EE curriculum, and the realities of the participant-schools.

3.2 Methodology and research design

A research design includes a research focus and the methods that help in generating, collecting, and analysing empirical data. In this thesis, the research design is based on qualitative research principles and it uses a case study method. The case under study in this investigation is how EE is conceptualised at primary school level by both official guidelines and teachers (the units of analysis of the case) in the context of selected primary schools located in Monterrey and its metropolitan area in Nuevo Leon, Mexico. The case was constructed by using information from curriculum documents, three sets of individual and face-to-face semi-structured interviews, observation reports of Natural Sciences lessons (which were focused on teachers' speech and actions), and other sources which Section 3.3 explains in detail.

3.2.1 Research paradigm and philosophical underpinnings

The research design of this study was conceptualised using qualitative research principles, and it subscribes to a constructivist (also called interpretivist) position. By qualitative research principles is meant that the researcher used a semantic and situated approach to understanding the issues highlighted in the research questions. A semantic understanding of social phenomena helps in understanding conceptions and circumstances that are meaningful to research participants, and it exposes relevant 'mechanisms' within the social technologies or social strategies of their context (Denzin and Lincoln, 2005). Quantitative research, in contrast, deals only with numerical data and, thus, its portrayal of localised and subjective

knowledge is limited. For this reason, the researcher did not employ quantitative methods. Constructivism was the paradigm used to develop and articulate the research questions and design presented in this thesis. Lincoln, Lynham, and Guba (2011, p.100) distinguish five different inquiry paradigms—constructivism among them—by attributing specific groups of beliefs about ethics, ontology, epistemology, and methodology –emphasising the last three— to each of the paradigms.

Since the beliefs within constructivism about ontology, epistemology, and methodology are fundamental matters of the design decided for this study. It is important to outline what this implies. In the constructivist paradigm, reality is understood by the co-constructed knowledge of social agents. Lincoln, Lynham, and Guba employ claims of relativism to describe the ontological and epistemological implications of constructivism in research; and, they suggest a relationship between them that is briefly explored in the following (2011). Two core ideas of relativism are that truth is not absolute, and that phenomena depend on independent variables like language, idelogies, cultures, etc. (Baghramian, and Carter, 2016); and, similarly, social constructivism involves that truth is relative either to a personal social agent (e.g. the choices of an individual) or impersonal agents (e.g. a culture or institutions) (Mallon, 2014). In this thesis, the latter translates in the belief that different conceptions of EE subjectively inform its practice in schools, which is, in parallel, influenced by cultures, institutions, and so on; in other words, and as observed by Reid and Payne (2013) in their analysis of EE research handbooks, this thesis holds the position that EE is socially constructed—just like some notions of the environmental crisis and the environment.

Constructivism in qualitative research, according to Lincoln, Lynham, and Guba (2011), adopts a hermeneutical methodology. Hermeneutics, applied to qualitative research data collection and analysis, involved principles and techniques to interpret textual data (Kuckartz, 2014, p.18). Considering general principles of hermeneutics, cultural products ought to be understood in context. Likewise, in constructivism truth depends on the person's interpretation and determining right or wrong understandings is not purpose (Kuckartz, 2014, pp.19-20). The latter are beliefs that also overlap with core ideas of relativism and constructivism. As it was briefly described, relativism, interpretivism, hermeneutics, and social constructivism are associated with the constructivist paradigm; nevertheless, the researcher is aware that different perspectives as ethical and methodological stances exist among them (Schwandt, 2003). Hence, further discussion about the pertinence of their association in the paradigm is still a pertinent topic of concern for research.

Subscribing the research to the constructivist paradigm has more specific implications to practical issues in research such as the aim of the research, knowledge accumulation, the way the researcher judges the quality of the study, and so on (Lincoln, Lynham, and Guba, 2011). For instance, in this study, the aim of the research is to understand meanings of EE by interpreting conceptions and beliefs of individuals (i.e. the research participants and the researcher) and impersonal agents (i.e. anonymous voices in the curriculum documents). Another example of applying the constructivist paradigm are the quality criteria involved in data collection and analysis, which are concerned with the trustworthiness and authenticity of data (see Section 3.5). In sum, the research paradigm was a helpful guide for the research design because it helped the researcher clarify here objectives and recognise her own understanding of reality and knowledge and the role of research at the time she conceptualised this project.

3.2.2 Case studies

Genres or traditions in qualitative research are distinguished by specific form, terms, and focus regarding what constitutes inquiry and they are a choice that follows the research purpose or problem (Bloomberg, 2012). The procedures of the research design in this study were guided by the case study approach, which is amongst the five most common qualitative research genres or traditions (Creswell, 2013). However, Yin (2014) argues that case studies are not limited to either qualitative or quantitative research. A case study is the analysis of an occurrence of something in a bounded system or systems—either large or more particular—like a child, class, or a school—and in a naturally occurring scenario or real-life situation, allowing the analysis of context-specific knowledge (Cohen et al., 2000; Creswell, 2013; Simons, 2009).

In this thesis the case study is: EE in Mexican primary education. This investigation regards ‘EE in Mexican primary education’ as a circumstance for case study mainly because:

a) It can be partially bounded to understand crucial parts of its system (like through teaching variables) and be studied in different environments (i.e. different schools, teachers, and communities).
b) EE changes deeply according to different circumstances from the socio-cultural, political, economic, and ecological dimensions; hence, it requires an in-depth study to explore it.
c) Its occurrence in the Mexican context combines both standardised and particular factors of the educational system, which makes it a mainstream but nuanced phenomenon.

d) The purpose of this investigation was to emphasise the place of EE in primary school education through the interpretations of some of its users (i.e. primary school teachers) and representations (i.e. curriculum documents).

Yin (2014) suggests that defining and bounding the case to be studied are two basic steps. He comments that deciding units of analysis (e.g. a teacher, a group of students, a focus group, etc.) to inform and study 'the case' in question is a way to define and bound a case study; additionally, the units of analysis are expected to be embedded in the case or at least have a relationship with it. The main units of analysis in this study are the individual cases of the teachers who participated in the project and curriculum documents that are relevant for teachers. The case is bounded[14] to a period (school year 2014-2015); a type of school (state-regulated primary schools); organisational levels within basic education (Year 6 of primary school education); a social group (in-service classroom teachers); a geographical location and culture (primary schools in Monterrey and its metropolitan area, Nuevo Leon, Mexico).

Creswell (2013), referencing the work of Yin (2009) and Stake (1995), distinguishes three types of qualitative case studies according to the size of the case. Among the three types described in Creswell's work, two of the types focus on illustrating an issue through a single bounded system; and, the one that is left, is the collective case or the multiple-case study, which includes multiple cases in a bounded system to illustrate an issue or research interest. Yin (2014) explains that one study can contain more than a single case; for instance, he suggests that a research study on school innovations can have various schools as singles cases, creating a multiple-case design that informs the same research focus.

As described in the above paragraphs, this research developed a multiple case study with exploratory purposes. In his work on multiple case studies, Stake (2006) observes that an 'important reason for doing the multi-case study is to examine how the programme or phenomenon performs in different environments' (p. 23). As such, rather than being interested in solely collecting the data from an individual or an individual case, the research interest of this thesis studies EE across the perspectives of various teachers teaching at Year 6 in Mexico. This aims to motivate and expand the potential learning contained in case studies of EE which are bounded to similar systems and contexts.

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[14] Although the case of this research has boundaries that, perhaps, enclose the units of analysis (i.e. the teachers) in a similar situation, the researcher was careful in considering the contextual singularities of every participant-teacher.

Yin (2014) claims that, like every other research method, case studies can be used for exploratory, descriptive, and explanatory inquiry purposes. The case study developed in this research is exploratory, because there are few reports qualitatively addressing primary school teachers' conceptions about EE and in the setting of this research. In addition, an exploratory case study attempts to suggest further direction for future research in a field (Yin, 2014), which is desirable for EE as an emerging field and for the socioeconomic and cultural scenarios of EE Mexican primary school education. Overall, an exploratory case study is majorly fitting when a topic has been scarcely investigated, and when further guidance is desirable for future research in the field, especially when various research geographies are involved.

Data collection methods

Overall, the case study in this thesis was constructed mainly using documents, interviews, and non-participant observation. To select the research methods for conducting the investigation in this thesis, the main guide was the nature of the inquiry (see Table 3.1.). Following this, the general trends noticed in the designs of previous and relevant research studies also functioned as a guide to this thesis (see these in Section 2.3). However, the selection of methods was naturally aided by the advice of prominent academic literature on case study design. Additionally, influenced by Mason's (2002) remarks about the nature of data, the researcher interpreted 'gathering data' as collecting existing data (e.g. Official documents) and 'generating data' as producing evidence which would not exist without the fieldwork activities of the study (e.g. an interview transcript or audio).

In case study design, is advised to use several sources and methods to generate and collect the data that will inform the case (Simons, 2009, Yin, 2014). Gilliam (2010) uses the term 'multi-method approach' to refer to accumulating data through different techniques. There are six typical sources (Yin, 2014) or sub-methods (Gilliam, 2010) to gather and generate evidence in case studies: documentation, archival records, interviews, direct observation, participant observation, and physical artefacts. For either single case or multiple case studies, Stake (2006) also indicates that the most common data gathering methods are interview, observation, data management, coding, and interpretation. The particularities of the methods selected for the investigation in this thesis are provided in the following paragraphs.

DATA COLLECTION METHOD	CONTRIBUTION TO CONSTRUCTING THE CASE	DATA COLLECTED/ GENERATED
Documentation **Existing and generated data.** **Relevant to RQ. 1**	a. Providing evidence of EE-related content from official documents in Mexico for primary school education. b. Informing the researcher about basic aspects of primary school teaching and learning. c. Allowing the triangulation of the participants' conceptions about EE and text from the official documents.	1. Three official documents (The 2011 National curriculum; Year 6 Study Programme and Natural Sciences textbook)
Semi-structured Interviews **Generated data.** **Relevant to** **RQ. 2 & RQ. 3**	a. Obtaining relevant background details of the teachers. b. Including in-depth evidence of how 11 teachers talk about EE in relation to the official documents and their context. c. Providing realistic accounts of how the teachers reacted to interview schedules.	1. Information Forms (Appendices A2-A4). 2. Audio-recorded files of the interviews. 3. Researcher's notes pre/post-interview.
Non-participant Observation **Generated data from naturally occurring situations.** **Relevant to** **RQ. 2 & RQ. 3**	a. Including in-site evidence of how the teachers teach EE-related content in Natural Science lessons. b. Recording through field notes pertinent contextual aspects of the schools and participants. c. Adding to the construction of units of analysis (i.e. teachers and their school) through the physical or digital files/documents.	1. Audio-recorded files of the teachers' speech while teaching. 2. Researcher's notes during and post-observation. 3. Physical or digital files/documents provided by teachers.

Table 3.1 Summary of the data collection methods

The researcher documented the case with curriculum documents and by collecting other types of data (e.g. Information forms, photos, and lesson plans) that provide background of the research setting and participants. Additionally, the observation method, direct observation (Denzin, 2009; Yin, 2014) also called non-participant observation (Cohen and Manion, 1981; Cohen et al., 2000), was employed to generate data that would corroborate and increase in-depth information of the case in context (Mason, 2002). The researcher focused on observing the participants' talk and their teaching activities that suggested teaching of EE-related content, limiting the observation time to the teachers' timetable. The non-participant

observations were aided by an instrument that was designed by the researcher to facilitate a systematic report of the observations (Cohen and Manion, 1981).

In this thesis, interviews are the principal data collection method for the space given to its results in this text. The interviews were outlined as face-to-face individual and semi-structured interviews (Mason, 2002). The semi-structure format included a list of main topics and preparing a pertinent list of open-ended questions to be addressed at the interviews (see Appendix A.5). This design was planned to allow a relatively open schedule and receptiveness to the responses of the research participants (Cohen, et al., 2000; King and Horrocks, 2010; Mason, 2002). In addition to these plans, the interviews were conducted in three separate sets (an initial, intermediate, and final interview) each of 30 to 45 minutes, although, the time was variant according to the teacher.

The separation of the interviews was planned in this way for various reasons: to sensibly separate the topics of interest of this thesis, encouraging a sense of continuity and closure in the teachers' participation; to allow the researcher's reflection and increasing knowledge whilst exploring the case one interview at a time (Brinkmann and Kvale, 2015; Mason, 2002); to build a sustained rapport with the participants of the research (Cohen, et al., 2000); to avoid stressing the teachers' timetables since the interviews had to be conducted during working hours; and, to clarify information provided at the initial and intermediate interviews (Brinkmann and Kvale, 2015). These reasons are matters also related to the quality of the interview design. Section 3.3 offers more details about the instruments designed for using these data collection methods.

To conclude this section, it must be stressed that gathering data from different sources and using different methods can assist in constructing a case based on evidence (or the representativeness of the case through its evidence) and is the basis for data triangulation. Triangulation, according to Gillham (2010), consists of having different standpoints from each data source. Denzin (2009, p.300) describes data triangulation can minimise data collection, analysis, or theoretical biases from the researcher. Correspondingly, Gillham (2010) and Yin (2014) suggest that combining data from different sources and methods maximises the trustworthiness of a study—a qualitative standard in line with the constructivist research approach. Triangulation is not without criticism, however, if the ontological and the epistemological implications of the research—in social constructionist research, triangulation, can operate as a reminder of the importance of context in interpreting social interaction (Silverman, 2001)—are considered alongside with it, then the triangulation of data

can enhance credibility by generating supporting evidence for the claims made in a research study (Seale, 1999, p.61).

Methodological concerns in case study research

Designing an investigation by using the case study method often raises methodological concerns in relation to its design and trustworthiness (Lincoln and Guba, 1985; Seale, 1999) and the internal and external validity of the study: internal validity is concerned with the inferences made in the analysis of data; and external validity deals with the generalisation of findings beyond a case (Yin, 2009). In this thesis, three main methodological concerns were considered: data management issues (Knight, 2002); the generalisation of findings (Bassey, 2007; Knight, 2002; Simons, 2009; Yin, 2014; 2009); and the researcher's subjectivity (Simons, 2009). However, this section only expands on the generalisability issues. This is because the researcher had no major problems with setting boundaries for the case study or managing the high volumes of data (her strategies are detailed in Section 3.4. of this chapter). Additionally, the researcher's subjectivity was addressed by taking steps to maximise the trustworthiness of the study (see Section 3.5, in this chapter) and being explicit about her personal reflexivity.

Generalisation in social sciences is problematic, since social phenomena are not predictable or stable and are influenced by the surrounding environment (Knight, 2002; Popper, 2002). Knight illustrates this point by reflecting on the study of attitudes; he comments that 'the attitudes that people report tend to be context and topic-specific and to change over time' (2002, p.43). It seems the unpredictable nature of social phenomena has led to similar beliefs about the problematic generalisation of small scale research. In fact, according to Flyvbjerg (2006), a common misunderstanding is that results from case studies cannot be generalised, therefore, it does not contribute to scientific development. However, case studies can contribute to generalisation in other forms. For instance, case studies improve theories by identifying disconfirming cases and empirical generalisation (Tsang, 2014). In the present thesis, the researcher aims at generalising the results through transferability (see Section 3.5, ahead) and by testing the Sauvé's (2005) EE typology to improve its understanding and application.

3.2.3 Reflexivity

The subjectivity of the qualitative researcher, the main 'instrument' of the investigation (Ely et al., 1997), is considered a potential problem for the internal validity of the research design and representativeness of data (Simons, 2009; Yin, 2009). Qualitative researchers have recognised this concern and addressed it by revealing their background and position in the

investigation (Knight, 2002; Seale, 1999). Reflexivity, in qualitative research, happens when the researcher ponders and questions his or her effect on the matter under study (Smartt, 2016, p.41), and it can be personal or epistemological (Willing, 2013). This section focuses on the personal reflexivity of the researcher. The epistemological reflexivity conveys the assumptions and decisions involved in the way the investigation was conducted; the personal reflexivity is a task where the researcher reflects upon: 'the ways in which our own values, experiences, interests, beliefs, political commitments, wider aims in life and social identities have shaped the research.' (Willing, 2013, p.10). In a research design, the purpose of reflexivity is to maximise the quality of the investigation by explicitly addressing potential biases that underlay in the researcher's role (Berger, 2015; Seale, 1999).

Comments on my personal reflexivity

Throughout this thesis, the voice of the researcher is attenuated by the writing style of choice. In this section, I, the researcher, step into the scene to be explicit about my personal reflexivity.

Firstly, I am native of the place where the research was conducted, although I do not belong to the professional community of the teachers who participated in this project share. I share the teachers' language and regional culture, but not the professional background or internal culture in their schools (I have worked in basic education, but I have never been a classroom teacher). Like scholars of ethnographic research have described (Hammersley and Atkinson, 2007), this meant that my role in the research site was both of an insider and outsider individual. For example, when talking to the participants my knowledge as an insider was useful to create rapport and understand their views; in contrast, my position as an outsider allowed me to naturally ask elaborations of basic aspects in teaching. Furthermore, being an insider and having a broad familiarity with the social, political, and economic realities of the research site facilitated some of the research design activities. For instance, I was familiar with the routes to formally gain access to the research site.

Secondly, due to my background, for this project I consulted scholarly literature in English and Spanish—see further comments in Section 2.1. However, the choice of readings was also influenced by my circles of interest and professional experiences. For instance, being in contact with second language researchers in the School of Education at the University of Leeds broaden my scope of relevant literature (e.g. teachers' cognition). Additionally, my previous work experience in a science education research group inspired my interest in the Natural Sciences curriculum, which then influenced my initially narrow way of understanding

EE in formal education. Nevertheless, soon after starting the PhD, my views of EE became more attuned with cross-disciplinary and interdimensional methods.

As became more acquainted with academic literature on EE and related topics, I understood more about my influence in conceptualising this project. This is because besides the needs that were identified in relevant literature (see Sections 2.3.1 and 2.3.4), my insider/outsider position and my predisposition to study EE from the point of view of science education had an impact in how the study was designed. I also hold values from my working class, Mexican and Latin-American identities which shape the way I conceptualise EE. From the beginning, I thought it was worthwhile trying to understand why education for sustainable development (ESD) was being highlighted in policy documents and reports. This is an example of how my pluralistic and non-hegemonic approach to EE influenced some of the decisions I made for the literature review and research design.

3.3 Data collection procedures

The data collection processes of this project are described in two main sections. Section 3.3.1 covers the gathering and selection of three documents for documentary analysis. Section 3.3.2 describes the fieldwork activities conducted in Monterrey, Nuevo León, Mexico. The fieldwork lasted from the 11th of November 2014 to the 12 of April 2015. This process generated and collected semi-structured interviews and data from non-participant observations of teaching. Finally, the outline of the data collection instruments and protocols considered key aspects (e.g. teachers' background, classroom practice, contextual peculiarities, and others) identified during the process of reviewing relevant literature—see the literature review in Section 2 of Chapter 2.

3.3.1 Documentary research

The documents studied in the documentary research are influential to primary school teaching, hence this part of the data collection was designed to complement the analysis of teachers' cognitions about EE. There were two significant steps in the data collection for the documentary analysis. First, the pilot search of documents. This was a process conducted before the formal conceptualisation of this research study; the purpose of the pilot search was to identify if EE was considered in the basic education curriculum. Second, the official and final selection of documents. The analysis of these documents is presented further ahead in Section 3.4.2.

Searching for environmental education in relevant documents (a pilot research)

Before conducting a formal research, a pilot search of EE-related references was performed in the digital versions of the 2011 National Curriculum for basic education, the Natural Sciences sections in the Study Programme for Year 3 to Year 6, and the Year 6 Natural Sciences textbook. The documents were downloaded from the official website of the Sub-ministry of Basic Education. The methods employed to select and analyse data involved detailed reading, highlighting text, and writing both marginal and digital notes. Overall, the pilot research suggested potential to perform a formal documentary research on the subject as content relevant to EE was found in the documents. The researcher identified EE was mainly introduced through educational aims. The aims were broad and emphasised sustainability, protection, and care for the environment.

Rationale for the document selection

The same documents used in the pilot search, the National Curriculum, Study Programme, and Natural Sciences textbook, were selected to study them further. Although, this study is focused on Year 6 Study Programme and the Natural Sciences curriculum. A newer edition of the Natural Sciences textbook was also a change between the features of the pilot search and the formal study. The newer version of the Natural Sciences textbook was a necessary adjustment as it was pertinent to the school cycle studied during the fieldwork—carried out during the 2014-2015 school cycle.

As mentioned in Section 1.3 of Chapter 1, the National Curriculum, Study Programme, and Natural Sciences textbook each have a different and important function for teaching and students' learning. The National Curriculum is essential to teaching because it comprises pedagogical proposal for Basic Education—which includes the primary school curriculum. The Year 6 Study Programme provides teachers with various educational aims, teaching advice and material, and the content structures for each subject in this school grade. The Natural Sciences textbook is a main source for supporting classroom teachers' lessons, and, for teaching, they represent the official and closest interpretation of the curricular proposal in the National Curriculum and Study Programme (Guerra-Ramos and López-Valentín, 2011, p.442). The selection of documents was further supported by the criteria offered in *A Matter of Record: Documentary Sources in Social Research* (Scott, 1990). Scott proposes four parameters to select the textual sources of a documentary research: authenticity; credibility; representativeness; and meaning.

To corroborate the *authenticity* of the digital documents, these were retrieved from official websites of the Ministry of Education and compared to the printed versions whenever possible

(SEP, 2013a). The documents are *credible* because they are sources of information directly downloaded from or obtained through the services of the he Ministry of Education. The credibility attributed to these documents, however, does not credit for the content accuracy of the documents. Furthermore, the documents are, by definition, *representative* since they are officially recommended standardised guides for state-regulated primary education. The *meaning* criterion attempts to determine if the data are clear and comprehensible for the researcher (Scott, 1990). In this case, the content of the official documents was comprehensible to the researcher because she shares the historical, cultural, and scholastic backgrounds permeating the documents.

In attempt to further reflect on the suggestions in the criteria for selection, the researcher examined the educational policy agreements[15] 181, 438, 494 and 540 (i.e. documentary primary sources[16]) to better understand the origin of the National Curriculum, Study Programme, Natural Sciences textbook (i.e. secondary sources).

The policy agreements were considered primary sources of information since they precede the National Curriculum, Study Programme, Natural Sciences textbook. Nonetheless, the policy documents were not a source of analysis in this study. These agreements are not normally used by teachers working in primary schools, which made them unsuitable for the research. However, studying the official policy agreements revealed to the researcher that the National Curriculum and Study Programme keep close resemblance with these policy documents. The only differences between educational guides and the agreements are the format of the documents and the writing style. For instance, the National Curriculum and the Study Programmes have a reader-friendly format because they are written for a broad range of readers; whilst, the policy agreements are long documents with a minimalistic format.

3.3.2 Fieldwork: gathering data from primary school teachers

The present section narrates this thesis' fieldwork activities, which were developed across Monterrey and its metropolitan area, in Nuevo León, Mexico. The fieldwork activities lasted from the 11th of November of 2014 to the 12 of April 2015. As mentioned in the introduction

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15 The policy agreements 181, 438, 494 and 540 are records of the structural changes introduced to the Mexican primary school curriculum in the last two decades (DOF, 1993; DOF, 2008; DOF, 2009; DOF, 2010); these changes are contemporary to the current primary education system.

16 What primary and secondary documentary resources are in documentary research is still a matter of debate, since it mostly depends on the type of document and its employment in research (McCulloch, 2004).

of this chapter, during the fieldwork activities in Monterrey the researcher managed to recruit 11 in-service teachers from 6 different state-regulated primary schools. After the fieldwork activities, the researcher counted had generated and collected 33 audio-recorded interviews (11 sets of initial, intermediate, and final interviews) and 39 hours of audio-recorded and hand-written registered classroom observations. The on-site observation reports were produced whilst observing, and they were extended after each teaching session was finished. Other types of data (e.g. information forms and collection of visual evidence from school premises and students' work) were also gathered, however, the interviews play the main role in this research.

The following sections encompass a narration of the recruitment of schools and participants and the instruments that were employed to collect their data. First, the section starts with describing the pilot study; this includes the development and trial of the data collection instruments and their protocols. Second, the reader is given the details of the selection and access to the research site and participants, as well as the details of the data gathered and generated during this project. Finally, this section also delivers the ethical implications of the fieldwork activities and how the potential issues were tackled by the researcher.

3.3.2.1 The pilot study

This exercise aimed at testing research instruments of this research (information forms, the initial and final interview schedules, and an observation sheet) and protocols for rapport and data collection. In addition, the pilot aims to identifying potential disruptions or issues that could take place during fieldwork. The main purposes of the pilot study are as follows:

- Test the suitability of the interview schedules (themes addressed) and interview format
- Test the usefulness of the information forms and the observation sheets
- Practice the protocols for the interviews and observation sessions
- Identify technical and logistical problems, and work on solutions

The topic guide for the initial and the final interview was informed by information obtained from the documents studied in the documentary research, and ideas extracted during reading about curriculum enactment and environmental education. The initial and final interview trials encompassed the following topics:

Initial Interview

- Description of the Year 6 and Natural Sciences programmes
- Meanings and curriculum relationships of EE
- Experience teaching EE content in primary school
- The 2011 reform and its potential impact on EE content

Final Interview

- Perceptions of their performance when teaching EE content
- Sources of information for teaching EE content
- Meanings and curriculum relationships of sustainability
- The importance of terminology in lessons

The information forms were designed to obtain basic information of participating schools and teachers. These were trialled along with the interview protocol and tested against pre-set time expectations for this data collection procedure (approx. 30 minutes based on the time slots for language and physical education lessons, which are typical times when classroom teachers are 'available' for other activities). The interview protocol included testing guidelines for anonymity of the participants and schools. In addition, a format for field notes to be used during the sessions of direct observation was designed for its testing alongside a protocol for joining Natural Sciences lessons.

The first step towards the refinement of the research instruments involved obtaining advice about their pertinence in the light of the research focus. The supervisory team of this project (i.e. academic supervisor and co-supervisor of this thesis, and who are two science education experts and experienced researchers from the School of Education at the University of Leeds) received a copy of these documents in English—although they were originally written in Spanish—, then, after critically engaging with these documents, they provided feedback and adjustments were made to the content in the forms, interviews, and usefulness of the observation sheets. The second step, was testing each of these instruments in a real scenario relevant to the research interest of this study.

Conducting the pilot study. Recruiting participants for the pilot study was a way to test access and gatekeeping challenges; although, the primary school teachers of School P (a semi-

urban primary school located in Apodaca, Nuevo Leon, Mexico) are former participants of a research project in which the researcher was involved. In October 2014, the Head Teacher of School P was contacted, which later lead to the successful recruitment of Nayeli, Mario, Maximo and Anabel[17]. They were all in-service teachers of ample teaching experience and who had taught Year 6. A written consent form was not necessary for the pilot study as they gave their verbal consent to form part in the trial. The piloting implied little intermission to the teachers' routines and only few ethical concerns (e.g. to avoid causing distress to the participants, respect the participants' autonomy by obtaining their consent to participate, and so on), as the data collected for the pilot was not treated for in-depth analysis and publication.

The initial interview was piloted in sessions that lasted from 30 to 35 minutes (see Table 3.2). The interviews were audio recorded and a jack microphone was employed to reduce any background noise. The exercise was performed sometimes while another class (e.g. English class) was developing or when students were busy working on activities that were given to them by the teacher. The three trials of the initial interviews followed a similar procedure: briefly introducing the participant to the interviewing process; filling out a short questionnaire with basic information; addressing main topics and follow up questions; and, closing the interview. The interviews were not transcribed.

TEACHER	SCHOOL YEAR	INTERVIEW LENGTH	SETTING
Nayeli	1	25 min	In her classroom
Mario	1 & 6	31 min	In his classroom
Maximo	5	33 min	In his classroom

Table 3.2 Summary of the initial interview piloting

Two Natural Sciences lessons from two different teachers—Mario and Anabel—were observed during the pilot (Table 3.3). The lessons included topics from the Block 2 of Year 6 Natural Sciences textbook (see Section 4.2.3), which is one of the parts in the textbook where content related to EE is addressed. Later, Mario became a participant of the main study. Mario worked two shifts in two different schools. The pilot interview was conducted in School P during the morning shift school. The rest of Mario's data were collected in School F whilst he taught in the afternoon shift. Inviting Mario to form part of the main sample of participant-teachers was motivated by his environmental activist profile. Mario was actively engaged in

17 The actual names of these teachers will be kept anonymous, so for the purposes of this study fictional names (unrelated to the participants' identity) have been chosen.

a local organisation of environmental activism, where the conservation and protection of natural areas was encouraged. Mario's professional profile shared similarities to the rest of the teachers participating in the study, however, his interest on environmental activism was enriching to the study.

TEACHER	RECORDING LENGTH	SETTING	LESSON
Anabel	58 min	In her classroom, at a primary school, morning shift.	Darwin's theory of evolution Changes in living beings and extinction processes, block 2, topic 1.
Mario	42 min	In his classroom, at a primary school, afternoon shift.	The relationship between air pollution, global warning and climate change, block 2, topic 3.

Table 3.3 Summary of the participant-observation piloting

The audio-recording of the lessons was assisted by using an audio-recorder of voice recognition features and employing a microphone jack to heighten the sound quality of the teachers' speech. During this pilot exercise, the suitability of the observation sheet was tested. The sheet was designed to manually register observations relevant to the research questions, see below:

AREA	INTEREST
Lesson planning	· Teaching aims of the lesson (s) · Familiarity and selection of learning content · Connection between curriculum and practice · Presence of EE within Natural Sciences
Background	· Concepts related to EE · Context-relevant reflections to EE · Reference to education in, about, or for the environment
Pedagogy	· Teaching strategies related to EE learning activities

Table 3.4 Topic guide of the non-participant observation pilot study

The interview schedule for the final interview was not trialled with teachers. Instead, two experts in the field of Basic Education and EE and external to the study were consulted about the content of the interview, and their comments were recorded in manual notes. Later, the schedule of the final interview was trialled with one of the experts; this exercise was audio-recorded and manual notes were also taken.

Technical and idiosyncratic lessons from the pilot study

The aims of trailing the research instruments and protocols were fulfilled during the pilot study. The insights obtained during the trailing are discussed below by examining each of the aims that defined the focus of the pilot study.

Testing the suitability of the interview schedules and interview format. All the teachers that were interviewed could promptly relate to the questions in the initial interview. The main problem found was the way some of the questions were formulated (see Table 3.5). Some expectancy bias from behalf of the researcher and teachers was noticed in the testing. Nevertheless, the semi-structure format of the interviews helped moving across topic; the format helped in avoiding focussing on fixed expectations and maintain a natural flow. Paying too much attention to the recording devices, writing lengthy notes, or looking at the interview schedule too often were factors that disrupted the flow of the interview and seemed to make the interviewee feel self-conscious. Knowing the schedule, active listening, and making brief notes for follow up questions were solutions to tackle the challenge of breaking the flow when interviewing.

INITIAL INQUIRY	ISSUE	SOLUTION
Could you please tell me how would you explain Year 6 in primary school? What are its main characteristics?	The word 'describe' was more suitable to start the interview because it suggested a stress-free question.	*Rephrased:* Could you please tell me how you would describe Year 6?
Have you identified what the aims/purposes of Year 6 are? [If yes] Can you give me a few examples?	Although it was written in this way in my script, in all cases I had rephrased the question to avoid breaking the flow of the interview.	*Rephrased:* What do you think the aims of Year 6 are?
How do you think that the natural sciences curriculum connects with the Year 6 programme?	None of the teachers who got asked this question understood what the question was asking.	*Rephrased:* Do you think there is any link or connection between the Year 6 Natural Sciences programme and the other subjects in the plan?
What suggestions do you think 'the reform' has on environmental education?	This question assumed more than necessary.	*Rephrased:* Do you think 'the reform' had any impact on or suggestions to environmental education?

Table 3.5 Editing sample of the initial interview after the pilot study

Testing the usefulness of the information forms and observation sheet. The information forms proved easy to fill in and clear. It was noticed that an extra form to gather the educational background of teachers was important to have, and hand it in during the second interview or third. The original format of the observation sheets was not entirely satisfactory. Initially I had a letter size sheet to report as much as 30 minutes of observation, but the trial proved that more space was necessary in the minute by minute format.

Practising the protocols for the interviews and observation sessions. The main aspect that changed from the original protocols both for interviewing and observing was related to timing. It was found important to efficiently direct the interview and observation sessions to avoid wasting valuable time on lengthy explanations. This was the first time the researcher had performed non-participant observation, in contrast to previous research experiences where she had taken part in the teaching, hence, performing and reporting the direct observation exercise was perceived as an entirely different experience by the researcher. Therefore, practising the protocol was beneficial for future performances of this research, in fact, it was perceived that the participants of the main sample teachers seemed reassured when the researcher showed mastery the protocol. This was later reaffirmed when they expressed their reflections about their participation in this study.

Identifying technical and logistical problems and develop solutions. There were a few situations that the researcher did not foresee and that the pilot study helped to consider. For instance, the pilot was a reminder of the importance of knowing the customs in schools (e.g. Learning the name of the gatekeeper—the person in charge of the actual school gates—, reporting my visit in the Head Teacher's office every time I visited, being discrete when waiting in the Head Teacher's office, and so on.). Every school has slightly different 'rituals' and School P was not the exception. Another issue was finding a place where to conduct interviews before hand. In the case of School P, there was no library or teacher lounge, so the interviews were conducted in the school yard or classrooms. These issues were helped by using a microphone jack.

The research instruments and protocols

The learning gained from trialling the research instruments and protocols was key to improve them. In the following sections, the main characteristics and aim of the instruments are discussed. In addition, the subsections below include a description of the general protocol that was chosen to apply each instrument during the data collection stage. Most of the instruments were designed and trialled before recruiting the participants of the study, except the

intermediate and final interviews that were defined during the first half of the fieldwork period.

Information forms. The researcher designed three forms (A, B, and C) to create databases of the participants. Form A collects information about the school administrators and assistants, name of the concierge (knowing their name was important to gain physical access to the schools), reference codes of the school, number of students, etc. (see Form A in Appendix A.2). Form B and Form C were created to obtain basic information of the teachers, education, timetables, class information and preferred pseudonyms (Appendices A.3 and A.4). The information forms and databases were securely stored, using a systematic filing procedure.

Interviews. The three interviews designed for this study include a list of themes (see Table 3.6), which aimed to orient the activity and encourage talk from the participants about these themes. The main interview questions exploring EE conceptions—asked at the initial interview—overlap with part of the interview scheduled proposed by Chatzifotiou (2005), albeit her study was not found until after the full-length of the fieldwork had been conducted. Additionally, the design for the three interviews considered the risk of motivating a response-bias by leading participants to express specific opinions (Brinkmann, 2013). This issue was addressed by asking three types of questions at the interviews: main, probes, and follow-up questions (Rubin and Rubin, 2005). The researcher recorded brief notes of relevant events happening before, during or after the interviews; they were included in the transcripts of the interviews using the following label: (School code, teacher synonym, interview number, interview notes).

GENERAL SCHEDULES FOR THE 3-PART INTERVIEW SET		
INITIAL INTERVIEW	**INTERMEDIATE INTERVIEW**	**FINAL INTERVIEW**
• The Year 6 curriculum. • Meaning and notions about EE. • Experience with learning activities of EE content. • Influence of the last curricular reform on EE content.	• Career background. • Notions about teaching. • Factors that impact teaching of EE in the teacher's context. • Self-perceived autonomy in teaching EE content.	• Discussion about the lessons observed. • Meaning and notions about sustainability. • Relationship between EE and sustainability; and other related terms.

Table 3.6 Topic guide of the semi-structured interviews

The schedules of the interviews only include the main questions (see Appendices A.5.1, A.5.2 and A.5.3); these according to Rubin and Rubin (2005, p.153) elicit overall understanding and experiences from the interview. In all interviews, follow-up or prompts questions were used to pursue a more detailed and explicit understanding of what the participants responded to main questions (ibid.). For instance, the main questions of the initial interview tried to understand how the teachers conceptualise EE and if they could see any relationship between EE and the Year 6 curriculum. Then, follow-up questions and probes, such as 'how you think that EE and Natural Sciences relate?', 'why that is related to EE?', 'who is 'we' in what you just said?' helped obtaining more details identified in broader comments. As an example, the initial interview schedule (Appendix A.5.1) includes some of the dialogue used by the researcher to introduce the questions; this feature is not included in the intermediate and final interview schedule. The following are some brief remarks about using the schedules and semi-structured interview format:

- The interview records show that the teachers' responses were much longer than the researcher's conversational turns, which is a sign of a successful interview experience.
- The participants, occasionally, changed the line of inquiry—which was expected due to the interview format—, but these changes often indicated something significant for the researcher to consider and follow up (for instance, their concerns about not having enough time to teach sciences or EE was often introduced by them in this way).
- Directing the course of the interviews was key to avoid expectation biases; for instance, it was observed that, as the teachers were informed the initial main themes in the research project, a few of the teachers showed a propensity to talk about EE in Natural Sciences even when they were asked broad questions about EE.

Protocol for interviews. The protocol followed when interviews were to be carried out did not vary much among interviews. The process included three different stages: scheduling; announcing the visit; and conducting the interview. First, the interviews were scheduled by contacting the participants in the way they preferred, such as email, text message or phone call. Second, assistants and school authorities were always informed of the researcher's arrival, the purpose of the meeting, and notified when the researcher was ready to leave the premises.

Perming the interviews involved other routines set for the comfort and general setting of the activity. During the first three to five minutes of the interview the participant would receive

information from the researcher about the main topics to be covered at the interview, and he or she would be reminded of the project's ethical considerations. The participant was always informed when the recording was going to be turned on and off. Additionally, the researcher would always provide a bottle of water and biscuits for the participants. At the end of the interview, the researcher thanked the participant and reminded him or her that it was always possible to add further information or expand his or her comments if necessary.

Rapport with the participants. In general, the relationship between the participants and the researcher improved after the first interview to one of trust and familiarity. The researcher's rapport with the participants was noticed through: a) the teachers' cooperative and relaxed attitudes towards the research; b) their willingness to address sensitive issues about their workplace and context; and, c) their feedback at the end of the data collection process. These signs of effective rapport were confirmed in relevant literature outlining qualitative interviewing (DiCicco-Bloom and Crabtree, 2006; King and Horrocks, 2010; Rubin and Rubin, 2005).

The factors that contributed to building a relationship of trust and familiarity between the interviewees and the researcher were various: following a systematic and normative process to obtain access to schools; communicating clear prospects and detailing the research activities to be undertaken; addressing the importance of ethical matters with the Head Teachers (who are in charge of managing schools) and the teachers; respecting the teachers schedules and answering to all their questions; and, motivating their familiarity by having regular contact (i.e. the non-participant observation sessions).

Collection of research items. The researcher collected some different items (photos, lesson plans, digital files, and relevant leaflets) during the fieldwork. She took photos in all the schools, however, for matters of confidentiality these are not displayed in the thesis. The photos are mainly of buildings, EE-related evidence of students' work, and EE-related displays in the participant-schools. The only teachers who voluntarily handed in research items were those from School E (see list of participant schools in Table 3.7); these include the teachers' curriculum vitae, one lesson plan, a booklet, and two digital files showing some of their EE-related work. All the collected items were scanned (when required) and grouped per school in digital folders. When used as evidence these items use the following label for identification: School code, item no. (E.g. E, item 4).

Non-participant observation. As explained in Section 3.2.2, the focus of the non-participant observation data was to capture teaching situations addressing topics that are relevant to EE and to study teaching situations of learning content related to EE. Hence, the researcher's

observations mostly highlighted episodes in the Natural Sciences lessons where the teachers expressed knowledge and learning activities related to EE. For observation techniques, Cohen and Manion (1981) describe an 'episode' as 'any coherent part or fragment of social life' (p.52). Each non-participant observation session was assisted by a sound-recording device and 'observations sheets' to register the researcher's observations (see Appendix A.6). The researcher differentiated her notes using written signs to identify when she was writing either contextual descriptions, textual dialogues, or her interpretation of an occurrence or something expressed in an episode.

Observation protocol. Inform school authorities of my arrival to the premises. Walk to the participant's classroom, then, they would indicate (usually with a hand gesture) the moment the researcher could enter the classroom. The researcher expected to have a seat in the back of the classroom or on a side. The immediate thing to do after accessing the classroom was to hand in the recording devices to the teachers (to avoid disrupting the normality of lessons too much) and assist them if required. During the observations, it was effective to, as much as possible, avoid eye contact with the teachers to prevent them from getting distracted by the researcher's presence. To end the observational session the teachers would give a signal to the researcher once the lesson was over; then, the teachers would hand in the devices, and, when appropriate, the researcher would exchange a few comments about the next session before leaving the classroom.

General impact of the observation design. Denzin (2009) considered that having an observer in a naturally occurring situation could, to some degree, affect the validity of data by producing changes in the behaviour of the observed (p.261). In this study, a few actions were taken to minimise this potential risk. First, the researcher scheduled the observation sessions according to the teaching plans and availability of the participants. Second, the researcher was introduced to the class, her role was explained, and it was emphasised that she was not going to interrupt the lessons during her visits (all the teachers tried to make sure that students understood my role during the visits). Third, there was usually a place on the back of the classroom assigned for the researcher to sit. Eventually, it was noticed that the 'inactive' role of the researcher was very quickly not a novelty in the classroom. However, a few times students, or the teachers themselves, called upon the researcher to integrate to the class or a discussion (e.g. Students would designate a sit for the researcher or a teacher would ask the researcher to corroborate a fact relating to an environmental issue). To all these situations, as described by general non-participant observation strategies (Cohen et al., 2000, p.187), the researcher would be discrete and polite, excuse herself from interrupting, and wrote a note of the event.

3.3.2.2 Access to the research site and participants

This investigation worked with in-service primary school teachers from mainstream and state-regulated primary schools located in Monterrey and its metropolitan area. The research site was decided based on two main factors: a) environmental education is a component of the strategies targeting the sustainability and environmental problems of Nuevo León and its metropolitan area (Gobierno de Nuevo Leon; 2010a, p.4; Gobierno de Nuevo León; 2010b, p.77), where environmental issues, like air pollution, are pressing (Martínez-Muñoz and Valdez-Cavazos, 2016; Gobierno de Nuevo León, 2016); and, b) the researcher is native of the research site; and, she shares familiarity with the general culture and practices of basic education in this place, which increased the feasibility of the study. The following paragraphs describe the recruitment of schools and teachers.

Gaining official authorisation. The initial step to seek access to primary schools in Monterrey was to obtain official authorisation from the Sub-ministry of Basic Education in Nuevo Leon—their offices coordinate schools in the fieldwork site (official letter in Appendix A.7). The authorisation process lasted around three months (from July to October 2014), then, when this process was concluded, official documents[18] were given to the researcher to present in the schools. The application form to solicit authorisation asked for a list of the schools where the project's fieldwork could potentially take place, and, this how the school recruitment process began. Once, the authorisation was granted, the Coordinator of Regional Units[19] emailed the administration office of each school in the list to inform them about the researcher's attempt to approach potential participants in their schools.

Recruiting process for schools. The study aimed to recruit a minimum of six teachers working in Year 6 and a maximum of 14, this according to the time scale of the project and the amount of work the researcher could manage. Mainstream state-regulated primary schools usually have at least one Year 6 class because this depends on the size of the school, thus, the researcher approached 12 schools to allow the possibility of recruiting the desired amount of participants. The criteria employed to select the 12 schools (see comment in 'gaining official authorisation') are the following: located in an urban or semi-urban environment in Nuevo León, and, if possible, near where the researcher was based; morning and afternoon schools sharing the same building; and, include one or two schools that have been awarded with

18 Official letters SEB-0749/14-15, SEB-0750/14-15, and CEEyOP-0116/14-15.

19 Regional units are managerial offices distributed across the state. They provide various services that support and coordinate schools, teachers, and school parents.

quality, teaching awards, and/or recognitions relevant to environmental education. These aspects represent mainstream social realities of teachers working in Monterrey and its metropolitan area.

To formally recruit schools, the researcher phoned the schools and made appointments with the Head Teachers of each school; during these meetings, the project was accepted or rejected by the Head Teachers. If accepted by them, in most cases, the decision to participate was then transferred to the Year 6 classroom teacher or teachers. In summary, it was not possible to access one of the schools in the list and five Head Teachers declined the invitation because they considered that they had enough work load. The rest of the schools became part of this project's sample.

The recruitment process for participant-teachers. The recruitment process aimed at having participants who were teaching in Year 6 and who had at least five years of teaching experience. The Head Teachers and the prospected participants received a folder holding the information about the project and the implications of their potential participation. The folder included an information sheet, copies of the official authorisation letters, and a consent form for participants (see the Appendices A.7, A.8 and A.9). The information sheet explained teachers about what their participation entailed, the type of data aimed to be collected and managed, and how the results would be communicated. The prospective participants were informed that it was possible to withdraw their participation at any point and without suffering any kind of reprisal (other ethical considerations are addressed, ahead, in this section).

Participant schools

The researcher successfully gained the participation from six state-regulated primary schools; four located in Monterrey and two in the nearby metropolitan area. Five out of the six participant-schools shared their premises with a different administration in the morning or afternoon—sharing buildings between primary education institutions is a strategy to extend the educational coverage in Mexico. One participant-school, School E, was a full-time school. All the schools in the sample have basic building infrastructure such as: classroom equipment (such as school chairs, whiteboard, air conditioner, but having a working projector or desktop computer was a common issue), a small library, a computer lab (not all the machines where functional in most schools), courtyards, an administration office and other basic facilities. Award winning schools might receive additional funding and can, generally, have more and better equipment. Table 3.7 summarises the characteristics of the participant-schools, and it includes awards and official programmes, like the 'Safe School' initiative (see in Section 1.1.2 of Chapter 1), to illustrate some aspects of the educational cultures in schools:

SCHOOL YEAR 2014-2015	SCHOOL A	SCHOOL B	SCHOOL C	SCHOOL D	SCHOOL E	SCHOOL F
SCHOOL'S FEATURES	LUZ & MORELOS	MARLEY & SANTIAGO	ADELA, BETTY & JOSE	ESTEBAN	ISABELA & RORI	MARIO
1. Funding 2. Shift 3.Estimated socioeconomic background	1. State-funded 2. Morning school 3. Low	1. State-funded 2. Afternoon school 3. Low	1. State-funded 2. Morning school 3. Low-Mid	1. State-funded 2. Afternoon school 3. Low	1. State-funded 2. Full-time school 3. Low	1. State-funded 2. Afternoon school 3. Low
CLASSROOMS	**15**	**24**	**20**	**15**	**10**	**8**
STUDENT POPULATION	**456**	**664**	**655**	**220**	**305**	**230 (approx.)**
FEDERAL PROGRAMMES/ INITIATIVES	-Health for Learning (SPA in Spanish) -Safe School -Science in family -Human development (Education for parents)	-Health for Learning (SPA in Spanish) -Safe School -Science in family	-Health for Learning (SPA in Spanish) -Safe School -Red Edusat	-Health for Learning (SPA in) -Safe School -Human development (Education for parents)	-Health for Learning (SPA in Spanish) -Full-time School -Safe School -Human development (Education for parents)	-Health for Learning (SPA in Spanish) -Safe School
OFFICIAL (STATE-FUNDED) ACKNOWLEDMENTS AND AWARDS	-Teacher Merit Award	-Health Promoting Recognition -School Merit Award -Teacher Merit Award -Nuevo Leon Award for competitiveness	No data was provided	No data was provided	-School Merit Award -National Quality Award	No data was provided

Table 3.7 Participant schools

Participant-teachers

Eleven teachers participated in this study. The recruitment process was successful since it was possible to recruit more participants fulling the desired criteria and surpassing the originally expected minimum of six participants. The teachers participating were five females and six males of different ages and working in heavily urban areas of Nuevo Leon. All the male participants and one female had two teaching contracts (i.e. they worked in two different part-time schools every weekday) because one teaching job was not considered enough by them to keep their families. The teachers from School E, two females, worked in a full-time school.

Not all the teachers were native to the research setting or neither live near their school, but all were, in general, well-acquainted with the sociocultural environment of their school, and of Monterrey and its metropolitan area. On this matter, Gilchrist comments that enculturation is an important trait of informants (e.g. the participants, in this project) because enculturation facilitates the representation of sociocultural groups (1999, p.358), therefore, this is a relevant matter to the representativeness of the sample and potential transference of findings. In this way, the participants of this project embody sociocultural customs (e.g. through colloquial talk and knowledge of social practices in their context) of the other primary school teachers working in urban and state-regulated primary schools in Mexico.

What is more, in ethnographic studies, informants can take different roles—like Burgess (1999) reflects in one of his accounts about using informants for research. Although this is not an ethnographic study, reflecting on the role of the participant-teachers was pertinent because it revealed that the teachers could manifest different roles: as informants of current and historic events of their educational context in local and broader levels; as narrators of their perceived experiences; and, as guides to become enculturated in the circumstances of the research setting.

Table 3.8 shows significant aspects of the participants' profile and the types of data collected in relation to them. This table was created with the information collected through the forms B and C; the information from the teachers in School E was obtained from these forms and their curriculum (E, item 2; E, item 3). In Table 3.8, is possible to observe a consistent number of interviews and a marked variation in the number of observation session across the participants. This is because planning for the interviews was generally easier for most teachers since some of the teachers found more challenging to predict the timetable for their teaching of Natural Sciences lessons (this is further commented at the end of Section 3.4.3).

TEACHER	LONG-TERM EDUCATION	YEARS TEACHING		CONTINUING PROFESSIONAL DEVELOPMENT	DATA COLLECTED
		PARTICIPANT SCHOOL	TOTAL		
LUZ	- Primary Education training - Primary Education degree - Master in Regional History	9 years in *School A*	31	-Experimental Work in Natural Sciences (course) Cultural Expedition (diploma) -Science and Technology (programme)	3 interviews 8 observations
MORELOS	- Primary Education training - Folk and Regional Dance	24 years in *School A*	28	-Didactic Planning for Competence Development (course) - Comprehensive Reform in Basic Education (diploma) -Science and Technology (programme)	3 interviews 7 observations
SANTIAGO	- Primary Education degree	8 years in *School B*	12	-Ecology (diploma) -Science and Technology (programme)	3 interviews 5 observations
MARLEY	- Primary Education degree	8 years in *School B*	12	Natural Sciences and Environmental Care (diploma) - Comprehensive Reform in Basic Education (diploma)	3 interviews 4 observations
ADELA	- Primary Education degree - Secondary Education degree - Master in Psycho-pedagogy - Master in Civics and Ethics Education (was studying)	13 years in *School C*	17	- Comprehensive Reform in Basic Education (diploma)	3 interviews 3 Observations

BETTY	- Primary Education degree - Secondary Education degree (was studying)	4 years in *School C*	8	- Comprehensive Reform in Basic Education (diploma) -Teacher Competences for Science Teaching (diploma)	3 interviews 3 observations
JOSÉ	- Primary Education degree - Master in Educational Management	1 year in *School C*	9	- Comprehensive Reform in Basic Education (diploma) -Teacher Competences for Science Teaching (diploma)	3 interviews 6 observations
ESTEBAN	- Basic Education degree - Master in Education - Secondary Education degree (was studying)	3 years in *School D*	10	- Comprehensive Reform in Basic Education (diploma)	3 interviews 8 observations
RORI	- Primary Education degree - Special Education Needs and Disability degree	8 years in *School E*	21	-Attendance to at least 20 workshops and diplomas (approx. 400 hours) on curriculum, teaching, collegial work, art and drama.	3 interviews 1 observation
ISABELA	- Primary Education degree - Special Education Needs and Disability degree	8 years in *School E*	12	- Attendance to at least 7 workshops and diplomas (approx. 200 hours) on curriculum, teaching and collegial work.	3 interviews 1 observation
MARIO	-Primary Education training	No data	22	No data [Mario never gave the forms A, B, and C back]	3 interviews 1 observation

Table 3.8 Participant-teachers

3.3.2.3 Relevant ethical considerations

The main ethical concerns of this study were concentrated in the research design. Although, in qualitative research, ethical issues can emerge at different stages of a research project (Creswell, 2013); therefore, ethical soundness has been considered an ongoing process throughout this research (Orb et al., 2000, p.96). Some main issues that generally apply to qualitative research are: informed consent, privacy, harm, exploitation, and consequences for future research (Hammersley and Atkinson, 2007, p.209; Orb, et al., 2000). Pondering on the potential ethical issues of the research raised three main themes: access to the research site; the autonomy and free will of the prospective participants; and, safeguarding identities of participants and third parties. The following paragraphs describe the ethical concerns that have not been detailed in other sections like consent forms and how the data was managed.

The autonomy and free will of the prospective participants. An important ethical consideration was to ensure the voluntary participation from the institutions and teachers approached by the researcher. To minimise the risk of neglecting the prospective participants' autonomy to decide their participation, the researcher provided verbal and printed information of the project beforehand; then, it was emphasised to the figures of authority in the schools, that it was of utmost importance to allow teachers decide their participation with the right to withdraw at any point if desired; and, finally, the teachers who decided to participate where given an informed consent form (Appendix A.9) that they signed once they had agreed with the particulars the form.

The informed consent letter aims to respect basic ethical principles within research work, such as the participant's 'right to self-determination' (Miller and Boulton, 2007, p.2202). Using a set of statements, the consent form communicated the commitment for both parts (the researcher and the participant) upon agreeing participation in the project, and, once signed it formally confirms a teacher's agreement to voluntarily participate in the project. The signed consent of the students' parents was not required because no data involving them was collected or treated in this study; however, the classroom teachers, in this case, acted 'in loco parentis' (Homer, 2001) by informing and asking the pupils for their verbal consent about having the researcher in their classroom while they were taking some of their Natural Science lessons.

Identity and data safeguarding of the people and institutions involved. During collection and management of data the researcher adopted a filing system for all the types of data collected, 'anonymisation' strategies, encryption of files, and secure physical and digital storage (e.g. Leeds University's servers). No personal archives were consulted to extract

information of the participants; however, sensitive data (e.g. birthdates, genres, contact information, and so on) were collected to create the study's internal profiles of participants and institutions. To avoid exposing the institutions, the schools taking part in the project were given a pseudonym (School A to F). To prevent disclosing the identity of the participant-teachers, the teachers chose their own pseudonym. The teachers' pseudonyms were revised by the researcher and adjusted if the originally chosen revealed information that was connected to their identities.

Additionally, the participants were asked if they felt uncomfortable or vulnerable about sharing sensitive data, but this was not the case with any of the participants. Manual anonymisation was always preferred over assisted anonymisation through a software. Automatic or software assisted anonymisation carried the risk of disclosing the identity of a third party or of a research participant (sometimes casually mentioned in the interviews), because the parameters used in automatic anonymisation are not sensitive enough to process spoken data (Rock, 2001). Finally, due to the nature of the data (thick descriptions, interviews, and data in Spanish) and analysis, other analysts, a second transcriber, and a few professionals who got involved with the translation process of evidence became acquainted with portions of the data. Upon agreement, these third parties signed a non-disclosure form that is in accordance with the confidentiality terms of the project (see example in Appendix A.10).

Other specific ethical issues are discussed and detailed in the ethical review form required by the University of Leeds, in the United Kingdom. Ethical clearance for this project was granted (AREA 14-020) by the University of Leeds ethics' committee before conducting the fieldwork activities; these activities were later directed following the ethical guidelines addressed in the ethical review.

3.4 Data processing and analysis

This section describes the actions taken in organising, managing and analysing the data collected for this investigation. First, Section 3.4.1 introduces the main analytical protocol that the researcher designed for the thematic analysis of data. After this, Section 3.4.2 and 3.4.3 provide the specific steps and nuances of analysing the curriculum documents and data collected and generated during the fieldwork. These sections include a description of how the evidence is displayed in the results, ahead, in the following chapters.

3.4.1 Qualitative data analysis: defining a process

To analyse the data and answer the research questions the researcher used her interpretation of thematic analysis—a strategy of qualitative content analysis. Generally, thematic analysis

involves selecting and sorting qualitative data into themes to facilitate the identification of significant patterns or threads (Ely et al., 1997). Since there are multiple frameworks to work with qualitative content analysis, the researcher decided to design an analytical protocol based on her interpretations of literature describing relevant methods. The protocol was created by adopting advice and algorithms from literature on qualitative content analysis, thematic analysis and framework analysis (i.e. Braun and Clarke, 2006; Kuckartz, 2014; Ritchie and Spencer, 2002; Schreier, 2012). Below, Figure 3.1 introduces the main steps of the protocol:

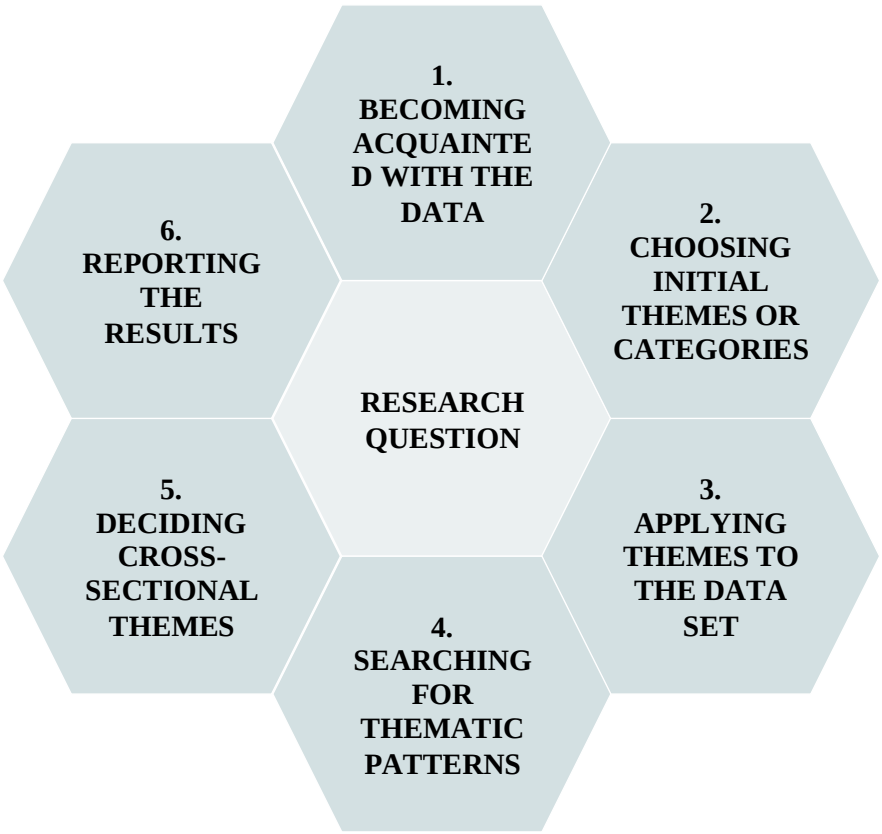

Figure 3.1 Main analytical protocol

'Research question' appears at the centre of Figure 3.1 to represent that having the research question in mind throughout the different stages of the thematic analysis was essential to guide the analysis. This representation of the protocol does not include the iterative and bi-directional analytical exercises that are necessary to conduct a rigorous qualitative analysis (Mason, 2002). Through this protocol, the researcher sought to explore the sociocultural context and meanings within textual data (i.e. documents, interview transcripts, field notes, extended field notes and so on) whilst searching for thematic patterns. This protocol was defined to facilitate a systematic analysis and objectivity, although, the analytical lenses of the researcher are not neutral.

In recognition of the constructivist stand adopted in this thesis, the researcher considers that the analytical decisions were influenced by the data collected and generated, the conceptual and empirical literature that was consulted for this investigation and the background and experiences of the researcher. However, in analysing data for specific research questions, the researcher draws a pragmatic difference between data and theory-driven analyses (Schreier, 2012). This distinction emphasises when an explicit theoretical framework was adopted or not when defining analytical categories. For instance, cues from the data and an analytical framework both influenced the thematic categories in the analysis of RQ.2; this means that theory and data-driven strategies were employed in this analysis (more on this in Section 3.4.3). The following bullet points describe the actions encompassed in the protocol further:

1. *Familiarization*. During this step, the researcher reduced and grasped an understanding of the data. This was accomplished by systematically reading the data sets.
2. *Choosing initial themes or categories*. Using either (or both) a theory-driven or data-driven strategy the researcher decided on thematic categories. The categories were decided by considering the research focus, prevalence and prominence of themes. After, boundaries are set for the thematic categories.
3. *Applying themes or categories.* After testing and refining initial categories, more robust categories were decided for application and re-analysis of data. The final categorisation of data was concentrated on selecting relevant passages of the text under analysis.
4. *Searching for patterns*. Data and profile matrices were used to assist a cross-sectional study of the units of analysis (e.g. the participant-teachers).
5. *Deciding representative themes.* The themes to be discussed in the findings were extracted from the cross-sectional analyses. Working with matrices frequently involved returning to the original sources of data to corroborate abstractions and interpretations.
6. *Reporting the results.* The report emphasises what is said in the textual data about the representative themes whilst intending to explain how it answers the relevant research question.

The main analytical protocol is a general framework that was designed by the researcher to guide all the analytical processes of textual data that were involved in this thesis. Essentially, this investigation concentrated on, first, responding to 'the needs' of the study, and, second, on selecting a systematic way to perform the analyses (Kuckartz, 2014, p.35). Among many aspects, the needs of the study include the qualitative nature of the data and allowing different

analytical processes for each research question. More details on the analytical processes of this investigation are provided in the following sections.

3.4.2 Documentary analysis

The first research question (Section 3.1.1) was studied by conducting a documentary search that involved identifying documents which are relevant for primary school teaching in Mexico. Having successfully gathered relevant documents, the subsequent action was to conduct a textual analysis of the documents; this included to select and analyse the data by following the steps illustrated in Figure 3.1.

The management and analysis of the data was assisted by manual techniques (highlighting parts of the text in physical copies of the documents, writing marginal notes on them, and writing reports in one of the researcher's journals) and Nvivo 10, a computer-assisted qualitative data analysis software. Below, the text briefly narrates the actions followed to analyse the content of the National Curriculum, Study Programme, and Natural Sciences textbook considering the first research question of the study.

Text selection and familiarisation with the documents

Iterative and detailed readings of the documents along with manual note-taking were useful to identify relevant pieces of the text. At first, the reading was selective and mostly included sections of the Natural Sciences programme. Later, to expand the text analysis and eschew narrow portrayals of EE, the researcher used Boolean word search operators (AND, OR, NOT and quotation marks for exact match) applied to the National Curriculum, Study Programme, and Natural Sciences textbook. The purpose of this step was to find other potential material related to EE perhaps outside the boundaries of the Natural Sciences sections that were initially selected.

Aided by Nvivo 10 and Preview v8.1 (file viewer software), the researcher considered 38 searches of keywords potentially connected to EE content. The selected glossary was comprised of concepts and terms identified as recurrent in EE literature. The searches included words of sociological, scientific, technological relevance such as: environment, identity, hydroelectric, interaction, biodiversity, climatic, consumption, sustainable, and so on. The results of word queries were not in themselves sufficient to select the data. Sometimes the word queries identified a word, such as 'environment', in text that was unrelated to EE. The researcher's interpretative skills were, therefore, vital in deciding what data was relevant.

Choosing and applying categories

The previous step was important to identifying the location of references to EE in the documents. To systematically conduct the analysis of the texts, the following was to apply the main steps represented in Figure 3.1. The analysis in this step was focused on thematically analysing the references to EE in the curriculum documents. The analysis of these EE references could have been furthered by applying the analytical framework (i.e. Sauvé's EE typology) used in the analysis of the RQ.2 (results in Chapter 5), however, this was a later realisation of the researcher. The time scale considered for the project did not account for this addition, therefore, the analysis was not furthered in this way. This circumstance, nevertheless, did not affect the development of the investigation.

The first few results of searching for relevant material revealed a prominent thematic pattern in all the analysed documents: most references to EE were articulated in educational aims. A second pattern was finding references to EE in learning content, however, this exercise mostly concentrated on the Natural Sciences textbook. The first pattern was considered more prominent as it was found across the three documents. Therefore, the categories for further analysis were concentrated in studying the educational aims which suggested links with EE (see data categorisation in Appendix A.11). The aims include expectations directed to teachers, students, and the community in general; it was noticed that the abstraction in educational aims is dependant of the generalisation level in the documents (e.g. the National Curriculum being the one with the most broadness and abstraction). The results of this analysis are presented in a similar order, ahead, in Chapter 4.

Translation of evidence from official documents

The source language[20] of the documents under study is Spanish from Mexico, therefore, a translation process was required to communicate the data in Standard English, the target language of the translation. To ensure the quality of the translations presented in Chapter 4, the researcher and two other professionals worked together in the translation process of the evidence. The group of people involved in this process was: the researcher conducting this study (translator A); a professional translator and interpreter of both source and target languages (translator B); and a professional in educational research and second language teacher of the target language (translator C). The translators, A and C, are both native speakers

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20 In terms of translation, Hervey, Higgings, and Haywood (1995) define 'source language' as 'the language in which the text requiring translation is couched' and 'target language' as 'the language into which the original text is to be translated' (p.7).

of Latin-American Spanish and fluent in English. The translator B is fluent in Latin-American Spanish and Standard English. The translation process is illustrated, below, through an example, which is used in Section 4.2.1.

Example of the Translation Process
Original data in Spanish [code 1] Competencias para la convivencia. Su desarrollo requiere: empatía, relacionarse armónicamente con otros y la naturaleza; ser asertivo; trabajar de manera colaborativa; tomar acuerdos y negociar con otros; crecer con los demás; reconocer y valorar la diversidad social, cultural y lingüística. (SEP, 2011a, p. 38)
Translator's A version [code 1.1] Competence for coexistence. Its development requires: empathy, to make harmonic relationships with others and with nature; being assertive; work collaboratively; to take agreements and negotiate with others; to grow with others; to acknowledge and value the social, cultural and linguistic diversity.
Translator's B version [code 1.1.1] Competence for coexistence. Its development requires: empathy, creating harmonious relationships with others and with the nature; being assertive; working collaboratively; reaching agreements and negotiating with others; growing with others; acknowledging and valuing social, cultural and linguistic diversity.
Final version, after back-translation [code 1.1.1.1] Competence for coexistence. Its development requires: empathy, creating harmonious relationships with others and with nature; being assertive; working collaboratively; reaching agreements and negotiating with others; growing with others; recognizing and valuing social, cultural and linguistic diversity.

Figure 3.2 Translation of documentary data: example of the various versions

Translator A and translator B were influenced by 'the committee' translation technique in which 'a group of bilinguals translates from the source to the target language' (Brislin, 1980, p.431), although the translators did not translate the evidence in parallel. Firstly, the translator A (the researcher) made the initial translation of the evidence. In this process, the original fragments in Spanish and their translations were all grouped in a digital document. Secondly, the translator B proofread the translations and compared both versions (Spanish an English) to confirm accuracy of meaning. Thirdly, the translator C translated the proofread English translations into Spanish, producing a second Spanish version of the evidence. Finally, both Spanish versions (original and back-translated) were compared to find possible inaccuracies in the proofread English translations and adjust the English translations accordingly. The aforesaid process is called 'the back-translation method' (Brislin, 1980). For the interview data, a different translation method was employed (see this towards the end of the following section).

3.4.3 Case units: cross-analysis of the participants' data

RQ.2 and RQ.3 were addressed by analysing the teachers' data generated during the fieldwork stage; the teachers who participated in this project were considered the units of analysis of the

case under study (i.e. EE in primary school education). A series of steps were necessary to manage and analyse the fieldwork data in a trustworthy manner. First, generated databases per school and participant. Second, the interview data was managed and processed; the audio-recorded interviews were carefully converted into transcriptions and imported as documents in Nvivo. Third, the interviews (initial, intermediate, and final interviews in Spanish) were thematically analysed across data sets and participants; overall, these analyses followed the analytical protocol described in Section 3.4.1. Further, details about these steps are described in the following sections.

Among the different sources of data, the interviews have a prominent role over the classroom observations. This is because more homogeneity[21] was achieved in the data collection of interviews, whilst the odd and fewer number of observation sessions did not favour the intended thematic and cross-participant analysis of lessons (most participants could not predict their Natural Sciences teaching timetable). Since the general procedure for the analyses has already been explained in Section 3.4.1, the present section focuses on detailing the management and treatment of the data and the *analytical framework*—or the explicit theoretical influence—that was adopted in the analysis of the second research question.

Data processing. 33 audio-recordings of interviews were generated from the interviews of the 11 participants (see Table 3.9, below). The audio recordings were transcribed verbatim and in the original language (Spanish). The digital texts resulting from transcribing the audio-recordings were not defined as 'raw' data in this project. The transcripts, instead, are considered as a close representation of an event in the real word, and they are a data management strategy that facilitates iterative analysis of textual data (Davidson, 2009; Tessier, 2012). The transcription process employed a conventional notation system (i.e. Anon, 1986), which was modified and adapted to the needs of this project. The notation helped in generating faithful reproductions of the audios and comprehensible transcripts by capturing emphases and pauses.

[21] Homogeneity, in this instance, refers to repeated data collection exercises across the participants. For example, the 11 teachers participated in all the interviews, collecting one of each interview schedules per participant.

TEACHER	INITIAL INTERVIEW		INTERMEDIATE INTERVIEW		FINAL INTERVIEW	
	Date (day/month/year)	Duration (minutes)	Date (day/month/year)	Duration (minutes)	Date (day/month/year)	Duration (minutes)
Luz	12/11/2014	23.06	25/02/2015	53.36	17/03/2015	46.30
Morelos	12/11/2014	25.28	11/02/2015	40.13	18/03/2015	39.04
Marley	14/11/2014	20.41	06/02/2015	31.25	18/03/2015	24.31
Santiago	14/11/2014	25.08	06/02/2015	27.43	18/03/2015	30.10
Betty	25/11/2014	31.46	23/01/2015	20.13	13/03/2015	49.21
Adela	25/11/2014	14.54	24/02/2015	55.30	13/03/2015	42.58
Jorge	05/02/2015	49.42	02/03/2015	50.42	15/04/2015	54.30
Esteban	25/11/2014	25.53	18/02/2015	45.47	19/03/2015	25.43
Rori	05/12/2014	37.06	13/02/2015	45.28	24/03/2015	49.36
Isabela	16/12/2014	48.52	13/02/2015	45.28	25/03/2015	46.19
Mario	28/10/2014	31.37	11/03/2015	59.17	15/04/2015	47.17
ALL	Average time	30	Average time	43	Average time	41

Table 3.9 Summary of the interviews generated

The transcriptions were produced by two transcribers: the researcher leading this project and a third party—who signed a non-disclosure agreement before handling any data. The researcher produced around 24% of the transcriptions, and the second transcriber the remaining 76%. Like Tilley and Powick (2002) suggest, the second transcriber was instructed by the researcher to explain the aims of the transcription method and the preferred notation. To ensure fidelity, the first versions of the transcriptions were re-examined by the researcher against the original audios, creating a second version of the transcripts. The software employed for the transcription of interviews are *Sound Organizer* v.1.5, *F5 Transcription Pro* v.3.2, and *MS Office* (various versions). The transcription reports include basic information such as title, date and time the interview took place, how long it lasted, and the researcher's notes pre/post the interviews.

Using Nvivo (v.10) to manage the transcripts and generate reports. All the interview transcripts were imported to *Nvivo* v.10 and employed in this project to organise, categorise and locate data (see examples in Appendices A.13 and A.15). The software was useful for the creation of interview reports per participant detailing how each interview progressed and the researcher's notes on the teachers' words. Interview sequences highlighted if the researcher caused any respond-bias by unnecessarily directing the participants; this strategy also helped the identification of when the teachers changed or emphasised a topic or idea. The interview reports were also used to identify significant cues in the participants' interviews.

The interviews' analytical processes. The initial, intermediate, and final interviews and the analytical procedure presented in Section 3.4.1, were fundamental elements to address the second and third research questions. The analytical processes were not, however, the same for both research questions. The analysis of the second research question relied mostly in the initial and final interviews; whilst the intermediate interview had prominent data for the third question. Furthermore, the analyses of the first and third research questions were, mostly, informed and oriented by the content of the data (see the final categories of analysis in Appendices A.11 and A.14). The second research question followed a theory and data-driven method to classify the data (Schreier, 2012). In other words, the thematic analysis of the second research question was guided by both an analytical framework and the content in the data, following, as Schreier (2012) suggests, an explicit theory-driven and data-driven analytical method (see the final categories of analysis in Appendix A.12). For the analysis of the second research question the researcher adopted an explicit analytical framework, and this is explained in the subsequent section.

Analytical framework for RQ.2. To respond the second research question, the researcher analysed all the interviews, emphasising the initial and final ones. The content of the initial and final interviews motivated teachers to discuss topics that were pertinent for RQ.2. During these interviews the teachers were asked questions such as: 'What does environmental education mean to you? What does sustainability mean to you? Have you taught any lesson or activity related to EE content?' (Interview schedules in Appendices A.5.1 and A.5.3).

The analysis of the second research question was an exercise informed by theory and data-driven decisions (Schreier, 2012). In pragmatic terms, this means the researcher was first guided by the themes that seemed significant across the participants' interviews, which led to finding and applying a relevant analytical framework. In relation to the second research question, the themes that were decided as significant across the interviews are: concept of the environment (e.g. the environment is a source of resources), EE aims, and teaching examples of EE activities and lessons. Similar themes are used in the EE typology proposed by Sauvé (2005), hence, the researcher decided to use this typology to refine the analysis and presentation of results (more information on the typology in Section 2.2.5).

Previous applications of Sauvé's EE typology. Before using Sauvé's (2005) EE typology, the researcher studied if and how other studies had employed the typology as a framework. Table 3.10, below, summarises how recent studies used Sauvé's (2005) EE typology for qualitative analysis of EE-related data. It appears that studies using Sauvé's EE typology normally focus on the EE currents (which is a metaphor for flexible, overlapping and distinctive approaches to EE); however, this thesis argues that the application of Sauvé's EE typology should consider studying its parameters separately to avoid the misrepresentation of data (see more on this in Sections 7.2.1 and 8.5). This means to individually analyse the EE aims, the concept of environment, the dominant approach and examples of strategy. In this way, the depth and breadth of, for instance, EE conceptions are emphasised and leaving the association of qualitative data with the EE currents as a secondary concern.

DOCUMENT	METHODOLOGY	USE	CONCLUSIONS
Viteri, F., Clarebout, G., & Crauwels, M. 2012.	Quantitative. Surveys. Primary school teachers and pupils	Categorises EE conceptions using the EE currents	"... findings suggest a strong conservationist theme among teachers whereas pupils approach EE from both conservationist and naturalist perspectives." P.577
Steele, A. 2014.	Qualitative. Comparative case studies. Lessons from 2 secondary school teachers across	Compares Sauvé's EE typology with a Science, Technology, Society, and Environment framework from Pedretti and Nazir (2011) for science teaching.	"The EE framework is a compendium that identifies broad strokes in EE; its greater usefulness lies in analyzing programs or courses, not specific lessons." P.245
Sim, G. 2014.	Mix-methods Surveys. Non-participant observation Interviews Primary school pupils	Uses Sauvé's EE typology as a conceptual framework to study learning opportunities and conceptions about biodiversity in museums	"...a range of currents that underlie the purposes of, and trends in, teaching about biodiversity through environmental exploration outdoors." P.67

Table 3.10 Previous and recent applications of Sauvé's EE typology as an analytical framework

How the typology was employed in this thesis. Applying the EE typology as an analytical framework consisted of identifying any of a current's parameters (i.e. concept of environment, EE aims, and examples of teaching EE) in the interview transcripts—initial and final interviews, mainly. In other words, the concept of environment, aims of EE, and, teaching examples of EE were used as themes to select and categorise data (text fragments from the transcripts). Consequently, the data selected was used to identify relationships between the teachers' conceptions and EE currents suggested in the typology (an example of data categorised in Appendix A.13). Additionally, the researcher conducted iterative readings of the categorised data to reassess its association to relevant EE currents. This information was used to design profile matrices for the cross-unit analyses, which were employed to find patterns across the participants' conceptions about EE.

Before performing the analysis, the researcher carefully studied the article proposing and explaining the typology (Sauvé, 2005). The readings of the article revealed that Sauvé does not explain her interpretation of each parameter clearly, yet clarifying what each parameter means is crucial to the consistency and trustworthiness of the thematic analysis. Hence, based on cues found in Sauvé's (2005) article, the researcher decided an interpretation for each parameter:

PARAMETERS	DEFINITION	EXAMPLES
Concept of environment	Includes interpretations about the concept of environment.	E.g. The environment as a resource provider. E.g. The environment as a place of identity.
Aims of EE	Identifies expectations that indicate a broad direction through purpose and goals.	E.g. Promote economic development that takes care of social equity and ecological sustainability.
Teaching examples of EE activities	Includes illustration of EE through teaching examples of lessons and/or learning activities.	E.g. Stories and legends to illustrate an environmental point. E.g. Community projects in school.

Table 3.11 Interpretation of the parameters in Sauvé's EE typology (2005)

It must be highlighted that in Sauvé's (2005) article, the parameter 'dominant approach' in the EE typology is broad and unclear, therefore, this parameter was not considered in the analysis of the data regarding this investigation. Additionally, the label 'examples of strategies' in Sauvé's document was substituted here with 'examples of teaching and learning EE activities' as it seemed more pertinent to the study.

Cross-Unit analysis for RQ.2 and RQ.3. The cross-unit analysis refers to the cross-sectional study of the units of analysis (i.e. the participant-teachers). This analytical strategy facilitates finding relationships and differences across data such as interview transcripts. The cross-unit or cross-participant analysis was employed at different points of the analytical process. To facilitate the analyses of data across participants, the researcher created various *profile matrices* in both digital and manual formats in the researchers' diaries (Kuckartz, 2014).

A profile matrix is a set of rows and columns organising the participants' information about one or various thematic categories for analysis. Matrices are economical in space, therefore, the teachers' words were represented through interview fragments or carefully chosen 'mottoes'. In a profile matrix, a motto is a summarised characterisation of textual data like a quotation or a group of quotations, which relate to an aspect of a research question (Kuckartz, 2014, p.54). In every exercise the researcher opted for specific and manageable matrices, each dealing with one or two themes. The matrices facilitated capturing the predominance of a theme across the participants as well as the prominence. Below, Table 3.12 and Table 3.13 present two different profile matrices which were generated during analysis:

Teacher	Year 6 Natural Sciences	Data Source
Luz	Study of environmental phenomena and environmental impact of human activities relevant to environmental issues such as global warming and climate change. Sciences cover factual knowledge and some examples of experiments, but it does not approach sustainability or sustainability projects like Geography. Natural Sciences and part within for EE.	1-Int. 71-80 3-Int. 196 1-Int. 181
Adela	Topics like diversity, pollution and way to solve pollution. In contrast to other subjects, Natural Sciences is closer to reality because it has cases of real life, and it links to other subjects (like Civics and Ethics Education). She mentions the case of the "Lacandones" as an example of sustainability. Relating the environmental (or other) content of Natural Sciences is a way of showing application of knowledge. Addressing EE content in Natural Sciences is simpler because they can talk about solutions in their own environment.	1-Int.4 1-Int.27-33 2-Int.132-133 2-Int.135

Table 3.12 Fragment of profile matrix: EE a cross-curricular theme

Teacher	Environmental education in formal schooling	
	EE AIMS	**NOTES**
Isabela	To achieve awareness in students for them to care and protect the environment.	Heard of EE in projects, etc.
Rori	To guide and educate the student to care and protect the environment.	EE should be t's own subject
Esteban	To make students aware of the damage that he/she can cause to the environment.	Heard of EE in training
Morelos	Help students recognize that caring and preserving the environment is necessary.	Had not heard EE before.

Table 3.13 Fragment of profile matrix: EE aims (initial analysis)

To improve the quality of the analysis, the researcher repeated the interpretation of the main matrices presented in Chapter 5 at least three times and during different times in the writing of the chapter. Additionally, during the writing of findings the researcher often returned to previous analysis and read pieces of transcripts as way to increase robustness of the findings.

Display of evidence. The main source of evidence in Chapters 5 and 6 are excerpts from transcripts of the interviews. The excerpts are separated from the rest of the text by a few distinctive features: Italicised, single space, and indented formatting in the paragraphs, and a tag-code indicating the origin of the excerpt. The tag-codes (see example below) include: the school's pseudonym or code, the participant's pseudonym, the number of interview (initial=I, intermediate=II, and final=III), and the turn(s) of speech from where the quotation was retrieved. The next figure exemplifies an interview excerpt:

> ***Researcher:*** *What is the role of the Natural Sciences subject in the Year Six curriculum?*
>
> ***Teacher:*** *Mostly, is to create awareness in children about what precautionary measures they can adopt to ensure a s.u.s.t.a.i.n.a.b.l.e world. I mean, technologically speaking we can advance, but as long as we procure not to harm or damage our environment and being able TO TAKE FROM IT w.i.t.h.o.u.t a.f.f.e.c.t.i.n.g it [the environment]. And, to leave it in good conditions for the next generations. (E, Rori, I, turn 68)*

The researcher carefully processed the evidence and tried to represent the participants' words as faithfully as possible. Some instances, like in the example above, will also include speech turns to illustrate how the evidence was elicited. Additionally, two types of edition strategies were applied to the quotations. Firstly, most quotations needed editing for reasons of readability, meaning that redundant words, stuttering and repetition were omitted. Secondly, the researcher edited the excerpts allowing stresses such as 'stretching' words or uttering a higher tone for a piece of their speech. These editorial marks are listed in the following table:

SYMBOL	FUNCTION	FICTIONAL EXAMPLES
[Capital]	It signals that the fragment, although it might seem like it, is not the beginning of a turn or paragraph in the original transcript.	**[T]**hey learn about the environment.
[.]	It signals that the paragraph was developed further in the original transcript or that more information came after and in the same turn.	I have been teaching over five years **[.]**
[…]	It means that some information was omitted between the previous sentence and the following because it was irrelevant or repetitive text.	The project was about environmental care **[…]** and it finished two months ago.
L.e.t.t.e.r	It indicates that the participant slowly uttered the word(s), which suggested emphasis.	Perhaps it will **h.a.p.p.e.n** tomorrow
CAPS	It represents a word(s) that was uttered in a higher pitch than the rest of the speech.	And it **SUDDENLY** started raining.
[explanation]	Usually a noun clarification interpreted by the researcher.	They **[her students]** were not feeling excited about it.

Table 3.14 Notation for editing marks in quotations

Translation processes of the interview evidence.

The translation techniques used to translate evidence of the documentary analysis were not suitable for the translation of data characterised by colloquialisms, idioms, and jargon. This claim is supported in two studies (i.e. Douglas and Craig, 2007; Khosravani and Dastjerdi, 2013) which compared collaborative translation techniques and the back-translation technique; their conclusions are that the back-translation technique is more effective for literal translations and less convenient when idioms and equivalence of terms are needed. This is because the back-translation method is concerned with word-for-word literal translations and the translation of interview evidence should allow indigenous features of the target language in the translation.

The process of incorporating cultural and indigenous features of the target language (Standard English, in this case) in a translation is called cultural transposition (Hervey et al., 1995). Cultural transposition diverges from the literal translations of the source language (in this thesis, Spanish from Mexico) to improve understanding of the messages translated and minimise the 'foreignness' of the data—as suggested by Hervey et al. (1995). There are five degrees of cultural transposition, according to Hervey et al. (1995), one of them, namely, communicative translation was most often employed in the translation of interview evidence; this involved using suitable equivalents for colloquial expressions and jargon.

In this thesis, the communicative translation was practised in a translation process which included three parties: the researcher conducting this study (Translator A); researcher in education who is a professional translator and second language teacher of the target language (Translator B); a native speaker of the target language (Translator C). The Translator B is native speaker of Standard English and a fluent speaker of Latin-American Spanish; furthermore, he was significantly familiar with the Mexican context. See, below, an example of the work between Translator A and Translator B:

Fragmento en español	**Translated excerpt: Translator A**
Data source: No. 5 (C, Adela, I, turn 40) #00:14:34-1#	
D: Pues sería el cuidado del entorno: empezar desde casa si se puede reciclar o cuidar este no sé... el entorno cercano que tengas a ti	*It [environmental education] is environmental care. It starts from home: if you can recycle or take care of the nearby environment.*
Translated excerpt: Translator B	
It [environmental education] would mean taking care of the environment. It means starting at home, by recycling or taking care of your immediate environment.	

Figure 3.3 Translation of interview data: partial example of the process

The translation of interview evidence was conducted in three parts. Firstly, Translator A translated all the selected evidence. Secondly, Translator B cross-checked around 25% (24 excerpts that were randomly selected by a third party) of these translations focusing on issues of communicative translation. Then, Translator A compared her translations with the versions from Translator B's and made pertinent changes. Finally, together Translator A and Translator C proofread the totality of translated interview excerpts in the thesis and made pertinent changes upon discussion and agreement.

Observational data

During the data collection period in Monterrey, a total of 39 hours of classroom observation were registered in audio-recordings and field notes (handwritten and digital extended notes). Despite the large amount of data obtained during the non-participant observation sessions, the use of this data in this project was mainly limited by the irregular number of sessions observed across the units of analysis, as the chart below exposes:

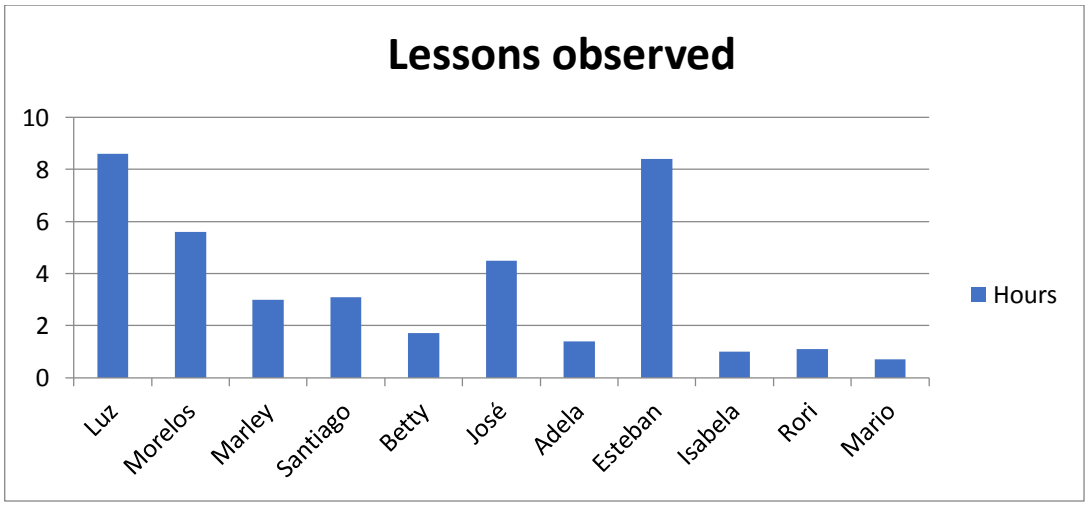

Figure 3.4 Non-participant observation sessions

The analysis of the observational data was primarily useful to enrich claims and analysis that was extracted from the interviews. Apart from the teachers in school E and F—who the researcher only observed once—all the teaching sessions that were observed were mainly guided by the content of the Year 6 Natural Sciences textbook. The latter is an important fact that shaped the use and analysis of the observational data. The themes related to EE and the contextual details observed at the non-participant sessions were useful to allow further detail to the findings presented for the second and third research questions.

Data processing and analysis. For both the audio recordings and physical and digital field notes, the researcher created a basic system that identifies each piece with a unique code. This

helped her keep track of the data when collecting it and easily find it afterwards. The audio-recordings were not processed, as they were used as supporting data. The researchers would listen to them when she needed more details or contextual information from her field notes. The manual and digital field notes were only analysed without the assistance of software because the thematic analysis was straightforward enough to conduct the analysis without it.

Overall, the analysis of the field notes involved careful reading of the observation sheets and extend notes. Additionally, the researcher read the observation sheets and the extended notes various times as she was analysing the interviews. These readings were often correlated to the Year 6 Natural Sciences textbook that the teachers where using during the fieldwork period. However, the analysis of the observational data was not prominent in this thesis because it was not possible to collect similar data sets per participant. Since a core aspect of the analytical strategy was to find thematic patterns across the participants' data, then having asymmetrical sets of observational data was not ideal. Furthermore, the lessons of eight out of eleven teachers were evidently influenced by the topics in the textbook (see Appendix A.18) since they followed the sequence in the Year 6 Natural Science textbook page by page, in the most classes. The analysis was similar (just different results) for those teachers (Rori, Isabela, and Mario from School E and F) who taught lessons that were not directly addressing the activities in the textbook.

Display of evidence. Among the presentation of the findings, this study makes claims from the non-participant observation sessions. These claims are often followed by a code-tag (Ob. field notes, ER-1), which identifies the data in the following order: the type of data, the school code, the initial of the teacher's pseudonym and no. of observational session.

3.5 Trustworthiness

Trustworthiness means increasing the quality of a qualitative study through a constructivist and systematic criteria (Cohen et al., 2000; Lincoln and Guba, 1985; Seale, 1999). This study agrees with Koch (2006) who summarised that trustworthy research should aim for having '…signposts indicating research decisions and influences should be present throughout the study and the entire study should function as an inquiry audit (p.93)'. Seeking to increase the trustworthiness of the findings, the researcher guided her work using some pertinent evaluation criteria (that addresses internal and external validity in qualitative research) posited by Lincoln and Guba (1985), which encompasses credibility, transferability, dependability, and confirmability. The same authors expressed that confirmability is maximised when the previous criteria are met (ibid.), thus, the last one will not be addressed below. These criteria

are interrelated in how the research design and analysis are conducted, and in the techniques used to increase trustworthiness. For instance, Members' check, a technique to maximise trustworthiness of responses (Cohen et al., 2000), is important to both credibility and dependability. Below the criteria are briefly discussed—as defined by Lincoln and Guba (1985)—along with the measures taken—also adopted from Lincoln and Guba (1985, pp.301-331)—in this study to pursue them.

Credibility. This criterion focuses on the truthfulness of the findings. To increase the credibility of the findings the researcher practised a combination of a *prolonged engagement*, *member checking*, *peer debriefing*, *and triangulation*. First, prolonged engagement was procured by spending five months conducting fieldwork activities with the participants and encouraging rapport. Second, all the participants engaged in a quick member check session just before conducting the intermediate and final interviews; then, months later they all received an invitation to access and revise the transcripts of their interviews, but none expressed interest in checking them. Later, at different stages of the analysis, peer debriefing (Lincoln and Guba, 1985) or inter-coder agreement (Kuckartz, 2014) was practiced—prior to the exercise, each participant involved signed a non-disclosure agreement—with different groups to test themes emerging from the data. Peer debriefing was practised by discussing the thematic analyses of various interviews: a small group of Mexican professionals in the field of science education discussed the analysis of Luz's (School A) initial interview; then, using the analytical protocol in Section 3.4, the researcher analysed all the initial interviews and discussed them with the transcriber; lastly, two peers who were unrelated to the research discussed the thematic analysis a full set of interviews from José (School C). The interviews were chosen randomly and the set of initial interviews was chosen because these were the first to be analysed. Finally, the triangulation of data collected offered contrasting and complementing data (for instance, validating claims from an interview with observation reports), mostly supporting the findings' claim about the complexity of EE in context.

Transferability. This criterion replies to the problem of generalisation in qualitative research—and case studies—indicated by previous research traditions (Creswell, 2013; Lincoln and Guba, 1985). The aim of transferability is showing how the results may have application in another context(s) different to the one where the research was carried out. Although, rather than 'showing how' this thesis can only facilitate enough information for a reader to make use of it, and, in his or her criteria, transfer it to a different context. Transferability was assisted in this project by offering detailed accounts of the cultural and social phenomena of the research in context, what is known as 'thick description' (Holloway, 1997). Therefore, the researcher has provided as much contextual information of the research

site as possible, for instance, when introducing the project in the first chapter; in addition, the reader has access to profile information of the participants and other details of circumstances of the institutions involved.

Dependability. This criterion is concerned being able to generate similar findings. A way to address this criterion is by documenting important decisions throughout the project. A decision trail (Koch, 2006) was left in physical research audit trails (Carcary, 2009), and these are: monthly writings given to the academic supervisor and co-supervisor of this thesis; two hand-written research journals as means to record methodological and analytical cogitation of the researcher (Burgess, 1981, p.80); memos in Nvivo 10; and reflections about the research process in the Postgraduate Development Record system (provided by the University of Leeds), which records the researcher's progress.

Chapter 4. Environmental education in curriculum documents

The purpose of this chapter is to present the outcomes of conducting a documentary research of EE in official curriculum guides for primary school education in Mexico. The documents analysed were: The National Curriculum for basic education in Mexico, the Year 6 Study Programme and the Year 6 Natural Sciences textbook. Section 4.1 provides the main features of the National Curriculum and both Year 6 documents. After, in Section 4.2 the researcher answers to the pertinent research question by presenting the results found in each of the documents. The guiding research question in this chapter was:

> ***RQ. 1*** *How do key curricular documents for the Year 6 of Mexican primary school education represent environmental education?*

The basic substance of these documents is expressed in a competence and aim-oriented curriculum. Accordingly, EE was found immersed in the educational aims across the National Curriculum and both Year 6 documents. Section 4.2.1 displays the results of searching for references to EE in the 2011 National Curriculum. Section 4.2.2 continues with the outcomes of analysing the Year 6 SP. Section 4.2.3 focuses on relevant educational aims for EE in the Year 6 Natural Sciences textbook. Overall, the outcomes of the documentary analysis informed the initial stages of the empirical design in this investigation. Additionally, the findings of this chapter complement a discussion point made in Section 8.1.2, which relates to the cross-participant patterns in the teachers' conceptions about EE.

4.1 About the official documents under analysis

The following sections introduce the main features of the National Curriculum, Study Programmes, and Natural Sciences textbook. The introduction to the documents follows the 'from general to specific' method by opening the section with a description of main features in the National Curriculum for basic education, then concluding with the Year 6 Natural Sciences textbook. In the following paragraphs, the description of these documents emphasises cues of the relationship held between EE and Natural Sciences.

4.1.1 The 2011 National Curriculum for basic education

The National Curriculum is a general description of the basic education curriculum for preschool, primary and secondary school levels (SEP, 2011a). The National Curriculum is a pedagogical proposal that integrates the three educational levels, resulting in no single National Curriculum for primary school or any of the other compulsory[22] educational levels. The National Curriculum also outlines a pedagogical proposal for intercultural bilingual education of minority groups (e.g. Nahua people). In addition, the National Curriculum offers recommendations and guidelines for school management. Hence, the National Curriculum is an encompassing, yet not a comprehensive text. As such, the National Curriculum presents compacted and summarised information mainly through brief explanations and bullet points.

This version of the National Curriculum (i.e. the 2011 edition, created post-reform) describes the main changes to the basic education curriculum that resulted from the last educational reform process. The pedagogic highlights of the curricular reform include the 'competences for life'. These competences are a cluster of aims oriented to preparing students to thrive in life. As the focus of the 'competences for life' suggest, the National Curriculum proposes a student-centred approach to teaching and learning. Hence, the educational aims in the National Curriculum address both teachers and students.

The document also determines four major areas in which the learning subjects are distributed: Language and Communication; Mathematical Thinking; Exploration and Understanding of the Natural and Social World; and Personal Development and Living Together. The curriculum in these major areas. For instance, Natural Sciences, like the other science-related programmes of basic education, belongs to Exploration and Understanding of the Natural and Social World. As the results in this chapter will show, the aims which are relevant to EE are

[22] Compulsory education laws in Mexico require minors to attend a state-regulated or privately-funded education from preschool to preparatory school (i.e. from 3 to18 years old).

mostly included in two of these areas: The Exploration and Understanding of the Natural and Social World and Personal Development and Living Together.

4.1.2 The Year 6 Study Programme

Each school year has a Study Programme or year programme per school grade. The function of Study Programmes is to facilitate pedagogic guidance for teachers and other educational authorities about the learning content (SEP, 2011b). In contrast to the National Curriculum, Study Programmes are long and comprehensive documents (four times longer than the National Curriculum). The Year 6 Study Programme is divided in two parts. The first part of document is divided in school subjects. The educational aims, learning goals, and syllabus for each subject are outlined in this section. The second part revisits the four major areas of interest for student learning: Language and Communication; Mathematical Thinking; Exploration and Understanding of the Natural and the Social World; and Personal Development and Living Together. In the second part of the Study Programmes, each of these areas is explained to teachers. Every major area is described through its purpose, suitable learning environments, pedagogic advice, and by offering a model for a lesson in the addressed area. The documentary analysis uses sections of the first and second part of the Year 6 SP.

4.1.3 The Year 6 Natural Sciences textbook

Every subject in state-regulated Mexican primary education has a textbook per school year or grade. Natural Sciences is taught from Year 3 to Year 6 (from 8 to 11 years old); accordingly, there are four Natural Sciences primary school textbooks available. In the last years, the federal ministry of education in Mexico has launched other complementary materials to textbooks these are: workbooks, various audio-visual materials, and websites for students' use (SEP, 2013b). Textbooks, however, are often the main teaching resource in class. As it was mentioned in Section 1.2.2, school textbooks are distributed for free to all students attending state-regulated primary school.

Guerra-Ramos and López-Valentín (2011) consider the Mexican textbooks are a response to the contemporary pedagogical proposal. Textbooks in the Mexican basic education system are an operationalisation of the National Curriculum and Study Programmes. However, the primary school textbooks are different to the National Curriculum and Study Programme for various reasons. Firstly, they address students rather than teachers or other people involved with the educational system. Secondly, every lesson in the textbooks has a set of learning goals called expected learning outcomes. There are general expected learning outcomes for each lesson and those directly relevant to learning activities within the lessons. In this thesis,

the term learning goals is also used to refer to the expected learning outcomes of lessons. Thirdly, there are occasionally discrepancies between textbooks and Study Programmes.

The Year 6 Natural Sciences textbook is divided in five learning units or 'blocks' (Cervera-Cobos et al., 2014); either of these terms are used interchangeably in this thesis. During a school year, a different block is taught every two-month period. The general structure of the blocks contains: an encompassing title, three topics, a project, a final assessment, a self-assessment for the students, and pertinence to a focus area. The fifth block in the textbook or Block 5 has less content than the rest of the blocks. Below, Figure 4.1 illustrates the organisation of a block in the Natural Sciences programme:

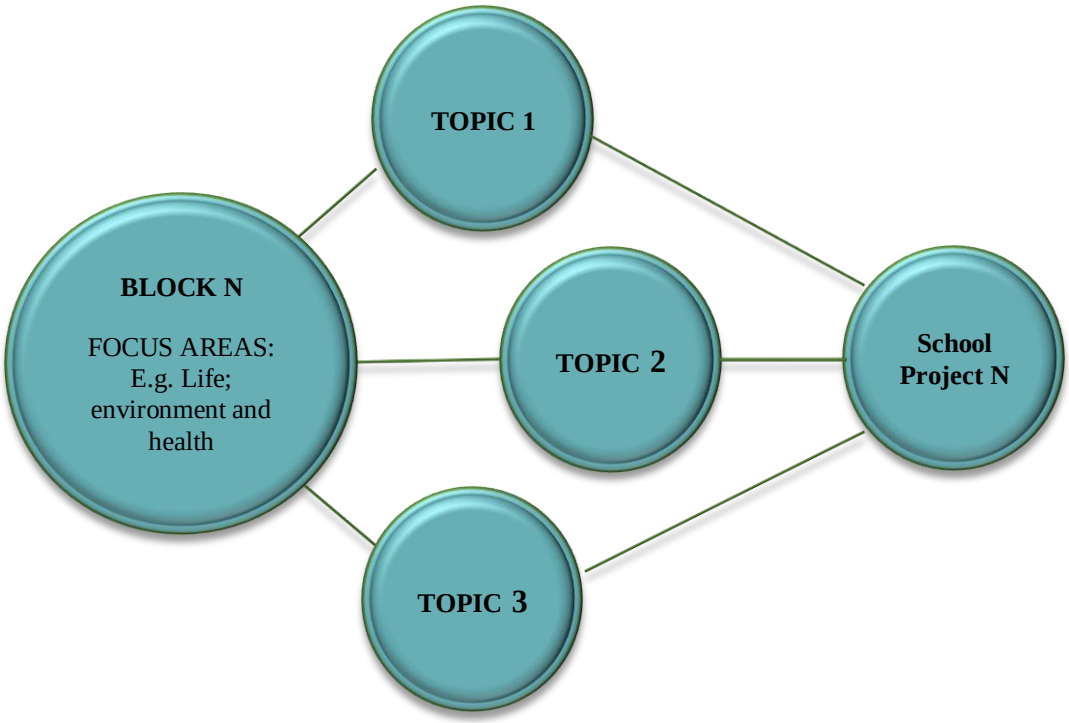

Figure 4.1 Structure for a Block in Year 6 Natural Sciences

The focus areas in Natural Sciences act like joints, connecting and organising the learning content. In addition, each topic in a block has a list of expected learning outcomes, learning activities, quick facts segments, illustrations, statistical data, and practical work for students. The Study Programme indicates that projects are an opportunity to apply the knowledge learned throughout a block, however, this presents a simplistic version of what project-based learning can endeavour (Gómez-Galindo et al., 2014).

4.2 Aims and goals related to environmental education in the official documents

Relevant content to EE (pertinent concepts and topics) were mainly identified in educational aims and learning goals of the National Curriculum, the Year 6 Study Programme and the Natural Sciences textbook. Educational aims are not neutral, since they represent values and interests of the context of influence where the policies and curriculum documents were generated (Ryder and Banner, 2011, p.711). Likewise, the educational aims that were found relevant to EE include and represent ideologies and approaches to teaching and learning the EE-related content.

The educational aims presented in this chapter encompass values, skills, and knowledge relevant to EE; other similar elements encompassed in the educational aims are attitudes, competences, and abilities. The analysis only identifies themes and principles generally related to EE and it does not focus on each of the components in the educational aims. In this analysis, the conceptual framework informing the identification of EE references are general themes and principles gleaned from the literature review in Chapter 2; a succinct summary of these is provided in the introduction of Section 2.2.

Furthermore, the results do not discriminate who is being addressed in educational aims (either teachers or students) but they separate educational aims and learning goals. In this thesis, *educational aims* refer to mid/long-term future-oriented expectations that attempt to have a constructive social impact through students' participation in society; albeit, these aims can apply to students, teachers, and even to curriculum subjects (e.g. the subjects' purposes). Here, *learning goals* (e.g. expected learning outcomes) denote present-oriented, pupil-focused, and lesson-relevant expectations of knowledge and culture acquisition for attitudinal and behavioural change.

4.2.1 Environmental education in the National Curriculum for basic education

Analysing the National Curriculum for traces of EE exposed three references in the socially-relevant themes, the competences for life, and the graduate's profile or graduation profile for basic education students. The *competences for life* are also an integral outlook of students' education, yet they are projected beyond the limits of basic education. The *graduation profile* describes 'desirable traits that students should own at the end of basic education' (SEP, 2011a, p.39). In comparison with the competences for life, the graduation profile expresses desired attitudes to more specific topics, like health and environmental care. Additionally, the National Curriculum promotes a list of *socially-relevant* themes which supports an integral and meaningful learning approach to basic education. The socially-relevant themes are

cornerstones in the National Curriculum because they foster the preparation of students to participate in society.

References to environmental education in the national curriculum

The first reference relating to EE was explicit in the listing of the socially relevant themes. Therefore, the National Curriculum clearly describes EE as a theme, rather than a subject or a field. The relevant excerpt is presented below:

> *Socially relevant themes are derived from the challenges of a society that constantly changes; a society that requires all its members to act responsibly towards the natural and social environment, life and health, as well as social, cultural, and linguistic diversity […] These themes promote learning of values and attitudes, while considering knowledge and abilities that refer to […]* ***environmental education for sustainability****, financial education, education for consumers [.] (SEP, 2011a, p.36, researcher's emphasis: bold format)*

Although the socially relevant themes mention environmental education for sustainability (EES), this term is not explained further in any other of the official documents analysed in this thesis. In fact, none of the socially-relevant themes are described in detail and they can only be traced across learning goals and learning content (other references to EE were found across Geography, Natural Sciences, History, Civic and Ethic Education). The 2011 National Curriculum depicts EE as a transversal or cross-disciplinary theme in relation to the major curricular areas *Exploration and Understanding of Natural and Social Worlds* and *Personal Development and Coexistence* (SEP, 2011a, p.43).

A second reference was identified in the competence for coexistence, which is one of the five competences for life of the National Curriculum. This competence reflects on the wellbeing of basic education students and its sustainability after going through basic education. The competence for coexistence is as follows:

> *Competence for coexistence. Its development requires: empathy,* ***creating harmonious relationships with others and with nature****; being assertive; working collaboratively; reaching agreements and negotiating with others; growing with others; recognising and valuing social, cultural and linguistic diversity. (SEP, 2011a, p.38, researcher's emphasis: bold format)*

In the fragment above, as in the rest of the National Curriculum, nature is broadly addressed and the type of relationship with it is only classed as harmonious. An important assumption in the competence for coexistence is that a good relationship between students and nature is a sign of coexistence or harmonious living together. However, what makes a harmonious relationship with nature is not explicit in the document. The competence for coexistence is

mostly concerned with encouraging successful social interactions—which are more detailed in this competence than the relationship with nature. The coexistence competence encourages the improvement of human relationships through participation, empowerment, and self-organisation. In like manner, Sterling (2001) asserts that participation, empowerment, and self-efficacy motivate the adoption and functioning of an ecological worldview. The competence for coexistence also suggests different aspects involved in social diversity which is relevant a theme for ecological diversity, personal and group identity, and other similar topics related to EE.

The third reference to EE was identified in the aims of the graduation profile for students. This reference to EE is more specific and primarily anthropocentric. At the end of the educational process, amongst the other educational aims, alumni of basic education are expected to:

> *Promote and accept health and environmental care as conditions that benefit an active and healthy lifestyle. (SEP, 2011a, p.40)*

The principal conjecture in the quotation is that environmental care, just like a harmonious coexistence, is an element of wellbeing. Health and healthy lifestyles run across the educational aims of the National Curriculum. It appears that the rationale for promoting environmental care in basic education focuses on how the state of nature can impact our lifestyles, which indicates an anthropocentric view of the nature and its role in our lifestyles. Anthropocentric conceptions of nature are associated with EE approaches which are usually occupied with environmental management interventions, the conservation of resources and sustainable development.

Overall, these references found in the competences for life and the graduation profile expect students to become aware and promote the benefits from coexisting with nature and caring for it because the state of nature impact the lifestyles of the humankind. Similarly, the socially-relevant themes aim at fostering critically aware, responsible, and participative students in these topics. Such topics include attitudes and skills that have been linked with EE since the time of the EE conferences in Tbilisi and Belgrade in the 1980's.

4.2.2 Environmental education in the Year 6 Programme

References to EE were identified in the subject purposes for basic and primary school education of the Year 6 Study Programme. Additionally, some of the expected learning outcomes from various subjects also display relationships with major topics that are commonplace in EE. However, most educational aims and learning goals in relation to EE were identified in Natural Sciences. These are specifically located in the curriculum standards

for Natural Sciences, the competences for basic scientific education, and the focus areas—although this last one is not a set of educational aims per se, but the focus areas involve educational expectations (SEP, 2011b). See a description of these curricular elements in the following paragraphs.

The *subjects' purposes* describe educational aims according to the anticipated effect each subject is meant to have on basic education students. The Year 6 Study Programme, like any other Study Programme, introduces each subject by presenting the subject purposes for both basic education and primary education.

The *competences for basic scientific education* are specific to Natural Sciences. This set of competences are concerned with the students' understanding of issues related to the nature of science and the use of scientific knowledge. The competences for basic scientific education are closely linked to the Natural Sciences' subject purposes and the Natural Sciences' expected learning outcomes, but they also contribute towards developing broader aims such as the competences for life and the profile of basic education graduates (SEP, 2011b, p. 95).

The *curricular standards of science* present a version of scientifically educated students through a comprehensive list of educational expectations and learning goals (SEP, 2011b, p.85). These standards provide direction for lesson planning and they are indicators of student achievement (SEP, 2011a, p.29; 2011b, p.373). The curricular standards of science also summarise the content of its more specific 'sibling': The Natural Sciences' expected learning outcomes. Along basic education, the curricular standards of science are divided in four periods; the third period standards correspond to Year 6 Natural Sciences.

Relevant subject purposes of the Year 6 Study Programme: Geography, Civics and Ethics Education, and History

The purposes of statutory subjects in primary school include references to EE through concepts and themes that are basic in EE. As mentioned above, the subjects' purposes are divided in two sets of educational aims: the purposes of basic education and those of primary school education. The purposes of statutory subjects aim to guide education towards a participatory society; moreover, the EE-related references in the basic education purposes of Geography, History, and Civics and Ethics Education anticipate an integrative or holistic approach to EE. These subjects are statutory, yet these are non-core subjects compared to the role given to Spanish and Mathematics. The relevant purposes of these subjects are described in the following paragraphs.

History in basic education is meant to motivate students' appreciation and care for natural and cultural heritages. The contribution of History to EE is to encourage a sense of belonging and identity in students; from the personal, local, national levels to the planetary level (SEP, 2011b, p.144). Geography is meant to motivate students' participation in environmental care and disaster prevention—as Mexico is a region where several natural disasters take place. The contribution of this subject is to offer students with knowledge that will allow them to become informed, reflexive, and critical thinkers in relation to the Mexican and global territories (SEP, 2011b, p.113). Likewise, Civics and Ethics Education is meant to encourage students to participate in the betterment of the social and natural environments across different sectors of society (SEP, 2011b, p.165). Such encouragement is promoted through awareness of cultural diversity and democratic principles—these are relevant to principles in EDS and other approaches in EE (Sauvé, 2005; UNESCO, 2005).

The subjects' purposes for the primary school level are similar. A purpose of primary school History is to provide learning opportunities for students compare and find common elements between past and current societies. This is meant to strengthen their identity and knowledge about natural and cultural heritages, in the hope that this will lead to taking care of them (SEP, 2011b, p. 145). Likewise, one the of Civics and Ethics Education's purposes for primary school promotes the collective participation of students in matters of social concern, which includes fostering socially-relevant topics like EES (SEP, 2011b, p. 179). Overall, the purposes of History and Civics and Ethics Education for primary school level are to stimulate a sense of belonging and identity, learn about diversity in various spheres, and introduce them to the democratic principles that are consistent the formal political framework in Mexico. These purposes are also related to general ideas in the EE, like the definition that is mentioned in the introduction of this thesis suggests.

Finally, Geography, the subject which next to Natural Sciences in references to EE, aims to highlight the interrelation of macro social systems with the natural environment at the local, state, national, continental, and planetary levels (SEP, 2011b, p.114). Like in History and Civics and Ethics Education, diversity is a theme advocated across Geography, including learning about different types of social and biological diversity. The notion of diversity is also relevant to more democratic approaches in EE (e.g. EES and ESD) and to those who celebrate the diversity of the field. As the following section will show, Natural Sciences also offers elemental information to understanding of the interrelation and diversity of the natural and social worlds, but with a higher emphasis on science, health, and technology.

References to environmental education in the Year 6 Study Programme: Natural Sciences

There are references to EE in the list of Natural Sciences' purposes for basic education, which describe the expected results in students after going through a basic scientific education. There are also references in the Natural Sciences' purposes for primary school education. These consider the expected learning outcomes according to the primary school students' stage of development. The list of purposes for Natural Sciences in basic education states the following in relation to EE:

> *The study of **Natural Sciences in basic education** seeks to encourage children and adolescents to:*
>
> *Participate in improving the quality of their life by making decisions that are aimed at promoting health and environmental care, with sustainable consumption as the starting point;*
>
> *Appreciate the importance of science and technology, and their impacts on the environment in terms of sustainability. (SEP, 2011b, p.83, researcher's emphasis: bold format)*

The excerpt highlights that Natural Sciences can provide students with the means to improve their decision-making skills and judgement in relation to health care and environmental improvement. The expectation in these aims is that students will eventually participate in solving social and environmental problems. The fragment suggests sustainability issues are inherently social, hence, the request of social intervention or participation in them. In Natural Sciences, environmental care is oriented to improve the lifestyle of humans, but links to improving the quality of living from other forms of life are unclear. These views, again, have an anthropocentric argument behind them.

Section 4.2.1 presents that environmental education for sustainability (EES) is mentioned in the 2011 National Curriculum as a socially-relevant theme, although, no guidance is offered in the documents to explain this approach in EE. However, in the above, the quotation offers notions of sustainability and environmental care through which it would be possible to sketch an approach to EES. Similar notions are repeated in the purposes of Natural Sciences, but for the primary school level:

> *The study of **Natural Sciences in primary education** seeks to encourage children to:*
>
> *Participate in actions of sustainable consumption that contribute to environmental care;*
>
> *Know the typical characteristics of living beings and use this knowledge to infer some adaptation relationships that they create with the environment;*
>
> *Identify the properties of materials, and how diverse human activities benefit from the transformation of materials. (SEP, 2011b, p.84, researcher's emphasis: bold format)*

The quotation shares a perspective that resembles education *about* the environment (see this term in Section 2.23); although, this fragment also promotes student participation through sustainable consumption practices. This suggests an interplay between education about and for the environment. Furthermore, these purposes frame environmental care mainly in terms of the sustainability of human life styles. Hence, science students in primary school are expected to learn about their relationship with nature and social environments, stressing the impact of human activity on the environment where students and the rest of the world coexist. This last point is relevant to developing the competence for coexistence that was mentioned one section before.

Further references to EE were found in the competences for basic scientific education. The Year 6 Natural Sciences Programme presents three competences for basic scientific education:

a) *Understanding natural processes and phenomena through the scientific perspective*
b) ***Taking informed decisions aimed at environmental care and precautionary health measures***
c) *Understanding the reaches and limitations of science and technological development in various contexts (SEP, 2011b, p.95, researcher's emphasis: bold format)*

The second competence is explicitly linked to EE by encouraging environmental care. The implications for EE in this competence are further explained in the competence outlining:

> *Making informed decisions aimed at environmental care and precautionary health measures:*
>
> *It seeks for students to participate in actions that promote sustainable consumption of the natural components from the environment […] From a cognitive point of view, the intention is that students analyse, assess, and argue about alternatives for problematic situations that are socially relevant and challenging[.] (SEP, 2011b, p. 95)*

The expectation in this competence is that students make informed decisions about the environment and their health by using scientific knowledge and skills. In the previous section, it was mentioned that upon graduation of basic education students are expected to promote health and environmental care because these aims are considered in the curriculum as crucial elements of a healthy lifestyle. This suggests that students' scientific literacy is intended to facilitate the attainment of the competences for life and the graduates' profile. The associations between education about the environment, science and technology, and healthy life styles are also included in the curricular standards of science. The fragment below was extracted from the section that explains the Year 6 science standards:

> *Regarding the environment, the focus is to identify and categorise living beings in relation to nutrition and reproduction. To identify fossil evidence to understand the development of life over time, the environmental changes, as well as the causes and consequences of deterioration in ecosystems and global warming. (SEP, 2011b, p.86)*

The Year 6 curricular standards of science are specified further in 29 statements which describe what the students are expected to achieve in reaching those standards. References to EE were found in 15 of those 29 statements (Appendix A.16). These also resemble general ideas of education about the environment and exploring the relationships of technology, science, the environment, and health. Table 4.1 shows a few examples of these standards:

Year 6 Curricular Standards of Science: EE References **(Natural Sciences, third period)** (SEP, 2011b, pp.87-88)
Category: Scientific knowledge
Can explain the concepts of biodiversity, ecosystem, food chains, and environment.
Category: Applications to scientific knowledge and technology
Can identify the advantages and disadvantages of current ways of generating and using thermal and electric energy, as well as the importance of developing renewable alternatives aimed at sustainable development.
Category: Attitudes associated with science
Demonstrates willingness for and makes decisions in favour of environmental care.

Table 4.1 EE-related curricular standards for science basic education

In addition to gaining scientific knowledge and skills, the Year 6 Natural Sciences Programme suggests complementing students' scientific education with a list of desirable attitudes and values for their development in society (see a description of these concepts in Section 1.3). The list of attitudes and values includes the promotion of health and environmental care and responsible consumption through: autonomous decision-making; responsibility and commitment; action and participation capacity; respect to biodiversity; and, prevention of ill-health (SEP, 2011b, p. 90).

In this list is not clear which are values or attitudes because the programme does not discriminate between them, yet responsibility, respect, and participation are the apparent highlights in these educational expectations. What is more, responsibility, respect, and participation are interrelated to various themes of social concern like the effects of over-consumption, biodiversity, health, citizenship and environmental care. These values and attitudes are newly mentioned in the biodiversity and environmental care focus area in Year 6 Natural Sciences (which are different in the Year Natural Sciences textbook, read about this in the following section).

The Year 6 Programme organises the learning content of Natural Sciences in five *focus areas*[23]: human development and health care; biodiversity and environmental protection; change and interaction of phenomena and physical processes; properties and transformation of materials; and scientific and technologic knowledge in society. The focus area biodiversity and environmental protection in the Year 6 Programme has references to EE:

> *[T]his focus area offers a wide perspective of the environment constituted by natural and social components, as well as their interactions […] The analysis of this interdependence promotes an understanding of the environment's importance for life[.] Attitudes and values of respect and responsibility are developed for a better use of natural riches and sustainable consumption practices. The analysis of personal lifestyles and relationships that human beings establish with nature is stimulated to understand that the existence of all living beings is influenced by certain conditions, and that every action has negative or positive effects on the environment, health and quality of life. The aim is to benefit the participation in environmental care in a guided way during the first years of education, and with increased autonomy in later years. (SEP, 2011b, p. 99)*

This focus area summarises the main references to EE found across the competences and standards discussed above. These references are environmental care, human-nature

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23 It must be noted here that the labels for the focus areas in the Year 6 Programme are slightly different to the ones in the Year 6 Natural Sciences textbook, see Table 4.6 for a quick comparison.

relationships, sustainability, health prevention and health life styles, and others. The references are general, but they provide a certain direction to teachers and their work. These references to EE, however, are subject to interpretation, depending on the ideologies and preferred EE approach or approaches. As seen in the trajectory of EE that was described in Chapter 2, controverted concepts like *environmental care* or *sustainability* could take many different meanings, which suggests that the Study Programme might benefit from providing more direction to teachers about the concepts and topics in these educational aims. Although, it must be considered that the National Curriculum and the Study Programme are both nation-wide distributed documents in an overall diverse territory, which means they cannot be prescriptive or significantly specific either.

4.2.3 Environmental education in the Year 6 Natural Sciences textbook

The Year 6 Natural Sciences textbook has copious references to EE in the expected learning outcomes (the learning goals of lessons) and learning content of its lessons. The analysis covered only the expected learning outcomes from Block 2 to 5 of the textbook because this is where most explicit EE aims, and content are included. Like the curricular standards, the expected learning outcomes are indicators for lesson planning and student learning assessments (Cervera-Cobos et al., 2014).

The expected learning outcomes are introduced in the Study Programmes and replicated in textbooks; albeit, in the textbooks they are simplified and worded differently because textbooks address students. For reasons of intelligibility, the expected learning outcomes of this section are presented in third person (e.g. the student is expected to learn about EE) rather than in second person and third person plurals—as they are originally written.

References to environmental education in Year 6 Natural Sciences

This section presents the content structure and expected learning outcomes of Blocks 2 to 5 from both the Year 6 Study Programme and the Natural Sciences textbook. The expected learning outcomes from both documents are presented in parallel to underscore discrepancies more easily (these are commented at the end of the section). Blocks 2 to 4 of the Year 6 Study Programme have 18 expected learning outcomes from various lessons related to EE; and they have 4 expected learning outcomes from proposals for student projects. In the same blocks, the Year 6 Natural Sciences textbook has 21 expected learning outcomes for lessons and six expected learning outcomes in student projects which relate to EE. There are no significant differences in the expected learning outcomes for lessons and projects, albeit separating them was important because the latter are learning activities and the former are learning goals.

The references to EE in the expected learning outcomes of the Year 6 Natural Sciences textbook are less attitudinal, since they are concentrated on the acquisition of knowledge about the environment. Such knowledge includes studying the role of science and technology in relation to EE-related matters such as environmental issues and potential solutions for them. The following table presents the expected learning outcomes from Block 2 in both documents:

BLOCK 2: WHAT ARE WE LIVING BEINGS LIKE? **Expected Learning Outcomes / Focus areas: life; environment and health**	
Students are expected to…	
Study Programme (SEP, 2011b)	*Textbook* (Cervera-Cobos et al., 2014)
Topic 1 'How do we know that we living beings change?'	**Topic 1** 'Changes in living beings and extinction processes'
▪ Being able to explain that living being, and the natural media has changed throughout time; also, capable to explain the importance of fossils to reconstructs facts of life in the past. ▪ Assess the causes and consequences of past and contemporary life extinctions, then propose actions to care for living beings. (p. 107)	▪ Understand the importance of fossils as evidence of the changes in living beings and the environment. ▪ Know some past and current extinction processes and reflect about their attitude towards other living beings. (p. 53)
Topic 2 'Why am I part of the environment and how do I take care of it?'	**Topic 2** 'Importance of the interactions between the environmental components'
▪ Identify that he or she is part of the environment; and, that the environment is constituted by social and natural components and their interactions. ▪ Practice sustainable consumption actions based on an assessment of its importance to improve the natural conditions of the environment and the quality of human life styles. (p. 107)	▪ Learn how we, as living beings, interact with nature. ▪ Reflect on the importance of responsible consumption and its environmental implications. (p. 66)
Topic 3 'What is global warming and what can I do to reduce it?'	**Topic 3** 'The relationship of air pollution with global warming and climate change'
▪ Propose actions to reduce air pollution based on an analysis of its main causes and effects on the environment and health. ▪ Identify what global warming is and how it was generated in the last decades; also, its effects on the environment and national initiatives to reduce it. (p. 107)	▪ Understand how carbon dioxide emissions cause air pollution, and how these emissions are associated with the increase of the Earth's temperature. ▪ Assess everyday actions in which they can contribute to reducing and preventing pollution. (p. 72)
Student project to develop, integrate, and apply expected learning outcomes and competencies.	**Project 2** 'Let us improve our environment'
▪ Apply abilities, attitudes, and moral values to her or his basic scientific education during planning, development, communication, and assessment of a project of his or her interest, in which the learning content of the block must be integrated. (p. 107)	▪ Learn to search, select, and organise information about the effects of human actions in the environment. The aim is to present proposals for the improvement of environmental conditions. (p. 78)

Table 4.2 Expected learning outcomes in Year 6 Natural Sciences, Block 2: the Study Programme and the textbook

Like in most learning goals related to EE in Natural Sciences, the expected learning outcomes of Block 2 are primarily centred on developing an education about the environment (see education *about* the environment in Section 2.2.3, Chapter 2). This is evinced by the verbs (e.g. know, understand, assess) and themes employed in the learning goals, which promote learning about changes of environmental conditions and our relationship with the environment. The expected learning outcomes in this part of Year 6 Natural Sciences highlight human-environment relationships and students' responsibility towards the environment. In addition, the content in Block 2 intends to promote sustainability through an analysis of consumption habits. Both texts emphasise the negative effects of human interaction with the environment, making a case for students to engage in searching for solutions to improve the environment and act on them.

Project 2 represents an opportunity for teachers and students to engage in a type of education for the environment (see Section 2.2.3 to consult education for the environment) by encouraging students' participation to change the status quo of an environmental issue—a basic principle in approaches to education for the environment like EES or ESD. Project 2 introduces the ecological footprint principle, hence, prompting students to reflect on the impact of their daily activities on the environment. The reach of this project's proposals is not specified in the outline, but local circumstances are often emphasised in Study Programmes and textbooks.

Project 3 has similar aims to Project 2; it promotes sustainability through waste management and the three R's strategy (i.e. reducing, reusing, and recycling). The expected learning outcomes of Block 3 are presented Table 4.3:

BLOCK 3: HOW DO WE TRANSFORM NATURE? **Expected Learning Outcomes / Focus areas: materials and technology**	
Students are expected to…	
Study Programme (SEP, 2011b)	*Textbook (Cervera-Cobos et al., 2014)*
Topic 1 'Why can materials be reappraised, reduced, rejected, reused, and recycled?'	**Topic 1** 'Relationship between the properties of materials and responsible consumption'
▪ Provide arguments on the use of certain materials based on their hardness, ductility, permeability features, making informed decisions about which material is optimal for the satisfaction of needs. ▪ After analysing the organic and social implications of using paper and plastic, decide towards the reappraisal, reduction, rejection, reuse, and recycling (p. 108)	▪ Know the properties of materials and the satisfaction of diverse needs through the uses given to these materials. ▪ Reflect on the impact of using paper and plastic, as well as on the reduction, reuse, and recycling of materials. (p. 84)
Topic 2 'When is a change permanent or temporal?'	**Topic 2** 'Importance of temporary and permanent transformations of materials'
▪ Characterise and identify temporal and permanent transformations of some materials and natural phenomena in the environment. ▪ Explain the benefits and risks of temporal and permanent transformations in nature and their everyday life. (p. 108)	▪ Distinguish temporary and permanent transformations in materials, which take place in some natural phenomena. ▪ Reflect on how temporary and permanent transformations affect nature and everyday life. ▪ Analyse the benefits and the risks of temporary and permanent transformations of materials. (p. 93)
Topic 3 'How is Energy obtained?'	**Topic 3** 'Identification of simple machines operation and making the most of them'
▪ Give arguments on the importance of energy and its transformations for the sustainability of life and everyday livelihood. ▪ Analyse the implications of the generation processes for thermic energy addressing its diverse sources and consumption. (p.108)	▪ Understand what happens with the force when using simple machines, as well as the advantages of using simple machines. ▪ Identify diverse simple machines that are generally employed in diverse activities. (p. 100)
Student project	**Project 3** 'Reuse and recycling of materials'
▪ [See same in Table 4.2] (p.108)	▪ Connect the features of the [some] materials to their reuse and recycling, aiming to choose the materials that have less impact on the environment. ▪ Assess the use of technology in the search for solutions against environmental deterioration. (p. 106)

Table 4.3 Expected learning outcomes in Year 6 Natural Sciences, Block 3: the Study Programme and the textbook

The expected learning outcomes of Block 3 show explicit links between science, technology, and their implications on the environment and human life styles. This is done by promoting scientific explanations of common human-made materials, the technologies involved in them, and by stressing their effects in the environment. As in most Natural Sciences lessons, the content in Block 3 is introduced by underlining the object of study, then asking students to reflect about it in relation to their everyday lives.

At this point in primary school Natural Sciences, the three R's are reintroduced to students—previous Natural Sciences programmes include this strategy. Once again, the proposed project represents an opportunity, but this time to explore the three R's in combination with notions of technology and scientific knowledge. More examples of the interrelation between science, technology, and the environment are contained in Topic 2 and Topic 3 of Block 4. This block presents a clear discrepancy between both documents; the content structure of Block 4 in the Natural Sciences textbook is different to the one presented in the Study Programme:

BLOCK 4: HOW ARE THINGS TRANSFORMED? **Expected Learning Outcomes / Focus areas: change and interactions; technology**	
Students are expected to…	
Study Programme (SEP, 2011b)	*Textbook (Cervera-Cobos et al., 2014)*
Topic 1 'How do I use force?'	**Topic 1** 'Making the best of image creation in mirrors and lenses'
▪ Compare force effects in basic functioning of simple machines, and the advantages of their use. (p.109)	▪ Understand how images are formed in mirrors and lenses, and how some optical devices work. ▪ Identify the importance of these devices in scientific research and other human activities. (p.113)
Topic 2 'How are images in mirrors and lenses created?'	**Topic 2** 'The importance of energy, its transformation and implications of its consumption'
▪ Provide arguments about the importance of optical instruments in scientific research and everyday living. ▪ Compares the creation of images in mirrors and lenses and relates them to the functioning of some optical instruments. (p.109)	▪ Learn about the importance of energy and its processed forms for life support, as well as for human activities. ▪ Analyse the environmental impact of the processes related to harvesting and consuming electrical and thermal energy. (p. 126)
Topic 3 'How is energy manifested and where can it be obtained?'	**Topic 3** 'Making good use of energy'
▪ Describe diverse types of energy (movement, light, sound, heat, and electricity) and their transformation in the environment. ▪ Give arguments about what making the best of alternative energy implicates to human activities and its importance for environmental care. (p.109)	▪ Take steps to making good and responsible use of energy in daily activities. ▪ Learn about different sources from which energy is obtained. (p. 131)
Topic 4 'How is the Universe?'	
▪ Describe the basic components of the universe and argues the importance of technical developments to the increment of knowledge about the universe. (p.109)	
Student project	**Project 4** 'Construction of artefacts to satisfying needs'
▪ [See same in Table 4.2] (p.109)	▪ Make a simple tool. ▪ Test and assess the tool and propose improvements for it. (p.140)

Table 4.4 Expected learning outcomes in Year 6 Natural Sciences, Block 4: the Study Programme and the textbook.

Besides connecting the triad of science, technology, and the environment, the Topics 2 and 3 in Block 4 promote the environmental management of energy. The environmental management of energy suggests the presence of sustainability principles and the attribution of responsibility to humankind in these matters. Responsibility is a consistent topic in Year 6 Natural Sciences, albeit this is limited to students' responsibility, leaving other levels of responsibility unexplored in these teaching materials (e.g. the responsibility of industry). Moreover, in Block 4 the role of technology is mostly associated with the generation of energy for human life development and sustainability. Yet, energy can be discussed from the point of human and ecological sustainability, economy, physics, and every discipline contributing to an integral view of environmental problems.

At the end of the block, Project 4 invites students to fabricate a tool, insisting on studying technology from the practical work or 'hands on' perspective. Other aspects of advanced science and technology are presented in Block 5, the last learning unit in the book. In relation to EE references, Block 5 includes a project aimed at promoting coexistence and reflection in socially-relevant themes:

BLOCK 5: HOW DO WE TRANSFORM NATURE? **Expected Learning Outcomes / Focus area: change and interactions; technology**	
Students are expected to…	
Study Programme (SEP, 2011b)	*Textbook (Cervera-Cobos et al., 2014)*
Student project	**Topic 1 '**Knowledge about the main characteristics of the universe**'**
[See same in Table 4.2] (p.110)	▪ Ability to describe basic components of the universe using their main characteristics. ▪ Identify the contributions of science and technology to knowledge about the universe. (p. 146)
	Project 5 'Paths for reflection and living together**'**
	▪ Propose alternative solutions to sets of problems related to health, responsible consumption, and environmental care (p. 164)

Table **4.5** Expected learning outcomes in Year 6 Natural Sciences, Block 5: the Study Programme and the textbook.

Once again, the content structure for this block is divergent between both documents. The element in common is the last project, which includes EE-related suggestions. Project 5 is the concluding activity for Year 6 Natural Sciences. The expected learning outcome of the project is not related to the content of the previous topic (the universe), therefore, giving away a sense of disconnection between content. The last project, nevertheless, reconsiders major themes presented across the Year 6 Natural Sciences in both documents, which are health, sustainability, and environmental care. The occasional lack of coherence visible in the content structure and learning outcomes of the Year 6 Study Programme and Natural Sciences textbook is commented in the following section.

Discrepancies between the Year 6 Study Programme and the Natural Sciences textbook

The discrepancies between the Study Programme and textbooks can affect lesson planning and student assessment because they generate puzzlement regarding which should be used as a guide—as in fact reported by teachers in this study (A, Luz, I, turns 35-47; E, Isabela, II, turns 71-91). The discrepancies found in this text analysis involve: different focus areas, topic titles, different content structure for Blocks 4 and 5, and variations in the expected learning outcomes. The variations between expected learning outcomes are not strong and they are different because they address either teachers or students. Other discrepancies are sharper.

The focus areas for Natural Sciences in the Year 6 Study Programme are different to the ones in the Natural Sciences textbook:

FOCUS AREAS FOR YEAR 6 NATURAL SCIENCES	
Study Programme (SEP, 2011b)	***Textbook*** (Cervera-Cobos et al., 2014)
▪ Human development and health care ▪ Biodiversity and environmental protection ▪ Change and interactions in phenomena and physical processes ▪ Properties and transformations of materials ▪ Scientific and technological knowledge in society	▪ The environment and health ▪ Life ▪ Scientific knowledge ▪ About materials ▪ Technology ▪ Change and interaction

Table 4.6 Focus areas in the Year 6 Study Programme and Natural Sciences textbook

The focus areas organise the learning content in Natural Sciences according to thematic areas. A significant change in the combination of health education and education about the environment in the focus area of the Natural Sciences textbook, which were originally separated in the Study Programme. Nevertheless, effectively connecting health and education about the environment seems still a pending task since the health education content and the EE-related content are presented separately in the textbook.

Another significant discrepancy is Topic 1 in Block 3 (see the Table 4.3). In relation to teaching about sustainable consumption, the Study Programme suggests using a five R's model (i.e. reappraising, reducing, rejecting, reusing, and recycling) whilst the Natural Sciences textbook promotes the classical three R's model (i.e. reducing, reusing, and recycling). Therefore, teachers who use the Study Programme for lessons planning might use the first model, but then find a discrepancy in the corresponding textbook. This circumstance was in fact documented in one of the lessons observed in School E, where Rori stressed to her students that they had discovered 'two more R's' in the strategy (Ob. field notes, ER-1).

Finally, there are also discrepancies between the content structure of Blocks 4 and 5 in between both documents (see Tables 4.4 and 4.5). Block 4 in the Natural Sciences textbook covers the learning content on energy in two topics, whereas the Study Programme only includes it in one. This means the topic was given relevance, but by decreasing the time available for students to work on the final project. The final project in Block 5 was designed

to integrate the focus areas of Natural Sciences with socially-relevant themes, such as environmental care. Nevertheless, Block 5 projects are challenging for students and teachers. Year 6 is a hectic grade for teachers and students, therefore, the projects at the end of the year tend to be ignored for the sake of assessments and various other 'end of primary school' practices. In fact, Marley from School B mentioned this issue by saying that the last weeks of a block (when projects are meant to be developed) are used to revise for exams (B, Marley, II, turn 89).

4.3 Summary of the outcomes for the first research question

The results presented in this chapter are summarised in the following points:

- EE is a socially-relevant theme to human coexistence and healthy lifestyles.
- The EE approach (i.e. EES) in the documents is loosely outlined, yet the EE-relevant aims are consistent in stressing student participation, a cross-curricular EE, and anthropocentric arguments about environmental care.
- The EE-relevant aims range from lesson-relevant and pupil-focused learning goals to long term and future-oriented expectations.
- Significant psychological and social constructs for EE, like students' identity, diversity, and participation, are mainly proposed in aims of non-core subjects.
- The 2011 National Curriculum, the Year 6 Study Programme and the Natural Sciences textbook fail to emphasise the influence of political and economic developments on EE (as seen in Section 2.2.2, Chapter 2)
- The results in Chapter 4 corroborated that is pertinent to explore teachers' conceptions about EE

Chapter 5. Teachers' conceptions about environmental education

Following the analysis of EE aims and learning goals in curriculum documents, this chapter presents conceptions about EE from the teachers participating in this study. The research question leading this chapter asks:

> ***RQ. 2*** *What are the conceptions about environmental education that Mexican primary school teachers have?*

This research question was tackled by cross-analysing all the transcripts of the initial, intermediate, and final interviews, finding most relevant data in the initial and final interviews. To study the interview data, the researcher employed Lucie Sauvé's (2005) EE typology as an analytical framework. The teachers' conceptions about EE are presented in three parts: the aims they attribute to EE, their conceptions of the environment, and teaching examples of lessons and activities that the teachers associated with EE. Each of these aspects are discussed in light of the EE currents from Sauvé's typology. As the teacher cognition framework suggests in Section 2.3.5, these conceptions are evidently the result of teachers' experiences, their beliefs, subject matter and pedagogical knowledge, knowledge; yet, the messages contained in the conceptions about EE is what this thesis emphasises.

Chapter 5 is distributed in seven sections. Section 5.1 briefly reminds the reader about the analytical process involved in answering the RQ.2. Section 5.2 introduces the overall results by presenting all the EE currents that are linked to the teachers' conceptions about EE. After this, a more detailed exploration of the participants' conceptions about EE is presented from Section 5.3 to Section 5.6. The various aims attributed to EE by the participants are encompassed in Section 5.3. Then, Section 5.4 describes the teachers' conceptions of the environment. This is complemented in Section 5.5 which reports EE teaching examples of activities that the teachers associated with EE. This is followed by Section 5.6 in which two teaching scenarios showcasing EE-related content are illustrated in detail by analysing how two teachers taught the same lesson. To conclude, Section 5.7 offers a summary of the outcomes presented in this chapter.

5.1 Key aspects of the analytical process for research question two

Studying the participants' conceptions about EE involved analysing all the interview schedules, yet the relevant data were concentrated in the initial and final interviews. To understand the teachers' conceptions about EE, the researcher adopted an EE typology proposed by Lucie Sauvé (2005). The typology classifies EE in 15 different pedagogical approaches that Sauvé refers to as 'EE currents' (Section 2.2.5 describes this typology in further detail). Sauvé distinguishes the EE currents by identifying the different emphases of each current in four parameters: concept of the environment, the main aims, the dominant approach, and examples of strategies (or teaching examples). In this thesis all the parameters, except the dominant approach, were used as categories to classify and study the teachers' conceptions about EE.

To correlate an EE current to a participant's conceptions, the researcher searched for any of the three parameters (i.e. aims, the concept of environment, and teaching examples of EE activities) characterising the EE currents. This was a condition set for the analytical process of RQ.2: the presence of any of the three parameters from any of the EE currents in the participants' interviews was considered an association between teachers' conceptions and a current in the typology. Such condition was devised by the researcher to minimise the impact of using categories to understand a complex construct, such as conceptions about EE, because the use of categories on qualitative data involves the risk of oversimplifying the data.

The results presented in this chapter considered both predominance and prominence of the data. The distinction between these terms was also developed and decided by the researcher during the analysis of RQ.2. Predominance refers to the number or quantity of teachers' data that relate to the same current (for instance, the results presented ahead were mentioned by at least seven teachers). Prominence denotes the centrality of a claim within an EE conception. For example, Isabela (a teacher from School E) predominantly mentions learning content that is relevant to the *conservationist/resourcist current*, but her conception of the environment, the aims she attributes to EE, and her teaching strategies prominently suggest an emphasis on the *praxic current*. Cross-participant matrices and their correlation with the EE typology were key to studying the EE aims and the other parameters in the teachers' conceptions. However, the full analytical process involved in this chapter is described in Sections 3.4.1 and 3.4.3 of this thesis. When possible, the interview data discussed in this chapter is triangulated with information from the observation reports (Appendix A.18), information gathered from the Forms A, B, C (see these in Section 3.3.2 and in the Appendices A.2, A.3, and A.4), and by other documents provided by the teachers (e.g. lesson plans of School E).

5.2 Teachers' conceptions about environmental education: an overview

This chapter reports what EE currents were identified in the teachers' conceptions about EE. This study defined what the teachers' conceptions about EE are by considering the aims they attributed to EE, their conceptions of the environment, and the teaching examples of lessons and activities they associate with EE—these three aspects are also parameters of Sauvé's EE typology. This thesis' interpretation of these parameters can be revisited in Table 3.11 of Section 3.4.3, Chapter 3.

Five EE currents were found to have full similarity with the conceptions about EE for 10 out of eleven participant-teachers (see Table 5.1, below, for a better illustration). Full similarity means that a participant's conception about EE suggested similarity with all the parameters of an EE current (i.e. the concept of environment, aims of EE, and teaching examples of lessons or activities). The currents and its parameters are described in Sauvé's EE typology displayed in Appendix A.1. From the 11 participants, two (Santiago and Isabela) showed full similarity between their conceptions about EE and two EE currents from Sauvé's typology; one participant's data (José) did not communicate full similarity with any EE current. The rest of the participants have EE conceptions that suggest full similarity with only one EE current (see the individual matrices showing these results in Appendix A.17).

Full EE current similarity in the teachers' conceptions about EE		
Environmental Education Currents (Sauvé, 2005)	**Participant-Teachers**	**Number of Teachers**
a) Conservationist/resourcist	**Luz** (School A); **Santiago** (School B); **Esteban** (School D); and, **Isabela** (School E)	**4**
b) Scientific	**Marley** (School B) and **Mario** (School F)	**2**
c) Bioregionalist	**Morelos** (School A); **Santiago** (School B); **Adela** and **Betty** (School C)	**4**
d) Praxic	**Isabela** (School E)	**1**
e) Sustainable development/sustainability	**Rori** (School E)	**1**
f) No full similarity with any current	**José** (School C)	**1**

Table 5.1 EE currents fully identified in the teachers' conceptions about EE

These results in Table 5.1 display a representation of the conceptions about EE that the teachers prominently communicated, however, their conceptions also prominently include alternative meanings for the same parameters and which relate to other currents (but without showing a full similarity between their conceptions and any other of the EE currents). For example, a participant sometimes mentioned an EE aim relevant to current 'X' in combination with a teaching example emphasised in current 'Y'. Thus, focusing on the parameters in Sauvé's typology allowed a richer panorama of the participants' conceptions about EE than, for instance, only stressing the full similarity of their conceptions with some of the EE currents (as shown earlier in Table 5.1).

The rest of the results in this chapter stress the identification of the typology's parameters in the teachers' data while reflecting on the similarity between their views and the emphases in the EE currents. The global results of the teachers' conceptions about EE are presented in the following table:

CONCEPTIONS ABOUT EE (considering EE aims + concept of environment + teaching examples)												
Environmental Education Currents (Sauvé, 2005)	**PARTICIPANT-TEACHERS** **1.** LUZ **2.** MORELOS **3.** MARLEY **4.** SANTIAGO **5.** ADELA **6.** JOSE						**7.** BETTY **8.** ESTEBAN **9.** ISABELA **10.** RORI **11.** MARIO					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	CaP:
1. NATURALISTIC		X	X	X		X			X	X	X	**7**
2. CONSERVATIONIST/ RESOURCIST	X	X	X	X	X	X	X	X	X	X	X	**11**
3. PROBLEM-SOLVING					X	X						**2**
4. SYSTEMIC			X		X						X	**3**
5. SCIENTIFIC	X	X	X	X		X	X	X	X	X	X	**10**
6. HUMANISTIC/ MESOLOGICAL		X									X	**2**
7. VALUE-CENTRED	X	X	X	X	X		X		X	X	X	**9**
8. HOLISTIC												**0**
9. BIOREGIONALIST	X	X	X	X	X	X	X		X	X	X	**10**
10. PRAXIC	X					X			X	X	X	**5**
11. SOCIALLY CRITICAL										X		**1**
12. FEMINIST												**0**
13. ETHNOGRAPHIC	X	X	X	X	X		X	X	X		X	**9**
14. ECO-EDUCATION											X	**1**
15. SUSTAINABLE DVP. /SUSTAINABILITY	X					X	X	X	X	X	X	7
C:	**7**	**7**	**7**	**6**	**6**	**7**	**6**	**4**	**9**	**8**	**11**	
C: total number of currents per participant CaP: frequency of a current across participants												

Table 5.2 Correlation between teachers' conceptions about EE and the EE currents in Sauvé's typology

Sauvé observed that there are intrinsic overlaps between currents (2005, p.12), however, the results in this chapter suggest more than overlaps between currents when the parameters of the typology are applied as a framework. This is because the participants' conceptions refer to various meanings for the same parameter (either the EE aims, the concept of environment or teaching examples of lessons and activities), which, therefore, suggests correlation of the teachers' conceptions with various EE currents.

Table 5.2 shows that the teachers' conceptions about EE and their correlation to EE currents exposed there are seven out of fifth-teen currents which are predominant in the teachers' conceptions. These currents are: the naturalistic, conservationist/resourcist, scientific, value-centred, bioregionalist, ethnographic, and SD/sustainability currents. The cross-sectional analyses of parameters in the teachers' conceptions about EE also suggest the correlation with other EE currents, albeit, these were less predominant across participants. Also, the teachers' talk about sustainability was explicitly elicited in the final interview, and this is mainly why there are correlations between the teachers' conceptions and the SD/sustainability current. The rest of the references which are associated with other currents were not directly encouraged by the researcher.

The following section provides an exercise showing how the correlations between teachers' conceptions and the EE currents were generally identified. Later, the subsequent sections present the results of studying each of the parameters (i.e. EE aims, the concept of environment, and teaching examples of EE-related lessons and activities) in the teachers' conceptions.

5.2.1 Identifying the parameters in Morelos' and Mario's conceptions about environmental education

This section shows an interpretation of Morelos' and Mario's data where conceptions about EE were identified. The examples illustrate how these teachers' conceptions about EE relate to various EE currents through some of the typology's parameters (see Sauvé's EE typology in Appendix A.1). A full representation of Morelos's and Mario's conceptions about EE and the EE currents can be found in the matrices of the Appendices A.17.2 and A.17.11 respectively. The purpose of this exercise is to familiarise the reader with key elements and steps of employing Sauvé's EE typology as a framework for analysis. The first example, below, introduces Mario's most explicit conception about EE. Mario has over 33 years of classroom experience, and he is an active member of a local pro-environmental and non-lucrative organisation. As the interview excerpt shows, Mario's description of EE displays

links to the systemic, eco-education, humanistic/mesological, and conservationist/resourcist currents:

> *Okay. To me environmental education involves children becoming aware that they are living beings and form part of an ecological niche. And, as part of that niche, children should do something to conserve it. Because if their niche deteriorates, it's logical that children, as they are human beings —living beings—will be affected by this deterioration as well. So, they would have to learn to take care [of their niche.] (F, Mario, I, turn 95)*

Mario's description indicates an understanding of the environment that is relevant to both the eco-education and systemic currents (See Table 5.3 ahead). He suggests the environment is a place for students to learn about their identity, which is bounded by an ecological niche[24]—which is a type of system. In the eco-education current the environment should facilitate personal development towards environmental awareness (see this concept in Section 2.2.3) and 'construct one's relationship with the other-than-human-world' (Sauvé, 2005, p.34). Mario made emphasis on using EE-related content to teach students about their living space:

> *[I] consider it important for students to understand in which ways they are linked with ecology…I mean, with their [immediate] space. If they could understand how to look after their space and what actions they must follow to care for the environment [.] (F, Mario, I, turn 72)*

Mario's excerpts mention helping students to conserve their ecological niche by developing their realisation of how an ecological system works. He suggested experimental work beyond observations was perhaps more effective to engage students in these matters (F, Mario, I, turns 62-66). These are EE aims, and they are also relevant to the systemic and conservationist/resourcist currents. For Mario, EE ought to encourage awareness in students about their interdependency with their ecological niche. Mario, like other participants of this study, suggested environmental awareness as a necessary condition to develop pro-environmental attitudes and behaviour (see this concept in Section 2.2.3). In this case, Mario expresses actions for the conservation of students' niche as a logical consequence of becoming aware of their interrelation with it.

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24 An organism's niche is 'the role that a species plays in a community' within a specific habitat (Allaby, 2015). An ecological niche then includes the interaction between nature and the social systems of the species within.

EE current	Conception of the environment	Aims of environmental education	Teaching examples
EXTRACTED FROM SAUVÉ'S EE TYPOLOGY (2005, pp.33-34)			
Conservationist/ Resourcist	Resource	Adopt behaviours compatible with conservation. Develop skills related to environmental management.	Guide or code of behaviours; 3Rs set of activities [i.e. reducing, reusing and recycling]; environmental audit; conservation project.
Humanistic/ Mesological	Living Milieu (junction of nature and culture; place of existence and living habitat)	Know and appreciate one's milieu of life; better know oneself in relation to this living milieu. Develop sense of belonging.	Itinerary; landscape reading; study of milieu; investigation
Systemic	System	Develop systemic thinking: analysis and synthesis [*sic*], toward a global vision. Understand environmental realities in view of enlightened decision-making.	Case study: environmental system analysis; construction of ecosystem models.
Eco-Education	Role of interaction [*sic*] for personal development, Locus of identity construction.	Experience the environment to experience oneself and to develop in and through it. Construct one's relationship with the *other- than-human world*.	Life story; immersion; exploration; games; introspection; sensitive listening; subjective/objective *alternance*.
CORRELATION OF MARIO'S EXCERPT (F, Mario, I, turn 95) WITH EE CURRENTS			
Conservationist/ Resourcist	-	Conserving students' ecological niche	Code of behaviour to care for their ecological niche.
Humanistic/ Mesological	Place where students' cultures and nature interact.	Develop students' awareness of their habitat.	Experimental work beyond observations.
Systemic	An ecological niche is a system in itself.	-	-
Eco-Education	Students' niche: an element of their identity.	Developing students' awareness of their interrelation with ecological systems.	-

Table 5.3 Comparison between Mario's conceptions about EE and the EE currents

The second example was taken from Morelos' conceptions of what EE entails. Morelos is also an experienced teacher, who had taught for 28 years and most of that time he has worked in School A. For decades, Morelos had lived nearby School A, which made him a member of the local community beyond his teaching role in School A. Morelos' conceptions about EE relate to the humanistic/mesological and naturalist currents. These are two approaches that are less predominant across teachers' conceptions, but prominent in Morelos' views. The fragment below displays the relevant evidence:

> *I told them [students] "The thing is, you guys can't imagine it because you haven´t seen it" […] "so it's gonna be hard to imagine how beautiful these hillsides were, you know? Because you haven´t seen them before." They drew a picture; I said to them "Okay. We're going to draw two pictures: one of what the school looks like now and another of what you think it was like before the school existed. And we came to the conclusion that the only thing that building more things bring, unfortunately, are more problems …environmental problems, problems with pollution [.] (A, Morelos, I, turns 103-107)*

The quotation shows that Morelos uses his personal experiences, like being acquainted with the surroundings of the school, to inform the learning exercise. The fragment describes a Spanish (i.e. literacy) activity that, among other aims, intends to study the environmental impact of changes in the landscape surrounding School A. The activity is meant to facilitate a reflection about the effects—adverse effects as implied by Morelos' account—of human construction on the aesthetics of, in this case, a natural landscape.

EE current	Conception of the environment	Aims of environmental education	Teaching examples
EXTRACTED FROM SAUVÉ'S EE TYPOLOGY (2005, p.33-34)			
Naturalist	Nature.	Reconstruct a link with nature.	Immersion; interpretation; sensorial games; discovery activities.
Humanistic/ Mesological	Living Milieu (junction of nature and culture; place of existence and living habitat).	Know and appreciate one's milieu of life; better know oneself in relation to this living milieu. Develop sense of belonging.	Itinerary; landscape reading; study of milieu; investigation.
CORRELATION OF MORELOS' EXCERPT (A, Morelos, I, turn 103-107) WITH EE CURRENTS			
Naturalist	-	-	Living in a place to gain experience and knowledge about it.
Humanistic/ Mesological	A place where human culture and nature overlap.	Promote a better understanding of the school landscape (where students spend significant time) throughout time.	Learning activity involving the school's surrounding landscape.

Table 5.4 Comparison between Morelos' conceptions about EE and the EE currents

Morelos' conceptions of what EE involves seeing the environment as place where nature and human cultures exist, which is relevant to the humanistic/mesological current—although, this a conception of the environment that constantly overlaps with the same in other currents. Moreover, Morelos' views also relate to the main aims in the humanistic/mesological current by trying to develop in students a better understanding of their usual surroundings. Sauvé explains that in a humanistic/mesological approach to EE 'the point of understanding the environment is often the landscape' (Sauvé, 2005:18), which converges with Morelos' activity.

The learning activity described in the previous quotation is a teaching example that relates to the ones in the humanistic/mesological and naturalist currents. The humanistic/mesological current appeals for 'sensoriality, affective sensibility, creativity' (Sauvé, 2005, p.18), just like Morelos tried to do in the activity. These aspects are not emphasised in the Spanish programme—where this learning activity is suggested (SEP 2011b, p.47); hence, the evocative and creative aspects of the activity were part of Morelos' input. This reveals that, in this learning activity, the likeness to the humanistic/mesological and naturalistic currents

was encouraged by Morelos' personal preferences of how to teach EE-related content. Additionally, the general results suggest that, in the data, the less predominant EE currents were often related to teachers' personal preferences or experiences in relation to EE topics.

The above analyses of Mario's and Morelos' EE conceptions attempt to provide the reader with examples of how the analytical framework was employed when interpreting the data. The following outcomes are mostly approached through an interpretative description of the teachers' conceptions about EE that predominate across the participants. The following sections extend the results presented in this section by individually examining the aims attributed to EE by the teachers, their conceptions of the environment, and their examples of teaching and learning activities for EE-related content. Each of these parameters is illustrated by using representative examples taken from the interview transcripts.

5.3 Aims associated with environmental education

The previous section presents the results of analysing three parameters (i.e. EE aims, the concept of environment, and teaching practices) in the participant-teachers' conceptions about EE, relating these to the EE currents. This section presents the predominant and prominent EE-related aims in the teachers' EE conceptions: resource management and conservation and fostering environmental awareness through a scientific approach to EE. These aims resulted from the analysis processes that are detailed in Sections 3.4.1 and 3.4.3, which involved applying the EE typology to the qualitative analysis of the interview data and creating cross-participant matrices to find patterns. See the general results of this parameter in the following table:

EE AIMS (Data correlation with the EE typology)												
Environmental Education Currents (Sauvé, 2005)	**PARTICIPANT-TEACHERS** **1.** LUZ **2.** MORELOS **3.** MARLEY **4.** SANTIAGO **5.** ADELA **6.** JOSE **7.** BETTY **8.** ESTEBAN **9.** ISABELA **10.** RORI **11.** MARIO											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	CaP:
1. NATURALISTIC									X		X	**2**
2. CONSERVATIONIST/ RESOURCIST	X	X	X	X		X	X	X	X	X	X	**10**
3. PROBLEM-SOLVING					X							**1**
4. SYSTEMIC												**0**
5. SCIENTIFIC	X		X	X		X	X	X	X	X	X	**9**
6. HUMANISTIC/ MESOLOGICAL											X	**1**
7. VALUE-CENTRED				X					X	X		**3**
8. HOLISTIC												**0**
9. BIOREGIONALIST		X		X	X		X					**4**
10. PRAXIC									X			**1**
11. SOCIALLY CRITICAL												**0**
12. FEMINIST												**0**
13. ETHNOGRAPHIC												**0**
14. ECO-EDUCATION											X	**1**
15. SUSTAINABLE DVP. /SUSTAINABILITY										X		**1**
C:	**2**	**2**	**2**	**4**	**2**	**2**	**3**	**2**	**5**	**4**	**5**	
C: total number of currents per participant CaP: frequency of a current across participants												

Table 5.5 Correlation between the aims associated with EE by the teachers and EE aims as defined in each EE currents

In their conceptions about EE, the teachers participating in this project frequently suggested pedagogical and environmental aims, which often addressed contemporary or future environmental problems. Often, their EE aims described expectations about what EE should be for; sometimes, the teachers were explicit about expecting a prompt behavioural response from students when presented with an EE-related activity or problem at school. Other times, the teachers expressed learning expectations for a future time (beyond primary level education) or lifelong aims for students. Moreover, the participants often mentioned environmental intervention or action as a desirable consequence of becoming environmentally aware or knowledgeable; they associated these two concepts to the aim or aims of EE.

5.3.1 Resource management and conservation

Resource management and conservation aims were identified across all the participants' conceptions about EE. Paraphrasing the words from the teachers, these aims include promoting awareness and individual actions in students for them to manage and conserve, mostly, natural resources. These aims also invite further analysis of the teachers' talk about resource management and conservation, for instance, two teachers make an interchangeable use of the terms conservation and preservation. The sections ahead describe these aspects in more detail.

Associating the conservationist/resourcist current

The environmental and pedagogical aims in all the teachers' conceptions about EE predominantly focus on natural resources and their management. In these aims, human actions for conservation were oriented at conserving nature, resources, or maintaining ideal conditions to the support human life. These are aspects which have strong similarities with the aims of the conservationist/resourcist current. José, a participant from School C, is a mid-career teacher (nine years of experience) who also teaches pre-service teachers as part of his career; he said the following:

> *Environmental education implies creating awareness about what we have and how we can conserve it… how we can preserve these resources we have. (C, José, I, turn, 118)*

To Morelos, a participant from School A, who has decades of classroom experience, his main conception about EE is the following:

> *To me, environmental education is working with students for them to recognise the work that must be done to PRESERVE[25] the already much damaged environment. So, to me, environmental education is teaching them to care, conserve, and improve our environment…an already much damaged environment. (A, Morelos, I, turn 97)*

In the fragments, Morelos and José suggest fostering environmental awareness and skills to care and improve the environment by conserving it. The conservation and preservation of the environment indicates a reference to managing the environment. Likewise, the aims of the conservationist/resourcist current are centred on conservation of the quality and quantity of resources (i.e. conservation of natural resources); on environmental management (e.g. what is meant by waste management); and, on human-centred or anthropocentric values upon nature (see values in Section 1.3). Like most of the teachers' remarks about EE, the aims of the conservationist/resourcist current involve adopting behaviours that are compatible with conservation, and developing skills related to environmental management[26] (Sauvé, 2005, p.33).

Usually the EE aims suggested by the teachers included pedagogical aims and environmental aims across all the conceptions about EE. The quotations from José and Morelos, above, have the presence of both types of aims. The pedagogical purpose in their claims about EE involves teaching students—or 'creating awareness' as José claims—about what resources need to be conserved and the skills required to do so. José and Morelos identify that the conservation of resources on which humankind depends is a matter related to EE. Their views emphasise anthropocentric notions of EE (i.e. centred on humans) and partial awareness of the human-environment relationship. In fact, José mentioned *responsible consumption* was a strategy aimed at preservation of species, sustainability, and sustainable development (C, José, I, turn 104). This is also an environmental aim that suggests concern for present or future problems regarding the sustainability of resources and contemporary human lifestyles. Esteban, from School D, also emphasised concerns over future depletion of resources:

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25 In the quotations, the words that appear in capitals represent an emphasis that was given by the interviewee.

26 Environmental management is 'a process of decision making about the allocation of natural and artificial resources that will make optimum use of the environment to satisfy at least basic human needs for an indefinite period and, where possible, to improve environmental quality.' (Barrow, 2006, pp.163-164)

> *[Students] themselves should become aware that oil is a non-renewable resource, for instance, and ask themselves: "why is it non-renewable?" They should become aware of which other forms of energy will exist later in time. They themselves should realise what they are, perhaps, going to face in the future. (D, Esteban, I, turn 64)*

The teachers' conceptions that relate to the conservationist/resourcist current also converge with most of the emphases in the EE-related content of Year 6 Natural Sciences. Esteban's excerpt, for instance, mentions similar aspects of resource depletion than those mentioned in the Natural Sciences textbook for Year 6. Discounting the fact that this project brought the links between EE and Natural Sciences to the participants' attention, the official curriculum documents, like the textbook, appear to have an important influence on the teachers' conceptions about EE. During the non- participant observation sessions, the lessons of eight out of the eleven teachers were predominantly and prominently guided by the content in the Year 6 Natural Science textbook (see Appendix A.18). Luz, in fact, used the Year 6 Natural Sciences textbook and others to support her answers in the initial and final interviews (A, Luz, I, interview notes; A, Luz, III, interview notes).

Conservation talk in environmental education aims

In addressing conservation in the conservationist/resourcist-like aims, two salient aspects were identified. First, when mentioning conservation, the teachers mostly referred to nature, resources, or maintaining ideal conditions to the support human life. Second, Morelos and José, as seen in the previous quotations, homologized both terms *conservation* and *preservation*, when, in fact, these terms have been shown to have different implications for different people (Minteer and Corley, 2007).

Firstly, most of the aims across teachers' conceptions that resemble a conservationist/resourcist emphasis repeatedly relate to managing resources in nature and in the immediate environment. Morelos, however, talked of managing natural resources like water and he stressed the conservation of nature (the environment) rather than resources (A, Morelos, I, turn 19; A, Morelos, II, turn 135). Thus, the object of conservation for Morelos was nature. Likewise, Mario, another participant with a long-standing career in teaching, said that students must aim to conserve their ecological niche (F, Mario, I, turn 95). He identified a relationship of dependency between humans and nature that he believed students should grasp. Mario did not focus his speech on managing resources as other participants did, instead he emphasised aiming at conservation as way to support ideal conditions for human life. These implications for conservation relate to the conservationist/resourcist current since

Sauvé considered that conserving nature or conserving bio- diversity is 'largely centred on a conception of nature as a pool of resources' (2005, p.14).

Secondly, the use of *conservation* and *preservation* interchangeably was prominently identified in Morelos' and José's data (for instance, see their quotations in the previous section). However, the terms conservation and preservation can have divergent meanings. Minteer and Corley (2007) distinguish the implications of both terms in the following manner:

> *[C]onservation is said to rest upon man-centred [sic.] or anthropocentric foundations, while preservation is justified by non-anthropocentric claims, such as the argument that nonhuman nature has inherent worth or intrinsic value (a good of its own) that should always be promoted[.] (ibid., p. 308)*

Minteer and Corley (2007) report a research study in which their participants (US citizens and scientists) attributed different resource management approaches—and different meanings—to both conservation and preservation. For instance, in the case of scientists, Minteer and Corley (2007) found that conservation is associated with an active and hands-on management approach of nature, whilst preservations was leaving nature to its own devices (p.326).

This study finds that Minteer's and Corley's (2007) findings are relevant, because the meanings attributed to conservation and preservations are used interchangeably. Although, the emphasis made by José and Morelos is closer to the views of conservation that Minteer and Corley (2007) found in scientists. For instance, José uses both terms to mean protecting and saving the resources 'we have', as he indicated (C, José, I, turn, 118), whereas Morelos applies both terms to mean the protection nature and care for the 'damaged environment' (A, Morelos, I, turn 97). Although both teachers appointed slightly different aims to conservation and preservation, the way they employed these terms indicates a homologous meaning (i.e. protecting the current state of 'x', x being the object of conservation/preservation) for both conservation and preservation. Although such a dichotomy might not have an obvious influence in the teaching sphere, it can be valuable to emphasise the values and ideologies that are communicated when teaching EE-related content.

5.3.2 Fostering environmental awareness through knowledge

The teachers' conceptions about EE frequently and prominently mentioned connections between knowledge, awareness, and change of attitudes and behaviour. Such aims assume that providing knowledge about the environment and learning about its issues is conducive to environmental awareness and behavioural change in students, but this argument has been largely debated in EE (Kollmuss and Agyeman, 2002). The content of these aims is relevant to the scientific current because in this EE approach 'the general perspective is one of better

understanding in order to better orient actions' (Sauvé, 2005, p. 17). This section did not include in-depth exploring of notions about knowledge in the data (e.g. drawing differences between declarative or procedural knowledge in teachers' understandings) because the intention was to emphasise the teachers' strong messages about a straightforward and causal relationship between knowledge and awareness to foster pro-environmental attitudes and behaviour in pupils. This point is explained further in the following sub-section.

Associating the scientific current

In expressing their conceptions about EE, most teachers that stressed gaining knowledge and awareness are aims of EE. These aims assume that environmental awareness or an environmentally-literate person would make environmentally-sound decisions such as caring for the environment. The connection between EE aims of this kind and aims in the scientific current, are not necessarily related to the relationship between EE and Natural Sciences. Therefore, the association of teachers' aims, and the scientific current is focused on the role of knowledge and using knowledge to become environmentally aware. This is exemplified in couple of excerpts, below, where Marley emphasises the importance of knowledge in EE:

> ***Researcher:*** *Okay. So, what would you say was the aim of environmental education?*
>
> ***Marley:*** *I think that the aim or the purpose of environmental education is, firstly, for us TO KNOW what harms the environment […] [T]he planet is becoming more and more vulnerable to the actions of men, no? So, to me, environmental education is that it is about us KNOWING how to look after the planet we live in. (B, Marley, I, turns 51-52)*

Marley depicted EE as having a type of knowledge which included knowing what harms the environment and how to care for it—as he expressed earlier in the same interview. He indicated knowing where to dispose rubbish was an example of knowing how to care for the environment (B, Marley, I, turn 34). Marley emphasised the need of teaching knowledge about the environment because he believed there was an explicit connection between having knowledge about EE-related topics and showing attitudes towards environmental care. Marley said:

> *'In my view, EE starts with knowledge, but then what follows is the attitude [change]' (B, Marley, II, turn 75).*

Despite his emphasis on knowledge, Marley did not support that EE was straightforwardly linked to Natural Sciences because the EE-related content in Natural Sciences were not relevant to environmental care:

> *Natural Sciences address topics that involve more knowledge and memorisation… like 'who created the theory of evolution' […] they are part of the environment, but they aren't about environmental care. (B, Marley, II, turn 83)*

Perhaps Marley meant that Year 6 Natural Sciences does not include factual knowledge predominantly related to EE. Marley did not rely on the curriculum documents to learn about these matters, as he shared that he had attended a training module to learn about contemporary environmental issues. Throughout the years, Marley noticed significant changes in the local environment and climate; and, as a consequence of this, he attended a private course to learn about global warming and climate change (B, Marley, I, turn 28). Additionally, Marley expressed he felt the need to learn about environmental issues before teaching them, although attending the course was predominantly a personal concern. Likewise, Santiago, who was Marley's colleague in School B, suggested that knowing about the environment was related to fostering pro-environmental behaviour in students:

> *Talking about environmental education is everything related to the environment. We teach students about the purpose of, for instance, rivers, skies, mountains, plants and animals. They [i.e. rivers, etc.] all have a function to fulfil and when students become aware of that, then it would prevent them from damaging the ecosystem. (B, Santiago, III, turn 108)*

This fragment shows the emphatic correlation between knowledge and pro-environmental attitudes and behaviour which the researcher could often identify in teachers' comments about the aims of EE. This argument is relevant to the scientific current, in which Sauvé (2005) indicated:

> *As in the systemic current, the [scientific] approach is predominantly a cognitive one: the environment is an object of knowledge and that knowledge is necessary for more appropriate decision- making. (p.17)*

The emphasis on a cognitive approach in EE aims, is detailed further by a teacher from School E, Rori who, next to her colleague Isabel, had more than five years conducting year-long EE projects at School E. Their projects were part of a student 'eco-club' that relied on involving the whole school and the nearby communities in their activities and participation in local competitions. Like the teachers from School B, above, Rori attributed a relevant role to Natural Sciences and environmental and social sustainability:

> *Researcher: What is the role of the Natural Sciences subject in the Year Six curriculum?*
>
> *Rori: Mostly, it's to create awareness in children about what precautionary measures they can adopt to ensure a s.u.s.t.a.i.n.a.b.l.e world. I mean, technologically speaking, we can advance, but so long as we do it without harming or damaging our environment… being able TO TAKE [resources] FROM IT [the environment] w.i.t.h.o.u.t a.f.f.e.c.t.i.n.g it, and, to leave it in a good condition for the next generations. (E, Rori, I, turn 68)*

Rori's quotation display that she associates science and technology to planetary sustainability, emphasising the need to create environmental awareness through scientific knowledge and precautionary measures. She stressed this knowledge was achieved by exposing the causes and consequences of human actions to children:

> *[S]o, yeah, it's necessary to MAKE the kid*[27] ***see the causes and consequences*** *of all this [degradation of the environment]. So that he [sic.] can decide for himself. Because at the end of the day, his beliefs will shape his future. He needs to act, I mean, he needs to decide what side he's going to be on or HOW he can implement strategies. (E, Rori, I, turn 88, researcher's emphasis: bold format)*

Rori's expectation is that associating causes and effects of human impact in the environment influence students' decisions and stances towards current environmental problems. The cause and effect relationships are often mentioned in the teachers' conceptions about EE, especially when referring to the effects of human action on the environment. Hence, Rori's words also illustrate the implicit connection that teachers often made between gaining knowledge and achieving students' environmental awareness. This point is also illustrated through the following excerpts from Esteban and Betty:

> *[T]hey [students] need to start VISUALISING where we are heading and what we are doing; and, what's going on and what are the consequences of what we are doing. (C, Betty, I, turn 20)*

More than referring to present and future environmental implications and problems, in the quotation above, Betty emphasises that her students need knowing of cause-and-effect relationship regarding their impact on the environment. Esteban, from School D, emphasised a similar conception:

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27 Rori, like other participants in this study, refers to the archetypical primary school pupil as 'the kid'.

> *I see environmental education as a term in which **it is up to us**, as teachers, **to make the students aware** of the situation our society is going through. To get the kid [primary school students] to **reflect about the damage that he** [sic] **can cause** to the environment. To get the kid **to know what benefits the environment**, and to get the kid **to know the consequences** of simply tossing a piece of paper; also, **the consequences of neglecting natural resources**, that little by little are becoming scarce[.] (D, Esteban, I, turn 64, researcher's emphasis: bold format)*

The previous quotations, above, suggest that aiming to teach EE involves teaching students about the causes and consequences of their actions (or of any other EE problem they mention). Likewise, Sauvé (2005) indicated that looking to identify cause-and-effect relationships to understand 'environmental realities' is a typical emphasis in scientific approaches to EE (p.17).

Moreover, Betty and Esteban also connected knowledge of current and future environmental issues to increasing environmental awareness and fostering pro-environmental attitudes and behaviour. Betty was particularly interested in the concept of *ecological footprint* (which is a strategy to trace and learn about the factual consequences of human actions on the environment); in fact, she was actively trying to reduce her ecological footprint (C, Betty, I, turns 47-49). Betty said it was important to make students aware of EE and future sustainability problems (C, Betty, I, turns 47-49), and these views about resource scarcity and future sustainability are associated with conservationist and sustainable development aims.

The role of progress in teachers' conceptions

The connection of EE and science was also identified in teachers' conceptions beyond knowledge and a curricular subject like Natural Sciences. These results are included here because they indicate a potential influence of the scientific-like aims in the previous section. The connection of EE with science was highlighted by some teachers in two ways: the importance of economy, science, and technology for progress and environmental care; and the teachers' predominant identification of EE-related content in Natural Sciences.

The first point, the importance of economy, science, and technology for progress and environmental care, is illustrated below through one of Morelos' excerpts, he suggests progress in environmental care is dependent on science:

> *Other countries that have a higher level [of economic growth] can prioritise sciences [over literacy and numeracy], and are therefore able to make more progress in terms of environmental care, taking care of nature [.] (A, Morelos, I, turn 31)*

Morelos' belief about what economic progress can achieve in relation to environmental improvement is supported in modern views which include SD strategies (UN, 1992). Although, Morelos added that thriving economies sustain their progress based on the suffering of many other countries (A, Morelos, III, turn 321). Along similar lines of argument, Esteban, from School D, observed that thriving economies and more industrialised countries largely contribute to waste issues because of their consumption habits (D, Esteban, I, turn 89).

Luz, who is Morelos' peer, believed that the technological progress of a nation was based on 'good applied science' (A, Luz, II, turn 183). Although, showing critical analysis about the contribution of science and technology to the environmental problems was not mentioned in the teachers' interview accounts. Rori from School E, who showed personal interest for sustainable development and digital technology in teaching, observed a few times that to ensure sustainability in the future, technological progress should respect environmental care and protection (E, Rori, I, turn 68; E, Rori, III, turn 372).

Whenever the teachers of this project mentioned science in relation to EE, science was perceived by them as positive and technology as a potential threat to the environment. In a study of primary school teachers from Puebla, Mexico, Fernández-Crispín (2009) identifies that the participants' cognitions about the human-nature relationships are based on social representations (e.g. not based on scholastic work), in which nature was perceived as weak and needing care and protection from the human kind. In later study, Fernández-Crispín and Benayas-del Alamo (2012) concluded that primary school teachers (from southeast of Mexico) perceive science and technology as beneficial for nature, although their participants also considered that technology could have negative effects on the environment.

The second point, the teachers' predominant identification of EE-related content in Natural Sciences, was suggested by their readiness to indicate that EE-related content mostly existed in the Natural Sciences syllabus—although, they were also prompted to find this relationship by what they knew of the design and interest of this investigation. The Natural Sciences programme was often the first subject that teachers mentioned when they were asked about EE. Luz, who has over three decades of classroom experience, shared the following:

> ***Researcher:*** *In the Year 6 curriculum, where have you seen content related to environmental education?*
>
> ***Luz:*** *In Sciences, specifically in Block 2 in sciences, yeah? Where it directly talks about interactions in the environment and its importance…about climate change and global warming [.] (A, Luz, I, turns 71-72)*

Teachers, like in Luz's example above, often mentioned the EE-related content in Natural Sciences because it has explicit references to popular views of the environment—like the one presented above in Morelos' excerpt. Santiago, from School B, also identified explicit environmental content in Natural Sciences, albeit he could see its connection to other subjects as well (B, Santiago, I, turn 52). Additionally, José reported the *curricular standards of science* in the Year 6 Natural Sciences Programme (see this curricular element in Section 4.2.2, Chapter 4) were also related to EE:

> *[I] think that it [curricular standards] indicate, to us, their importance to encourage scientific knowledge and knowledge about the environment in students; to encourage students to become proactive members of society. To encourage environmental education, among other topics of worldwide importance. (C, José, I, turn 88)*

José's excerpt includes the combination of various claims that were made along this section. Firstly, he identifies a link between knowing about the environment and science, albeit he explicitly discriminates between scientific knowledge and knowledge of the environment (which resembles education about the environment, see this term in Section 2.2.3). Secondly, this fragment restates the assumption that more knowledge about the environment equals pro-environmental attitudes and behaviour; in the quotation, José calls it 'proactive members of society'. The teachers' references to EE and science are an element of influence in scientific-like aims, and they also remind us of the long-term relationship between EE and science education—see an overview of this relationship in Section 2.6.6, Chapter 2.

5.4 Teachers' conceptions of the environment

An important part of outlining the teachers' conceptions about EE was understanding their conception(s) of the environment. The way the teachers perceive the environment might be relevant to what they think EE is for and how they approach it in their lessons. These views about the environment include what the teachers think the environment is and our role in interacting with it. These results were obtained from analysing the main aspects they emphasised about the environment and relating these to an EE current. In most instances, the teachers' concept of environment was grasped when they talked about aims they associated with EE, such as caring for the environment (i.e. the environment is a place or something that needs our caring). Only a few teachers, those in School C, were explicitly asked what they understood the environment is, because they emphasised this concept during their interviews.

As in the previous section, the general results of teachers' conceptions about the environment are presented, below, in Table 5.6. However, this section describes in major detail the

predominant and prominent conceptions about the environment in the teachers' conceptions. The principal conceptions predominantly include metaphors about place and abode: the environment as a place of resources (related to the conservationist/resourcist current); the environment as a place of belonging (related to the bioregionalist current); and, the environment as territory or place of identity where nature and culture mingle (related to the ethnographic current). This suggests that, overall, the data includes conceptions of the environment as nature and as a socially-constructed place (see these difference in Section 2.2.3, Chapter 2).

CONCEPT OF THE ENVIRONMENT (Data correlation with the EE typology)												
Environmental Education Currents (Sauvé, 2005)	**PARTICIPANT-TEACHERS** **1.** LUZ **2.** MORELOS **3.** MARLEY **4.** SANTIAGO **5.** ADELA **6.** JOSE						**7.** BETTY **8.** ESTEBAN **9.** ISABELA **10.** RORI **11.** MARIO					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	CaP:
1. NATURALISTIC		X	X	X		X						**4**
2. CONSERVATIONIST/ RESOURCIST	X		X	X		X		X	X			**6**
3. PROBLEM-SOLVING												**0**
4. SYSTEMIC			X		X						X	**3**
5. SCIENTIFIC		X	X								X	**3**
6. HUMANISTIC/ MESOLOGICAL											X	**1**
7. VALUE-CENTRED												**0**
8. HOLISTIC												**0**
9. BIOREGIONALIST	X	X	X	X	X		X		X	X		**8**
10. PRAXIC									X			**1**
11. SOCIALLY CRITICAL										X		**1**
12. FEMINIST									X			**1**
13. ETHNOGRAPHIC	X		X	X	X		X	X	X		X	**8**
14. ECO-EDUCATION											X	**1**
15. SUSTAINABLE DVP. /SUSTAINABILITY						X				X		**2**
C:	**3**	**3**	**6**	**4**	**3**	**3**	**2**	**2**	**5**	**3**	**5**	
C: total number of currents per participant CaP: frequency of a current across participants												

Table 5.6 Correlation between teachers' conceptions of the environment and the environment as defined in the EE currents

The concept of environment, Sauvé (2004a) explains, is socially constructed in accordance with cultural and contextual realities—here adding: realities from individual to collective levels. The results in the table, above, indicate that teachers who are actively engaged or interested in EE had a more complex idea of the environment. These teachers are Mario, Marley, and Isabel. However, having a 'simpler' conception of the environment was also related to teachers, like Rori, who had a marked inclination to sustainability. Rori, like Isabela and Santiago, was prominently interested in motivating 'an environmental culture', but her views were predominantly held to the principles like the ones in the sustainable development/sustainability current.

When mentioning the environment, most of the participants, as the Table 5.6 shows, associated the environment with being a place (usually local or regional) where nature and human cultures interact, finding elements of our personal and social identity in those spaces and interactions. For instance, Mario, Betty, Isabela, Morelos, all teachers from different schools, show evident concern for environmental pollution and overconsumption in Monterrey and its metropolitan area; perhaps because these are the serious environmental issues of their context. Other geographical and cultural aspects of the participants' context, like health issues and inequality, were not brought to the researcher's attention when discussing EE. Even though, Monterrey and its metropolitan area suffer from several problems related to the environmental crisis and SD. As such, the teachers participating in this study focused on the possibilities to manage and change the surrounding environment.

5.4.1 The environment as a place of resources

A group of participants associated the environment as a place where resources are found; although these teachers did not ignore the existence of nature. In fact, the conceptions about the environment as a resource were often associated with elements of nature. In this resourcist conception of the environment, the participants described that caring for the environment primarily involves conserving or procuring the sustainability of natural resources or those necessary to sustain human life. Comparably, Sauvé describes that one of the main features in the conservationist/resourcist current is considering nature as 'pool of resources' (2005, p. 14). The type of resources mentioned by teachers ranged from biodiversity as natural resources to sources of energy and other basic components for human sustainability.

Association with the conservationist/resourcist current

The teachers' references to the environment as 'a place where resources are found' were often accompanied by a reference to caring for the environment. These views about the environment

linked caring of, mostly, natural resources since they are conceived by them as an important part of the environment for humans. Marley said the following:

> *Erm I think that aim or the purpose of environmental education is, firstly, for us TO KNOW what it is that harms the environment. And that* ***the abuse and excessive use of natural resources will obviously take LIFE*** *of the planet away from us, no? And it has sheltered us for many millions of years, no? And it's becoming more and more vulnerable to the actions of men, no? So, to me, environmental education is for us TO KNOW how to look after the planet we live in. (B, Marley, I, turn 52, researcher's emphasis: bold format)*

This quotation was used previously to highlight Marley's views on the aims of EE. This example is now showing the full quotation where he refers to the environment as a planet with life in it and as a place of resources. Throughout his interviews, Marley stresses the importance of knowing about the planet and its systems to care for the environment (B, Marley, I, turn 28); he associates caring for the environment with the sustainability of natural resources. A similar view was shared by José:

> ***Researcher:*** *what comes to your mind when you hear the word 'environmental'?*
>
> ***José:*** *Well, what comes to mind is everything that surround us, everything that is around me…living beings and the resources that allow the development of [human] life.*
>
> ***Researcher:*** *how would you teach this term in the classroom?*
>
> ***José:*** *It's implicit in the contents… we have never made students aware of what it really means […] I would suggest identifying the elements constituting our environment, what we need to live here[.] (C, José, I, turns 132-134)*

José's conception of the environment as a provider of important resources for human life is consistent with his views about the aims of EE. He expressed EE aims for the conservation of 'the available resources we have' (C, José, I, turn 118). As the excerpt shows, he recognises nature as part of the environment, yet emphasising the usefulness of it for human development. Apart from Morelos and Mario, most teachers used or suggested pragmatic and instrumental metaphors to explain and address nature. For instance, Santiago, from School B, described nature as being composed by parts or elements that have a use or function:

> *When students become aware of* ***what the use is*** *of every element in the environment or what it means for them to be there, then they will avoid polluting or damaging it. So, environmental education is all about that. (B, Santiago, III, turn 108, researcher's emphasis)*

These conceptions about the environment are also relevant to the conservationist/resourcist current of EE because they emphasise natural resources as an important part of the environment and the need to manage those resources.

This type of conceptions about the environment was also common in learning activities (see Section 5.5), like in the student projects described by the teachers in School E. Isabela mentioned that her students were working on an extracurricular project 'based on the environment' (E, Isabela, I, turn 137), which visibly had a resourcist conception of the environment because the topics chosen by her students suggested this. She said, 'the projects include: caring for gas [i.e. sensible gas consumption], caring for electricity, caring for water, two are going to do something about recycling [.]' (E, Isabela, I, turn 137). Hence, those projects which were 'based on the environment' associated human subsistence and environmental care by targeting the caring of resources and environmental management.

In this study, the resourcist conceptions about the environment could be linked to the teachers' and students' context: a busy urban environment where nature in the city is scarce and water shortage has been a serious issue many times before. Sauvé (2005, p.14) indicates that often the conservationist/resourcist approach to EE is preferred in places where resource scarcity has been or is an issue for the general population.

5.4.2 The environment as a place of belonging and identity construction

The teachers' conceptions about EE, overall, address the need to care for the environment. The previous section describes the teachers' conceptions about the environment related to caring and conserving natural resources. In this section, the other predominant conceptions about the environment provide more detail of what 'caring for the environment' means to the participants. In Table 5.6, the associations between the teachers' conceptions and the bioregionalist and ethnographic currents indicate that most participants described the environment as 'the surrounding space' which needs looking after, and this generally meant the home or school. These conceptions of the environment are connected to belonging and identity in relation to a place. Likewise, the bioregionalist and ethnographic currents describe the environment in such terms. This conception about the environment suggests an approach to EE that is concerned with local circumstances and small-scale goals. Moreover, such conception is aimed at local pro-environmental action or environmental improvement, rather than looking for ways to become engaged in global concerns about the environment.

Association with the bioregionalist and ethnographic currents

Teachers' conceptions of the environment often referred to the place of inhabitancy and coexistence for them and students. This conception of the environment is also promoted in the Year 6 Natural Sciences curriculum, as Luz from School A, Esteban from School D, and Isabela from School E accurately indicated (A, Luz, I, turn 49; D, Esteban, I, turn 40; E, Isabela, I, turn 91). The teachers who communicated this view of the environment suggested that the environment is the home, the classroom, or the local surroundings, and these spaces need our care to keep them in optimal condition for our living. For instance, Adela from School C, who like her colleague José did not have a particular interest for nature or EE, made this point patent:

> ***Researcher:*** *What do you think environmental education means?*
>
> ***Adela:*** *It [environmental education] would mean taking care of the environment, starting from home by recycling or… I do not know, taking care of your immediate environment. (C, Adela, I, turn 40)*

Moreover, these views about the environment included a reflection of the relationships between humans and nature and how they influence each other. Their views also involved seeing the environment as the place where belong, underscoring our responsibility to maintain and improve the paces we inhabit. Regarding this point, a few teachers said the following:

> *To me that is environmental education, I mean, teaching [environmental] care to children, you know? Teach them to conserve and improve* ***the environment we have****…an environment that is too damaged. (A, Morelos, I, turn 97, researcher's emphasis: bold format)*

Morelos quotation identifies the environment as something we possess and which needs looking after. Similarly, Isabela described the environment as place that needs to be looked after by us, and in order to achieve this, she highlighted the need to 'love' the environment:

> ***Researcher:*** *What does environmental education mean to you?*
>
> ***Isabela:*** *Environmental education erm is about us as teachers, getting students to love* ***their environment****. Environmental care: that they know they must look after the place where they live [.] (E, Isabela, I, turn 105, researcher's emphasis: bold format)*

Isabela's colleague Rori, showed a similar conception of the environment:

> *I teach children about environmental education. I mean, h.o.w to e.d.u.c.a.t.e the k.i.d to i.m.p.r.o.v.e* ***h.i.s*** *[sic.] e.n.v.i.r.o.n.m.e.n.t [.] (E, Rori, I, turn 80, researcher's emphasis: bold format)*

Part of the conceptions about the environment that describe it as a place of belonging, include allusions about owning the environment. Therefore, the researcher found that these views about the environment were significant to the concept of the environment in the bioregionalist and ethnographic currents. In these currents, Sauvé (2005) describes the concept of the environment as a combination of a geographic (characterised by natural and cultural features) and inhabited area; such conception of the environment, she mentions, is connected to a sense of identity and being part of something and somewhere (p. 21).

Furthermore, caring for or looking after the environment where we belong, according to the teachers who had this conception, involves activities like cleanliness and conserving natural resources (including plants and animals) in the place we live. Adela illustrate this point in the following excerpt:

> ***Researcher:*** *What does environmental mean to you?*
>
> ***Adela:*** *It's the immediate environment of where we happen to be, for instance, the classroom. If we are at home and there's something in our way or that's not good for us, we then get rid of it. Because that's the environment where you happen to be. The environment is not just about the physical space, but also the people with whom you interact. (C, Adela, I, turn 86)*

As shown earlier in this section, Adela focused her reflections of the environment on where her students have their physical and social space of influence. Her description of environmental improvement includes actions in relation to cleaning local spaces and everyday waste management, like disposing rubbish in bins. She expressed that individual actions in our close environment are key to support national initiatives, such as international treaties supporting environmental improvement (C, Adela, II, turn 147).

The school environment is one of the main spheres mentioned by the teachers who talked about the environment as a close and surrounding place. Santiago, for instance, said EE meant respecting the place where one lives: 'even if it is an urban area, I think there are many chances to care for the environment' (B, Santiago, I, turn 42). These views of the environment indicate that these teachers significantly considered the importance of motivating students to take part of pro-environmental actions in their area of influence, such as their home and school.

The teachers who communicated this conception of the environment also commented or indicated the importance of identity and sense of belonging in lessons. Accordingly, Luz argued some of the learning content in the textbooks was not relevant to her students' environment and geographical location. She said it would be easier to teach children from Nuevo Leon (this study's fieldwork-relevant region) about EE in relation nearby areas or even

about the United States of America, as it was closer to them, than about some sustainability case in Chiapas which is southwest, Mexico (A, Luz, III, turns 222-230). Luz said that perhaps her students could not even picture this part of Mexico —as the differences in terms of biodiversity, climate, and culture are great between the northeast and southwest areas of the country.

The conceptions about the environment in this section also incorporate the relationship of human cultures and the environment. This aspect is more relevant for the conception of environment in the ethnographic current, which emphasises the cultural dimension of environmental relationships (ibid., p.26). The latter is suggested in Betty's conception of the environment:

> *The environment is all that is surrounding. Everything surrounding us: nature and what nature gives us, and what men [sic.] have created as well. (C, Betty, I, turn 35)*

Betty's conception of the environment, just like Santiago's (School B) and José (School C), divide the environment into nature and human constructions. Betty perceives the environment 'gives us' resources, which is a human-centred expectation about the ontology of nature. Moreover, Betty described her concern with the quality of natural resources and indicated she tried to reduce her ecological footprint after taking a science education course on these matters (C, Betty, I, turn 47-49; C, Betty, III, turn 128-139). Likewise, Santiago describes the environment as combination of human cultures and nature. Throughout his interviews, Santiago argues for students' awareness of the surrounding biodiversity and the need to respect it:

> ***Santiago:*** *[M]aybe there are only a few animals [in the area], but we must care for them and respect them. Sometimes there are some birds that sit in trees that we cut, because they [the threes] are in our way...*
>
> ***Researcher:*** *or the little bears' situation…*
>
> ***Santiago:*** *The bears coming down to our residencies… I tell you, we're invading their habitat: areas where they belong. I find it logical that they [bears] walk the same routes, right? And now they find houses in their way… (B, Santiago, I, turns 42-46)*

Santiago's views about the environment indicate he also separates nature and human cultures. He suggests biodiversity belongs to nature and human constructions ought to consider their needs as well. Overall, like in Santiago's example, environmental interactions between nature and humans were perceived by teachers as humans abusing nature or harming it. These references on the role of humans in the environment suggest that their views have a degree of understanding about our interrelationship with it; but, the teachers mostly described that

relationship as one of management and care—hence, displaying strong human-centred principles in relation to EE.

5.5 Teaching examples of environmental education lessons and activities

This part of the analysis covers the teaching examples mentioned by the teachers and which they associated with EE. This part of the analysis did not focus on where in the Year 6 programme the participant-teachers located EE; these reflections are mainly described in Section 6.2 of this thesis. The teaching examples of EE reported in these outcomes encompass teachers' previous experiences, plans, and ideal scenarios for teaching EE-related content. The teaching examples also include everyday practices or codes of behaviour the teachers promote to encourage environmental awareness.

As in the previous sections, the general outcomes of the analyses on teaching examples of EE are displayed in Table 5.7. The observable patterns across participants reveal that the teaching examples more often suggest an association with the conservationist/resourcist, scientific, value-centred, bioregionalist, and sustainable development/sustainability currents (below, see Table 5.7). The teaching examples analysed and the observation sessions (see Appendix A.18), although they are a substantial part of the data, revealed that the EE-related activities in schools are—except in School E—overall sporadic, sometimes unfinished, and scarce in the participants' schools.

TEACHING EXAMPLES OF EE LESSONS AND ACTIVITIES

(Data correlation with the EE typology)

Environmental Education Currents (Sauvé, 2005)	**PARTICIPANT-TEACHERS** **1.** LUZ **2.** MORELOS **3.** MARLEY **4.** SANTIAGO **5.** ADELA **6.** JOSE						**7.** BETTY **8.** ESTEBAN **9.** ISABELA **10.** RORI **11.** MARIO					
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	CaP:
1. NATURALISTIC				X						X		**2**
2. CONSERVATIONIST/ RESOURCIST	X	X		X	X		X	X	X	X	X	**9**
3. PROBLEM-SOLVING						X						**1**
4. SYSTEMIC												**0**
5. SCIENTIFIC		X	X	X		X		X			X	**6**
6. HUMANISTIC/ MESOLOGICAL		X										**1**
7. VALUE-CENTRED	X	X	X	X	X		X		X	X	X	**9**
8. HOLISTIC												**0**
9. BIOREGIONALIST	X	X	X	X	X	X	X		X	X	X	**10**
10. PRAXIC	X					X			X	X	X	**5**
11. SOCIALLY CRITICAL												**0**
12. FEMINIST												**0**
13. ETHNOGRAPHIC		X		X								**2**
14. ECO-EDUCATION												**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY	X						X	X	X	X	X	**6**
C:	**5**	**6**	**3**	**6**	**3**	**4**	**4**	**3**	**5**	**6**	**6**	

C: total number of currents per participant CaP: frequency of a current across participants

Table 5.7 Correlation between teachers' examples of EE teaching and the strategies associated with the EE currents

Besides being associated with various currents, the teaching examples are of two types: knowledge-based and activity or practice-based. The teachers provided depictions of how they would teach topics related to EE or how they do teach them. In these depictions, they sometimes described lessons based on giving knowledge to provide explanations about certain phenomena or they described practical work activities for students and local communities. Additionally, this section presents a pastiche of data used to compare the EE-relevant teaching practices of two participant-teachers.

5.5.1 Knowledge-based teaching examples

Knowledge-based teaching examples are amongst the various descriptions provided by teachers when reflecting on EE-related teaching and learning activities. These examples are characterised by either a dialogic representation between the teacher and his or her students or a listing of topics the participants related to EE. These teaching examples usually followed a local to global perspective of the topics or the reverse. See the following piece of transcript:

> *Here, we try to get children to contextualise all those topics [environmental issues] in relation to their everyday living. That way he [sic.] realises: "That's true, teacher. See, when I went to town with my mum I saw a bus that suddenly released too much smoke, and we started coughing." "Okay. And what's that?" "Well, yes, it's pollution". (A, Morelos, I, turn 11)*

Morelos described the explanation of an environmental problem by linking it to students' everyday experiences. Teaching examples describing the study of natural phenomena and knowledge related to environmental problems is associated with the scientific current. This current, Sauvé describes, emphasises teaching learners through the study of phenomena and practising scientific activities such as experimentation and hypothesis testing (2005, p.33). The following excerpt conveys one of Marley's visualisation about how to address environmental issues of global concern:

> *I wanted to understand c.l.i.m.a.t.e c.h.a.n.g.e to be able to explain it to children. Because they do not KNOW what the greenhouse effect is. They do not KNOW how sunbeams enter the atmosphere or what the function of the atmosphere is, or how to explain this more technical stuff in a contextualised manner. To say: "Okay, that's global warming, the trendy word" and supporting my class with films and videos that are relevant to the topic [.] (B, Marley, I, turn 28)*

In this quotation, Marley was explaining his rationale for having attended a course about EE-topics. Throughout his interviews, Marley seemed essentially concerned with providing clear explanations of phenomena related to environmental matters, a matter that was corroborated when observing Marley's lessons (Ob. field notes, BM-1 to BM-4). For him, a global-to-local

approach to learn about the environment is key, however, he had an opposite approach to creating an environmental culture—this is explored in the following section. Across the interviews, different participants show different approaches to learning about the environment and other EE-related topics. For instance, Morelos preferred a local and value-based approach to activities and Mario described the benefits he saw in learning about ecology in the broad sense (A, Morelos, I, turn 11; F, Mario, I, turn 102).

Other teaching examples that are linked to the scientific current and involved practical work. However, these teaching exercises were focused on gaining knowledge, and they were not often developed in the classes of the participant-teachers who had mentioned them. The teaching examples given by teachers were sometimes an experience they had whilst participating in extra-curricular projects.

Both Santiago and José, provided lengthy descriptions of an experiment called 'the eco-column' brought to school by 'family science' an extra-curricular project of SEP—the Ministry of Education in Mexico (B, Santiago, III, turns 116-126; C, José, II, turns 8-12). This activity involves the re-creation of various eco-systems piled up in plastic bottles. The students involved in this activity are meant to practise diverse scientific skills like observations, hypothesis testing, writing analytical reports, and looking after the system. The aim of the activity is to facilitate reflection about the effects of 'x' pollutants in the ecosystems, hence, encouraging students' environmental awareness. However, both teachers expressed this type of activity was complicated to develop because of the materials needed. Likewise, Mario said that experimental activities related to EE were difficult to perform because there is lack of engagement from students and parents in his community and a lack of necessary materials for experimental activities.

5.5.2 Activity-based teaching examples

The rest of the teaching examples comprise practical work involving the separation of recyclable rubbish, student projects, local community campaigns and student clubs. These examples of teaching mainly include a set of activities connected to the three R's (i.e. reducing, reusing, and recycling), which are oriented to foster the conservation of natural resources and the sustainability of contemporary lifestyles. Such examples of teaching were predominant and prominent in the data and are linked to the conservationist/resourcist and sustainable development/sustainability currents in the EE typology. See evidence the following quotations illustrating this point:

> *For instance, I have printer paper [in the classroom] that the children brought. Sometimes I consider that the work we do can be done on half of a sheet instead of using a full sheet. I mean, we try to be economical with the material we use. For instance, last year I recycled. I have there [the interviewee uses body language to indicate] a bunch of markers that children have been using since last year [.] (A, Morelos, II, turn 145)*

Morelos gives an example of everyday activities he encourages in students; these are focused on changing individual and collective behaviours of the class. His strategies are to reduce the usage of paper and to re-use materials like markers—although, like most participants, he confuses recycling with reusing. A similar example was offered by Mario:

> *[A]nother example comes from my classroom: not a single notebook sheet is wasted. I've managed to create a culture [a habit] in them of not wasting paper. Now, at least, I recuperate them and recycle them. I recycle the paper. I put a bag for students to dispose their paper there. Then, I take it home and make a big package that I take to my [local environmental activist] club every fortnight on a Sunday morning. (F, Mario, II, turn 197)*

Mario also concentrates on setting examples for children to reduce the amount of classroom materials (e.g. paper, markers, notebooks and so on) they use. Likewise, during the field work it was observed that Luz (School A) and José (School C) were promoting the collection of recyclable rubbish in their class. In fact, José mentioned that, in his classroom, he was currently collecting 'PET' (i.e. polyethylene terephthalate) and aluminium cans in separate plastic bags (Ob. field notes, CJ-5). Mario, in contrast to other participants, does refer to recycling as a process of transforming material because taking those bulks of paper to his local activist group had that end. Therefore, this activity engages the class with the local community by contributing with a pro-environmental civil group. Other activity-based examples were mentioned by Santiago; his examples also suggest the engagement of his students with the local community by collecting material for a charity:

> *[W]e have participated in various campaigns. From reforesting, to cleaning areas like the little square next to the school or keeping our gardens clean and all that. All that helped us in becoming a little familiarised with environmental care. Here in the school, we also have a RECYCLING project where we separate the rubbish and then place it where it belongs; we also support a cancer initiative by donating bottle caps. You donated a certain amount of bottle caps [to an institution] and they would donate a cancer treatment [to a person in need of it]. So, one was doing that in parallel to collecting [plastic bottle caps]. (B, Santiago, I, turn 38)*

The activities in the examples, above, are not teaching lessons or planned learning activities per se, but they suggest a code of behaviour and values these teachers were trying or wanted

students to adopt. Developing guides or codes of behaviour for conservation and sustainability of natural resources is prominent in the conservationist/resourcist current. A similar example was observed in Mario's account of his recycling actions in the classroom. Mario portrays himself as an example or a guide for children (he said he is known at the school and by the school community for being invested in environmental care matters), hence, guides or codes of behaviour are not necessarily reproduced in banners or other sort of policy objects schools use (Ball et al. 2012). Another aspect that seems clear from this type of teaching examples is the emphasis on individual actions:

> *I tell say to them [students at School C] "hey, the rubbish bin is only three steps away, I mean…" I tell them: "cooperate, participate, try and put rubbish in its place". (C, Adela, II, turn 147)*

The rest of activity-based teaching examples, like Santiago's depiction above, involve classroom and school level projects for students and sometimes the nearby communities. Most teaching examples comprising activity-based or practical work are also related to the value-centred and bioregionalist currents. Because the teachers frequently regarded these activities to the improvement of local spaces like the nearby neighbourhood, students' homes, and the school itself. The bioregionalist is concerned with activities that help developing a relationship with the local and regional environment and a sense of belonging to it, as well as stimulating a commitment to appreciate relevant bioregions (Sauvé, 2005, p.22). Adela, who had almost 20 years of teaching experience, described some of the activities she could remember in relation to EE:

> *We've developed some campaigns for recycling and nature caring, but I don't know if that's related to environmental education [...], Some years ago, for instance, we had the 'Let's Clean Mexico' —I think it was called—and 'Ant Operation' campaigns. We had to form teams of students and parents and [together] improve the image of the school […] we've always had ecology and cleaning campaigns. (C, Adela, I, turns 54-60)*

Adela further describes in her example, that these activities we expanded beyond the school grounds and involved cleaning and improving the local environment. These activities are extracurricular (usually conducted on a Saturday) and were not active during the fieldwork of this project. Adela commented these were replaced for extra-curricular spaces to support learning of core subjects (C, Adela, III, turn 321).

The schools in the sample were, except for School D and F, participating in 'Safe, Healthy, and Sustainable School' an official programme promoted by the local Ministry of Education. Although, it seemed that in Schools A, B, C, and E the sustainable aspect of the 'Safe, Healthy,

and Sustainable School' was mostly executed by participating in privately supported student contests, which are normally funded by large corporations. Additionally, it seemed that the participation of schools in EE-related contests was not always effective; for instance, José, who is both a teacher trainer and a teacher in-service, observed that the 'Sustainable School' activities were sometimes only a paper exercise and no actual activities were developed in schools (C, José, I, turn 128).

A similar perspective to José's was provided by Luz from School A; she expressed that her school was involved in the 'Safe, Healthy, and Sustainable School' programme (A, Luz, III, turns 246-248), yet, she said, nothing had been done in recent years for the environmental dimension and that this was not considered in the school improvement programme (A, Luz, II, turn 314). From his decades of teaching experience in School A, Morelos, who was Luz's peer, could only remember a few examples of collecting rubbish for recycling and ecology projects from the Family Science programme—this is an official programme that engages students and parents in scientific experimentation after classes (A, Morelos, II, turn 195). The experiences of Luz and Morelos suggest that EE-related projects or activities were sometimes a paper exercise, although, some of the challenges to develop these activities were due to the lack of engagement in the community. Luz described that the surrounding population did not form part of community projects for environmental improvement unless they could perceive some sort of profit or monetary benefit from these activities (A, Luz, III, turns 332-336).

The activity-based teaching examples provided by the teachers were often related to promoting values that are significant to furthering EE awareness. Since most of the teachers linked these examples with analysing and clarifying student values in relation to EE-related topics. Some suggestions include the encouragement of an 'environmental culture'. Marley described an 'environmental culture' involves caring for the environment where one lives, one's house, school, neighbourhood: from the specific to the general—which is contrasting to his approach for learning about the environment (B, Marley, I, turn 60). The promotion of values and behavioural codes is relevant to the teaching strategies in the value-centred current, because this current encourages the adoption of environmental 'morals' or prescribing a code of socially desirable behaviour (Sauvé, 2005, p.19). See the following example from Rori at School E; this example overlaps with an activity previously mentioned in this section by Santiago:

> *[I]nstead of selling them [bottle caps] or something else, we donate them to an association that fights cancer in children. In this way, one is creating awareness in students, and showing them that—besides recycling and reusing—they can also help other people who have some sort of difficulty. So, in this activity we are promoting values as well. (E, Rori, I, turn 92)*

The quotation shows the last part of Rori's reflection about how sustainability actions can be linked to awareness in other themes such as health—although this last notion was faintly portrayed by the participants. Rori frequently mentioned the role of values in students' education and EE topics; she supported the promotion of values like responsibility and empathy in EE (E, Rori, II, turn 12; E, Rori, III, turn 359).

Rori, Betty, Isabela and Luz expressed that activity-based EE teaching (like Rori's example in the quotation above) stimulated meaningful learning and the attainment of a relevant value system. These teachers seemed to value practical work because it is meaningful to students, although most of the participants, expect from Rori and Isabela, did not often conduct a substantial amount of practical activities related to EE. A relationship was suggested between practical work and attitudinal and behavioural changes, yet this relationship seemed rather underdeveloped in teachers' conceptions. For instance, Luz said that students' knowledge was key factor to teaching and learning, however, having knowledgeable students was not enough (A, Luz, I, turn 55; A, Luz, II, turn 278). Luz said that if she could not see evidence of behavioural change in students then 'nothing is being achieved' (A, Luz, II, turn 278). Luz said that if after teaching her students about nutrition and environmental care she found them eating junk food and having a scruffy classroom, then it was like if she had achieved nothing with them (A, Luz, II, turn 280). In response to this, she mentioned that more time was needed to conduct practical work, like cultivating plants and edible gardens in the school (A, Luz, II, turn 280).

Regarding EE-related practical work, Isabela and Rori from School E, when compared to the rest of the participants, provided extraordinary activity-based teaching examples happening at their school. For over five years, Isabela and Rori had helped in forming and maintaining an 'eco-club' for students at School E—which, according to them, was highly encouraged by the Head Teacher. So far, School's E eco-club had participated in various privately-advertised contests supporting environmental improvement and resource sustainability. They also participated in other extracurricular projects that promoted environmental action for improvement, Rori described here students were engaged in one of them by the time she was participating in this project (E, Rori, I, turn 158). Their ample descriptions of teaching examples describe their activities were mainly focused in waste management (various

examples of reusing materials and separating rubbish) and resource sustainability and conducted in and outside the school premises inviting local communities to participate in their actions (e.g. E, Isabela, I, turns 101-137; E, Isabela, III, turn 325; E, Isabela, III, turn 344; E, Rori, I, turn 26; E, Rori, I, turn 80; E, Rori, I, turns 88-92; E, Rori, II, turns). Regarding this 'eco-club' project, Isabela comments:

> *The idea is that what students learn about environmental education here, they can apply at home and in their community […] What we want to achieve is that all this [EE learning] transcends the project and for it to be more than just passing a subject. And it's been achieved year by year. We have children with a deeply rooted environmental awareness [gleeful laugh]. (E, Isabela, I, turn 113 and turn 119)*

Isabela suggests that the work they have done with their students in the eco-club have fostered in students' environmental awareness. Isabela's colleague, Rori, indicated similar notions. It appears that both teachers are motivated by the results they observe in students:

> *We don't get any prize from this; we do it because we [herself and Isabela] are passionate about it, and we like it. We do gain the satisfaction of seeing the kid looking where to dispose his rubbish, and he asks you: "Teacher, is it the red or the blue bin?" (E, Rori, I, turn 138)*

This excerpt from Rori's interview is similar to Luz's appreciation of behavioural change in students; hence, Rori encouraged practical work (such as the eco-club and student participation in extracurricular contests) because she believed it facilitates pro-environmental awareness and behaviour. Isabela and Rori provided substantial examples about teaching EE-related topics. Their activities are consistent practices throughout the school year; and, this is a contrasting circumstance when compared to the rest of the accounts provided by the other participants of this project. As it has been shown so far, all activity-based teaching examples, including those from the teachers in School E, involve conserving resources and managing waste whilst attempting to spread their work outside the school premises. This indicated to the researcher that factors such as students' stage of development and various other circumstances regarding the cultures of schools are potentially connected to how these EE-related practices have been shaped for, what appears, years.

Finally, since the activity-based teaching examples offered by the participants frequently addressed overconsumption and sustainable consumption of activities—a strategy attributed to the sustainable development/sustainability current by Sauvé (2005), they were asked what they though sustainability meant. Across the 11 participants, eight of them expressed sustainability meant making the best of natural resources without harming the environment and regenerating its balance by replacing what was taken from it—which is also a relevant

notion in the resourcist/conservationist current. These views simplify the implications of using natural resources in various ways, for example, the recuperation of ecosystems is harder than simply reforesting an area because the ecological balance of the area must be considered.

The other three teachers, Rori, Isabela, and Morelos, emphasised other aspects of sustainability. Rori and Isabela emphasised the impact of consumerism as an unsustainable practice, hence, they explained sustainability involved helping students to become aware of their consumption habits and foster an environmental culture (E, Isabela, III, turn 319; E, Rori, I, turn 90; E, Rori, III, turn 303). Likewise, Morelos focused on the sustainability of values in families and how these affect the way students will later conduct themselves in society (A, Morelos, III, 244-261). Apart, from Rori, there were no teachers emphasising the role of economy and technological development in sustainability. Although, Luz, Marley, and José made a distinction between sustainability and sustainable development (see this distinction also in Section 2.2.4 of the literature review). The three of them described sustainability as one's ability to maintain one's living and sustainable development as a long term and far-reaching (national level for instance) plan for human and environmental sustainability (A, Luz, III, turns 147-152; B, Marley, III, turns 163-171; C, José, III, turns 346-356).

5.6 Two different portraits of the same: Isabela's and Esteban's teaching of an environmental education-related lesson

By using a pastiche technique, this section introduces two portraits of the same Year 6 Natural Sciences lesson taught by two teachers: Isabela (School E) and Esteban (School D). These teachers were chosen for this exercise because they showed contrasting teaching practices despite that they were teaching the same lesson. They also had a similar number of students in their classrooms, although these teachers worked in significantly different school cultures and in slightly different low socio-economic backgrounds. In this comparative exercise, this lesson was chosen because of its EE-related content and the availability of the data, as this was the only lesson where it was possible to observe Isabela's teaching.

The primary purpose of this exercise is to stress the display of teachers' conceptions about EE in their teaching practice—if they are displayed at all, hoping this would also illustrate the gaps and confluences between their conceptions and teaching activities. Another significant purpose for this exercise is to highlight how different teachers and school environments produce different versions of the same lesson, even though both teachers can face similar factors complicating the teaching of EE-related topics—more about such influencing factors

is presented in Chapter 6. Additionally, the exercise attempts to bring the reader closer to the context of the research by inviting her or him to reflect on the accounts presented.

5.6.1 Relationship between the properties of materials and sustainable consumption: A pastiche

The portraits presented in this section are a summary of how Isabela and Esteban taught Topic 1 from Block 3 of Year 6 Natural Sciences (see Table 5.8, below). At the time the field work was conducted, Isabela had been a primary school teacher for 12 years and was a full-time teacher in School E. Esteban had 10 years of experience teaching in primary, and a few years teaching in secondary school as well. He had a morning contract in School D.

On the one hand, School E is a thriving full-time school, with not much space in the building but a committed staff, which has been granted local and national achievement awards of diverse types. The general practices at School E exuded collaboration and interaction between staff, teachers, and students. School D, on the other hand, is a part-time school with a large school grounds and is managed by a Head Teacher who overtly defies the practices of the local Ministry of Education. The general practices at School D seemed traditional and strict, yet somewhat lax at times.

The portraits are briefly presented in a ‘pastiche’. Ely et al. (1997) explain that this presentation style for qualitative data directs the attention to multiple realities by combining various representations such as different types of data, descriptions, analyses, and others (pp. 96-97). The pastiches present a depiction of Isabela’s and Esteban’s work, and they were formed by combining data from their interviews and notes from the observation sessions. Their pastiches combine two different dimensions of their reality: what they said about EE and a representation of how they taught an EE-related lesson. The researcher used the recorded audios, extended notes of the observations sessions, and the observation field notes of Topic 1 from Block 3 to create narration of how these teachers taught this lesson (see a summary of the observation sessions in Appendix A.18).

Year 6 Natural Sciences, Block 3: How do we transform nature? Expected Learning Outcomes	
Focus areas: materials and technology	
Students are expected to:	
Study Programme (SEP, 2011b)	*Textbook* (Cervera-Cobos et al., 2014)
Topic 1 'Why can materials be reappraised, reduced, rejected, reused, and recycled?'	**Topic 1** 'Relationship between the properties of materials and responsible consumption'
▪ Provide arguments on the use of certain materials based on their hardness, ductility, permeability features, this aims to making informed decisions about which material is optimal for the satisfaction of particular needs. ▪ Make decisions towards the reappraisal, reduction, rejection, reuse, and recycling of paper and plastic, after analysing the organic and social implications of their use. (p. 108)	▪ Know the properties of materials and the satisfaction of diverse needs through the uses given to these materials. ▪ Reflect on the impact of using paper and plastic, as well as on the reduction, reuse, and recycling of materials. (p. 84)

Table 5.8 Summary of lesson 1, Block 3, Year 6 Natural Sciences

The pastiches allow the comparison of interview abstracts where Isabela and Esteban made significant observations about EE and an illustration of how they taught a lesson of EE-related content. Topic 1 includes the following themes: fundamental properties of materials; the uses of materials, such as plastic and paper, to satisfy human needs; and, the waste production involved with these materials. Embedded in themes about waste production and management, Topic 1 describes, from a macroscopic perspective, physical and chemical changes (e.g. hardness, toughness flexibility and permeability) in matter.

The pastiches of Isabela and Esteban were created to highlight the links and gaps between the teachers' conceptions about EE and the teaching strategies they use to teach it. The researcher's depiction of the lesson is presented in the left side of pastiche, and the interview excerpts are placed on the right side of the box. There is no specific suggestion of which part needs reading first since looking for associations and missing spaces between one column and the other is what matters. A commentary of the comparison between the two lessons is provided after the presentation of the pastiches.

Isabela, School E (full-time school), January 22, 2015. Lesson's duration: approx. 70 minutes.

Researcher's depiction of Isabela's lesson

(Ob. field notes, EI-1 [extended notes])

Isabela's Year 6 class in School E was relatively small (she had 24 students at that time) compared to the average primary school classroom in Mexico (having between 32 to38 students). At the time of the fieldwork, Isabela had a pre-service teacher she was training, but the pre-service teacher chose to perform a passive role during the observation.

By the time the researcher had arrived to the classroom, Isabela's students were already grouped in teams at the back of her classroom in School E and they were quietly speaking with each other. They all looked comfortable and used to this type of working structure. In the back of the room, the researcher noticed a few sheets with stars and team names which stood out from a board that Isabela uses to announce the month's events. These were the achievements of the class' teams since individual achievements were not emphasised in the classroom.

The class started with a quick review of that day's lesson and the expected learning outcomes. The last Geography lesson was mentioned in the conversation, as Isabela pointed out some similar content. After this, the lesson formally started with a whole-class discussion about environmental issues like pollution, overpopulation, poverty, lack of work opportunities, vandalism, and so on. At this point, Isabela encouraged the class to think about potential solutions for those problems and from the point of view of the Natural Sciences: 'In Natural Sciences, what [environmental] problems can we work on?'—Isabela asked.

After a brief discussion on potential solutions for environmental issues, Isabela played a video called *A letter to Earth* [a typical EE teaching resource in Mexico (SEMARNAT, 2008)]. The video is a fictional narration from a man living in the year 2070, and who compares the environmental tragedy of his contemporary reality with the times when he was growing up. In the conversation that followed this video, Isabela emphasised the gravity of potentially reaching a point in the environmental crisis where we would have to pay money to have clean air – as the video foretells. She asked her students 'Do you want to get to this?' The whole class answered with an alarmed negative. 'How old

Isabela's comments about EE

(Interview excerpts)

Environmental education is, we teachers, getting students to feel love for the environment. […] The idea is that what students learn about environmental education here, they can apply at home and in their community […] What we want to achieve is that all this [EE learning] transcends the project and for it to be more than just passing a subject. And it's been achieved year by year. We have children with a deeply rooted environmental awareness [gleeful laugh].
(E, Isabela, I, turns 111, 113,119)

We are meaning to make children reflect, encouraging them to take care of the [surrounding] environment, putting a bit more in children's heads that they have an ecological footprint. And, that they have to take care of the planet, otherwise the planet will not be the same in future generations; and, their grandchildren might not know the planet as it is now. So, we have to make children reflect about all this.
(E, Isabela, I, turn 49)

would you be in 2070?'—Isabela said. This was discussed at length by the students and Isabela, concluding that wasteful consumption could bring such future about.

After the presentation of the video and the following discussion, Isabela displayed on the board a video about the five R's (i.e. rejection, reappraisal, reduction, reuse and recycling) strategy for resource sustainability. She used information given in the Year 6 Study Programme and Natural Sciences textbook. In combination with this, she presented some photographs showing various types of pollution in the local area.

Isabela told her students that during her past holiday she had taken a few photos of what seemed a much polluted atmosphere. She said to them: 'Look at the state of our city… look, please look!' The next photograph showed a vehicle visibly releasing gas emissions of a dark colour, then, Isabela asked them 'Who has seen a truck doing this?' –And her students affirmed they had seen such event– 'And what do the traffic police do about this?'–asked Isabela. 'Nothing…' –the class uttered in a chorus. Isabela then said: 'Currently, nothing is being done, YET…but what can you do about it? For example, about the cars your parents drive? What can we do to avoid THIS? Look at all the smog! What can we do?'

A little later, the session moved on to allow students to work on their pro-environmental projects, which were planned to be submitted for a local EE-related contest. Isabela said: 'We have to plan for the audience of our project, okay? Each team has already chosen a theme'—said Isabela. Then, she gave each team an application form related to the contest's guidelines. The students filled in basic information about their project including their project´s justification and aims, and the project's contribution to the environment and their local community. Isabela specified 'Our theme must be community-oriented one. How are we going to do that?' Time-wise this part of the lesson was shorter than the rest of the activities.

At the end of the lesson, Isabela's students shared their initial project ideas with the rest of the class. The topics of the projects ranged from saving energy and gas to making a compost with organic waste from the school's canteen. Then, Isabela end of the lesson by asking: 'What did we learn today?' Although it was indicated in the book, Isabela did not emphasise the properties of materials, instead she focused on the environmental content of the lesson.

In class, firstly, we talk about the expected learning outcome […] at the end of the lesson I ask: "Did you learn what you wanted to learn? Then, students draw conclusions about whether they did or not. (E, Isabela, I, turn 93)

[W]e think hard about how to work on [EE] in exams and in class. It'd be super easy to just say to them: "Read from here to here, highlight there, and make a concept list… and that´s it. Next topic!" Except that, in this way, children don't understand, reflect, act, or become aware. You have to look for something that has an impact on them…something they are experiencing [.] (E, Isabela, I, turn 97)

***Researcher**: [W]hat do you think are the goals or aims of environmental education?*
***Isabela**: Well that's the goal –awareness– to succeed in getting students to be reflective about environmental care. If we don't succeed, then we are not achieving anything. So, I think that's the main goal of environmental education. (E, Isabela, I, turns 130-131)*

Esteban, School D (part-time afternoon school), January 12, 2015. Lesson's duration: approx. 60 minutes.

Researcher's depiction of Esteban's lesson

(Ob. field notes, DE-3 [extended notes])

Esteban's Year 6 class in School D was also, like in the previous pastiche, relatively small, considering that he reported having approximately 22 students—this was a calculation because he did not provide a final figure in Form B (see the form in Appendix A.3). Esteban's Natural Sciences lessons were regularly led by the content sequences and exercises suggested in the textbook (DE-1: DE-8, extended notes, see Appendix A.18). The eight lessons of Esteban that were observed during the fieldwork in School D indicate that a lesson in Esteban's class would not properly start until all his students were on the same page of the textbook and waiting in silence for him to start speaking. This session started in the same way: books were open on the students' desks and Esteban was at the front of the classroom waiting for order to be re-established amongst his students.

Following Esteban's request, a student read the introduction for Topic I from the textbook. The reading included some numbers and averages referring to the amount of rubbish annually generated in Mexico. Esteban used this opportunity and encouraged his students to practice some basic mathematic operations, using the waste production figures from the textbook. He was trying to connect the environmental learning content with mathematics. This exercise was followed by a class discussion about estimates on the amount of rubbish that is produced per student in the class. Esteban emphasised the alarming average amount of waste produced by each student. The discussion evolved into how the amount of waste could be reduced, for which Esteban proposed recycling as a solution. Then, a couple of students mentioned that batteries have a significant environmental impact, which was in tune with the content of the lesson in the textbook and typical rubbish separation campaigns in schools.

The textbook focuses on materials such as paper, cardboard, glass and plastic so it appears that, therefore, this motivated Esteban to instigate his students to list five products made of paper or cardboard and plastic. He said, 'Write five examples in which plastic and paper are given the same use in a product'. Initially, Esteban indicated that this listing was homework,

Esteban's comments about EE

(Interview excerpts)

For me teaching is the way we perform day by day when we come to work; when we come to impart [subject content] and educate the students we have under our command. That's teaching: the work we do...the ways in which we transport knowledge to children.
(D, Esteban, II, turn 34)

I see environmental education as a term in which we teachers are r.e.s.p.o.n.s.i.b.l.e for making students aware of the situation in which our society is living… getting the kid to reflect on the damage that he[sic] can cause to the environment. Getting the kid to know what benefits the environment; and, simply, getting the kid to know about the consequences of littering a piece of paper; also, the consequences of neglecting natural resources, that little by little are becoming scarce[.]
(D, Esteban, I, turn 64)

It's [sustainability] the process through which we have to become a.w.a.r.e and become capable of making good use of all resources or of all that we obtain from nature [...] to

however, he seemed to have changed his mind about this exercise during the lesson since he developed this activity for about ten minutes. The results of working in this activity were written on the white board; he asked his students about their results and organised these in a concept map on the board. Esteban took a few suggestions from the students and wrote the rest of the examples himself.

At this point of the lesson, Esteban's teaching persona predominantly suggested an authoritarian character; it seemed he could also be a terse and sarcastic at times—especially if a student provided the 'wrong' answer. His behaviours and attitudes in the classroom seemed part of his teaching style or teaching persona because he softened his ways when he was not teaching or addressing students. It is possible that this is one of the reasons why Esteban's students showed visible hesitation (noticed by the way they raised their hands to participate or used their voices to speak up) when attempting to participate.

After working on the list of products or materials made of paper and plastic, Esteban resumed in a lecturing mode and began to talk about separating rubbish for its recycling; this talk did not include much detail and lasted a few minutes. After this, Esteban asked another student to carry on reading the information in the textbook. This time the reading was about the properties of materials. At first, Esteban made the properties of plastic the initial focus of the reading, then, Esteban asked his students to think about the physical properties of plastic and wood. Eventually, Esteban moved on to explain the material properties presented in the textbook and these are: hardness, toughness, flexibility, and permeability. When studying this, Esteban tried to encourage students to think about materials sharing any of these properties, yet the connection between this topic and the three R's strategy and sustainable consumption (as the expected learning outcomes suggest) was not explicitly made. The rest of the lesson carried on following the content in the textbook until the bell rang, then, Esteban's students quickly left their seats to go home.

prevent harming the environment—which is what surrounds us.
(D, Esteban, III, turn 43)

I should have, but I have never ever been on an environmental education course where there are opportunities to learn something new about science [.]
(D, Esteban, I, turn 56).

Reflections from comparing Isabela's and Esteban's lessons

The juxtaposition of Isabela's lesson portrait and the interview excerpts in her pastiche show a close correlation between her views and her teaching example. The student projects seemed an attempt to make EE significant beyond school assessments using a reflective approach to EE—just as she mentioned in the initial interview. The projects of Isabela's students targeted a local community outside the classroom. Moreover, her class discussions were centred on consumption and waste management, and these are focal topics when learning about the ecological footprint; hence, this is another point that correlates with her views about EE. Esteban's views about EE seemed congruent with his teaching as well. He emphasised the role of information by focusing his lesson on facts and statistics. Likewise, the interview excerpts in the pastiche indicate he prioritises providing students with knowledge about EE-related issues. In fact, Esteban said that giving students the rationale of environmental problems was important for their environmental awareness (D, Esteban, I, turn 74), which perhaps motivated his reliance on the facts in the Natural Sciences textbook.

The general outlook of both examples shows Isabela's lesson offered students with more opportunities to exercise their learning autonomy whilst Esteban's students were given less chances to go beyond the textbook's content. For instance, Isabela's students were directing their own EE-related projects and even brought information to the lesson about their project. In contrast, Esteban's students generally showed a passive attitude and behaviour as they concentrated on following Esteban's instructions. Isabela had been involved in promoting an 'eco-club' in School E for over five years; yearly, her students participated in EE-related projects and contests (E, Isabela, I, turns 115-123). In comparison, Esteban only remembered a time, two years before, when School D was given a few trees to plant and look after (D, Esteban, I, turns 91-97). His experience teaching EE was little, perhaps because this was not a subject he found easy to become interested in. In an interview, Esteban said he had not tried increasing his subject knowledge of natural sciences and EE because he was more interested on improving his mathematical teaching skills, a subject he found easier to study (D, Esteban, I, turn 54-56).

The teaching activities used by Isabela and Esteban have links with the teaching examples in some of the EE currents in the EE typology. Isabela's lesson primarily used the following teaching activities: class discussions exploring students' experiences, values, and beliefs regarding resource consumption; telling stories of her experiences of noticing environmental pollution; and taking a reflexive posture when developing a local project. These tree activities relate to the teaching examples mentioned in the value-centred, conservationist/resourcist,

ethnographic, praxic and bioregionalist currents. Esteban's lesson mainly used the following teaching activities: class discussions exploring students' experiences, values, and beliefs regarding resource consumption; and, supporting a code of behaviour regarding resource consumption. These activities are linked to the teaching examples in the conservationist/resourcist, scientific, and value-centred currents.

Furthermore, the role of the expected learning outcomes featured differently in each case. Isabela emphasised the expected learning outcomes of the lesson, referring to the ones in the Year 6 Study Programme (this was revealed in her reference to the five R's and not the three R's, which are mentioned in the Study Programme). In contrast, Esteban made no mention of the expected learning outcomes and guided his lesson following the book content. Additionally, both teachers focused on environmental problems and how to individually contribute to finding solutions to ameliorate these issues. Isabela's and Esteban's lesson also converged in fostering attitude and behavioural change of students, which were mostly focused on managing their consumption habits and waste management. Like, the rest of the participants in this study, Isabela and Esteban referred to the terms recycling and reusing interchangeably during the lesson, even though recycling and reusing involve different processes and strategies.

In conclusion, attending schools to observe Year 6 Natural Sciences lessons allowed the researcher to appreciate the singularity of each participant-teacher and the commonalities across their practices (see summary of observations in Appendix A.18). Like Isabela and Esteban, every teacher participating in this study imprinted their practices with a preferred style and other peculiarities: José wore a suit every day because he believes his dressing adds to his teaching authority and formality. Betty, José's colleague, preferred being more casual with her students. Then, Luz, whenever possible, preferred teaching outside the classroom. Morelos, like his colleague Luz, was close to his retirement and seemed an epitome of patience with his students. These are only general impressions; however, they are useful to remind us that, despite the standardisation forces of the modern educational world, teachers are not all the same. Likewise, the participants' conceptions about EE have significant nuances besides the patterns found in how they understand and teach EE-related topics. Ahead, Chapter 6 explores more of these patterns and nuances in relation to the factors seemingly influencing teaching of EE-related content.

5.7 Summary of the outcomes for the second research question

The results that were presented in this chapter are summarised in the following points:

- The teachers' conceptions about EE, like Sauvé's typology, stressed three aspects: the aims associated with EE, the conceptions of the environment, and teaching examples and activities related to EE.
    - Aims concerning the conservation of natural resources and acquiring knowledge about the environment were both predominant and prominent in the participants' conceptions.
    - Conceptions of the environment primarily consider it as a local place of belonging and identification, and a place from where we obtain resources.
    - Teaching examples of EE activities are based on knowledge acquisition and projected at local improvement. These activities include analysing values which are relevant for environmental awareness and motivating codes of behaviour for consumption and resource sustainability.
- The teachers' conceptions about EE share aspects which significantly relate to the parameters in at least four of the EE currents—this depending on the teacher.
- The conceptions about EE from Isabela and Esteban are closely linked to their teaching of an EE-related content; this potentially indicates similar results for other pertinent cases.
- The teachers' conceptions about EE include reflections of sustaining contemporary lifestyles, but they do not include clear associations with health or health issues.
- Finally, the teachers' conceptions about EE are overall focused on four general patterns, student awareness and their behavioural change; resource management and conservation; knowledge-based; and concerned with the local and immediate environment.

Chapter 6. Influencing factors in environmental education teaching

The results presented so far narrate an intertwined story between curricular expectations and a richness of individual conceptions about EE. The purpose of this chapter is to present the results of analysing further the participants' cognitions about teaching EE-related content in Year 6; their cognitions encompass their views, perceptions, knowledge and beliefs of what shapes teaching of EE in their context. The results in this chapter answer the following research question:

> ***RQ.3*** *What factors impact environmental education teaching in Year 6 of Mexican primary school education?*

The outcomes of the analysis signal that the main factors impacting Year 6 EE teaching in the participants' contexts are: an interplay between the teachers' cognitions of the curricular proposal in the 2011 National Curriculum, the local demands for content coverage, and how the teachers interpret EE and its pedagogic potential. Additionally, teaching EE-related content is challenged by the influence of current leadership strategies and cultures and educational policies in schools. These factors seem to have a significant—and mostly unhelpful—effect on key aspects of effective teaching: management of teaching time and lesson plans, collegial work of teachers, and teacher leadership inside and outside the classroom (Creemers and Kyriakides, 2010; Harris and Muijs, 2005). Hence, in the participants' context, the provision of EE teaching and learning opportunities is strongly conditioned by the aforesaid factors and the teachers' response to them.

The chapter is distributed in five parts. Section 6.1 briefly revisits the main steps and decisions of the analysis that is relevant to RQ.3. Subsequently, Section 6.2 provides an overview of the results in this chapter, focusing on the rationale of the findings presented in the following sections. As such, Section 6.3 presents the teachers' cognitions about EE in the 2011 National Curriculum and the Year 6 Programme, including their instructional interpretation of EE. Then, Section 6.4 offers an illustration of the impact leadership, culture, and standardization policies on EE teaching through the partial accounts of teachers from School C and School E. To conclude, Section 6.5 presents a quick summary of the results.

6.1 Key aspects of the analytical process for research question three

The results presented in this chapter are informed by data obtained from all the interviews and across the 11 participants of this study. Since the intermediate interview explicitly addressed themes that are relevant to RQ.3 (see the protocol in Appendix A.5.2), the outcomes ahead are heavily informed by interview data of the intermediate interview transcripts. The analysis relevant to RQ.3 followed the analytical protocol that was discussed in Section 3.4.1. Additionally, profile matrices were created to facilitate a cross-participant thematic analysis. Finally, the evidence presented in Section 6.4 was triangulated with information from the observation reports (Appendix A.18), information gathered from the Forms A, B, C (Appendices A.2, A.3, and A.4), and by other documents provided by the teachers (e.g. lesson plans of School E). Further details regarding the data analysis of RQ.3 are provided in Section 3.4.3, in Chapter 3.

6.2 School and instructional factors impacting environmental education teaching: an overview

From iterative readings of the interview transcripts it became evident to the researcher that the participants often considered the teaching or potential teaching EE-related content is impacted by time constrictions (e.g. A, Luz, II, turn 141; C, Adela, II, turn 67; C, Betty, II, turn 12; C, José, II, turn 20; D, Esteban, II, turn 6; E, Isabela, II, turn 70; and F, Mario, II, turn 129). Generally, the participant-teachers expressed not having enough time to plan for or conduct EE-related content and activities. Nevertheless, time constrictions in teaching have been, for a long time, identified as a typical factor affecting the work of basic education teachers (Cohen and Manion, 1981).

Considering the above results, the analysis of RQ.3 was centred on identifying those circumstances that the teachers related to time constraints which, ultimately, impact the prioritisation and allowance given to EE-related teaching. All the teachers indicated factors, related to standardising measures and activities to enhance educational quality (these are, mainly, internal policies on student assessment, extracurricular activities, peer work, and administrative work), which stress their professional autonomy and the allocation of teaching time. Apart from Betty, all the teachers focused on external and school-level factors. This indicates that, regarding EE teaching, the emphasis on classroom level factors that is expressed in Borg's (2006) teacher cognition model did not feature strongly in this investigation (this point is expanded in Section 8.2, Chapter 8). Furthermore, some themes identified in the data (see thematic categorization in the Appendix A.14) are not discussed in

this thesis because they did not relate to RQ.3 or sometimes the links between these data and the RQ.3 were not sufficiently clear, like when the teachers talked about learning in broad terms.

6.3 Teachers' cognitions about environmental education in Year 6

This section presents the participants' cognitions of curriculum guidelines (the National Curriculum and the Year 6 programme) in relation to EE-related content. In this sense, teachers' cognitions (see the relevant theory-based decisions that were discussed in Section 2.3.5) include the views, beliefs, and knowledge through which the participants represent relevant external and internal policy about primary school teaching. First, Section 6.3.1 conveys the teachers' cognitions about teaching coverage of the Year 6 programme. This is followed by Section 6.3.2, which delivers the teachers' cognitions on the role and curricular allowance of EE in the 2011 teaching guidelines (see more about these documents in Section 1.3 and 4.1). After this, Section 6.3.3 details the links that they identified between EE and the primary school subjects of Year 6. To conclude, Section 6.3.4 reports on challenges some teachers identified regarding teaching a cross-curricular topic.

6.3.1 Perceptions of autonomy to teach environmental education

This section shows that the participants' responses are polarised in relation to how they perceive their autonomy to teach EE-related content in their lessons. The analysis identified two positions: those teachers who assert the subject content in the Year 6 Study Programme could be adapted to their teaching needs; and, those teachers stating that teachers' autonomy is restricted because they must teach the full-length of the subject content in the Year 6 programme. These views are significant cues for discussion, considering that the National Curriculum describes itself as a pedagogical proposal, which officially it does not impose teaching the full-length of the subject content. This indicated that the teachers' cognitions of their autonomy were likely to be informed by other external and internal policies or other normative practices in their schools. This theme is significant for R.Q. 3 because the way teachers interpret how much subject content they must teach can be reflected in their prioritisation of EE-related content. Especially, because EE heavily relies on teachers' prioritisation and ability to plan for cross-curricular content in core and non-core statutory subjects (Palmer, 1998).

Autonomy and flexibility to determine the depth of lessons

Santiago (School B), Isabela and Rori (School E) expressed that Year 6 curriculum is a flexible programme; and, this indicated that the full coverage of learning content is not

compulsory but left to the judgement of the teacher. Although, the flexibility regarding the coverage of subject content in class, was either not mentioned or emphasised by the rest of the participants. Santiago, for instance, indicated that the National Curriculum and the Year 6 Study Programme are flexible teaching guides:

> ***Researcher:*** *[H]ow do you, as a teacher, perceive your autonomy when you teach these topics [environmental education and sustainability]?*
>
> ***Santiago:*** *For example, the autonomy [I have] here is as follows: our country [he is referring to the Federal Ministry of Education] sends you resources - the Plan [the National Curriculum] and the specialised Study Program to each grade of Primary School. So, you have it; it's your guide for work, and the topics and the like are in there. But* ***you can decide how deep to go into each topic****. They [National Curriculum and Study Programme] do tell you what to do up to a certain point, but then there is the freedom - because it says in there that it's flexible [...]* ***So, you feel… we have a degree of freedom there: no one tells you how to teach; rather you decide for yourself*** *based on your experience and the students you have at a particular time. (B, Santiago, II, turns 42-43, researcher's emphasis: bold format)*

As mentioned previously in Chapter 5, Santiago had ten years of teaching experience and a recent teaching award at the time of his participation in this project; this suggests that he was most likely well-acquainted with the official guidelines and experienced in teaching. The evidence indicates that Santiago was clearly aware that he could go beyond the EE-related content outlined in textbooks as he acknowledges that the National Curriculum and Study Programme do not restrict his teaching autonomy—which he names freedom or liberty. Yet, in the Natural Sciences lessons of EE-related content that were documented for this investigation, Santiago strictly followed the textbook sequence (Ob. field notes, B-1S to BS-5, see Appendix A.18). This facts suggest that Santiago was not oblivious of his autonomy to adapt the coverage of lessons, thus, he was potentially restricted by factors external to his teaching and the classroom level. For instance, Santiago said that a lesson's depth can be increased by using audio-visual resources or planning school trips where children could experience nature (B, Santiago, II, turn 43), but the lack of financial and material resources frustrated his autonomy in this regard (B, Santiago, II, turn 34; B, Santiago, II, turn 44).

In relation to the evidence above, the Year 6 Study Programme recognises that the National Curriculum is a pedagogical proposal, and it emphasises the contextualization of learning (SEP, 2011b, p.91). Both the National Curriculum and Year 6 Study Programme do not demand covering the totality of the syllabus in teaching; instead, they stress reaching various sets of aims: the expected learning outcomes, curricular standards, life competencies, and so

on (SEP, 2011a, p.11; SEP, 2011b, p.244). For instance, student competences are not necessarily attained by teaching all the subject content in the programme's proposal:

> *It is important to note that working toward a competence is neither founded on addressing the [subject] content nor achieved in one school year; its attainment is a result of the intervention of all the teachers involved in the basic education of students… these [prospected competences] are the result of achieving the expected learning during the 12 years that make up basic education. (SEP, 2011b, p.246)*

This quotation shows that the Study Programme does not emphasise a requirement to covering all the subject content. In accordance to this, the participants from School E, Isabela and Rori, expressed that they plan lessons and student assessments in accordance to the expected learning outcomes in the Study Programmes. School E is a pilot-institution where educational innovations and new programmes are tested; thus, this school is a source of extraordinary teaching challenges compared to mainstream primary schools. Rori and Isabela appeared well-acquainted with the last curricular reform as they had attended multiple teacher-training courses (see Table 3.8 in Section 3.3.2 of Chapter 3), and they had experienced the challenges of working in School E. For instance, Isabela said the following:

> *[W]e have always been told textbooks are not the main resource. I mean, instead you must carefully consider [the expected learning outcomes]; and take students into account. And, if textbooks are not helpful, then we must look for something else that will bring the learning outcomes about [.] (E, Isabela, I, turn 73)*

At the initial interview, Isabela explained that during the early implementation stages of the last curricular reform they did not have up-to-date textbooks, which taught her and her colleagues to guide their work by following the expected learning outcomes. Rori and Isabela suggested that the emphasis placed on the expected learning outcomes outstrips concerns about strictly following the subject content of Study Programmes. Neither Rori nor Isabela felt their autonomy to teach EE was restricted by the official guidelines. Rori, like Santiago, said the lessons' depth depended on teachers' planning:

> *Look, the programme regularly includes it [the EE-related content]; but, for example, it does not detail the depth of a lesson. I mean, it includes the themes; it gives one the [learning] content, but it does not specify how much you can expand or trim a lesson. A lot of it depends on—this is important—teacher's knowledge, through which he or she can expand [a lesson] or teach relevant knowledge to students. (E, Rori, I, turn 106)*

In the fragment above, Rori emphasises that the teacher's subject knowledge—which, to some extent, is related to Shulman's contribution on content knowledge (1987)—determines the depth of lessons. This claim supports the aim-oriented approach in the National Curriculum

and Study Programmes, and the possibility to expand on cross-curricular content such as EE. Rori, who had 21 years of teaching experience at the time of the fieldwork, expressed feeling satisfied with the last curricular reform because she agrees with the aim-oriented and cross-disciplinary learning content in it (E, Rori, I, turn 14-18). However, Rori sometimes could not deepen her lessons further (as it happened to Santiago as well), because she was pressured to cover all the learning content of compulsory subjects:

> *A very important factor is that sometimes we do not cover all the content in time, and, then, one has to quickly teach it. And, it is not the same, right? To teach them [students] as they are supposed to be taught for them to learn. Hence, one, as a teacher, tries to work out strategies to complete everything. We, and a lot of teachers in this [school] district, are in the same situation. (E, Rori, II, turn 78)*

Rori understood there was potential in the official guides to deepen the lessons which involved EE-related content, yet she was limited by having to cover all the subject content suggested in the Study Programmes. This indicates that teachers are potentially conflicted by understanding the principles of the pedagogical proposal but having to juggle a response to policy demands on student assessment and content coverage. Despite this tension, both Rori and Isabela were keen to include EE-related content in their lessons, and they did not express feeling their autonomy limited because their Head Teacher was supportive of projects contemplating EE aims (E, Rori, II, turn 128; E, Isabela, II, turn 58). This suggests that perhaps the leadership of the school authorities, like the Head Teacher, might have a role in overcoming external pressures of accountability and standardization (this is illustrated further, ahead, in Section 6.4).

Comprehensive coverage of the subject content in the syllabus

Other participants, different from Santiago, Rori, and Isabela, identified that their autonomy to incorporate EE content was restricted by a demand to cover all the learning content of statutory subjects. A few excerpts ahead present this claim from the point of view of five teachers: Morelos and Luz from School A; Marley, from School B; Adela from School C; and, Mario, from School F. Their comments show they feel pressured to address the totality of the subject content in the Year 6 Study Programme. These views about what to teach caused some of the participants to feel time-constrained and, consequently, they translated these constraints into making EE-related content a non-priority in comparison with the statutory subjects or other teaching activities.

For example, Morelos from School A said that they, teachers, knew ‘environmental care is important’, but that it is difficult to teach it because there are other curricular demands and

priorities –like teaching literacy and numeracy skills (A, Morelos, I, turns 29-33). Similarly, Marley from School B, in the following instance, emphasises that teaching EE-related content depends on the demands in the Study Programme:

> ***Researcher:*** *[W]hat autonomy do you have in teaching environmental education and sustainability?*
>
> ***Marley:*** *LITTLE. I have little freedom because …erm... well, I have to follow a programme [the Year 6 Study Programme]. This is a programme that rules us all, and it is the guiding document. And, I have to cover all the content …erm… which is delivered in blocks [learning units] in there [...] environmental education is only a topic in one Block [in the Natural Sciences programme], so just up to that point I have to teach it. But of course, we deal with it indirectly in other subjects, like in Geography [.] (B, Marley, II, turns 76-81)*

Marley qualified his autonomy as limited. Firstly, he said that EE is 'only a topic in one block', which implies that EE is not a predominant subject in the SP—a claim that appears not to consider that EE-related content is included in four Blocks of Natural Sciences as seen in Section 4.2 of Chapter 4. Secondly, the fact that he perceives little autonomy (which he names 'freedom') to teach EE implies that, for him, greater autonomy would imply teaching EE beyond what is outlined in the syllabus. Mario, the participant from School F, perceived that his autonomy to teach EE-related content was limited as well:

> ***Researcher:*** *[H]ow do you perceive your autonomy [to teach environmental education content]?*
>
> ***Mario:*** *Well, it's very limited. Because, firstly, the teachers do not have academic freedom; we have a programme [the Study Programme] that says: 'this has to be done, this has to be done, and this is the expected learning outcome'. And, sometimes one says, 'there's one [aspect or topic] missing here', but, well... it's not in the curriculum, so I won't teach it, right? Because I can only teach these [topics] […] so, my level of autonomy is limited because there is no freedom to modify the syllabus. (F, Mario, II, turns 172-173)*

Mario, who has more than 30 years of teaching experience, related a lack of autonomy to a lack of 'academic freedom'. His perspective of academic freedom is to be able to explain—when he considers it necessary—a topic beyond what is outlined in the curriculum. Mario suggested that teaching EE topics needs specific facts from science disciplines. Likewise, Luz expressed that to teach EE it is necessary to include more subject content and time devoted to its learning activities, but she clarified that this is currently not considered in the national guidelines:

> *[I] feel we have to give more time to a practice [EE teaching/lessons] that IS NOT written anywhere in the curriculum or study programs. I mean, one has to go beyond the curriculum and the programme [.] (A, Luz, II, turns 281-282)*

Luz explained that if she wanted to see signs of environmental awareness in students' behaviour, then she had to go beyond the work suggested in the National Curriculum and Study Programmes. She believed that only teaching the EE topics from the syllabus was not enough to have a visible change in students' behaviour (A, Luz, II, turn 282). Luz did not disagree with the syllabus, but she acknowledged that the EE content in Study Programmes have limitations. Comments about teaching EE beyond the syllabus outline was not in all the cases accompanied with a perception of lacking autonomy. Regarding EE teaching, Luz said she has autonomy and support from her headmaster, but she perceived a lack of support and consistency from the school community when carrying out these type of activities (A, Luz, II, turns 306-308).

There were other apparent aspects, like personal preference and interest, related to how the teachers interpreted their autonomy to teach EE. For instance, let us consider the accounts of Adela from School C and Mario from School F. Adela expressed she was not too keen on nature whereas Mario's interest was explicit since he was a member of a local environmental activist group in Nuevo Leon (C, Adela, II, turn 163; F, Mario, II, turn 194). Hence, even though both Adela (School C) and Mario (School F) suggested the content of Study Programmes need to be fully covered, they showed contrasting perceptions of their teaching autonomy regarding EE.

On the one hand, Adela preferred what she called a 'general approach' (i.e. she addressed EE-related content lightly) in her lessons of EE content because she saw no chance to carry out experimental practices and investigation (C, Adela, II, turn 191); however, Adela made no claim of being limited to teach EE. On the other hand, since there was a need to cover specifically the content in the programme, Mario expressed he felt limited to provide further and in-depth explanations of environmental issues. He said environmental problems, like carbon emissions, would be less difficult to grasp, if students learned more about 'the chemistry behind it' and that students need learning about atomic and molecular dynamics to understand current environmental issues, like air pollution (F, Mario, II, turn 159; F, Mario, II, turn 173). Additionally, in Mario's opinion, the subject content load in the Study Programme does not consider the realities of students, teachers, and schools:

> *[I] think the curriculum is made in such a way that the people who made it [curriculum designers] at their desks did not understand how much time it is needed to apply [i.e. implement] it. And they were only thinking 'what can I include? They [the students] can do this, they can do that...', but they [curriculum designers] really did not considered THE TIME needed for a student to work at THEIR PACE [.] (F, Mario, II, turn 123)*

In the above, Mario observes that an important issue exists between the expectations of the study programmes and actual teaching and learning. Additionally, the disparities between classroom and curriculum expectations are intensified by school policies which motivate exam-oriented agendas, like teaching the full-length of the subject content in the syllabus—a point that is expanded in the results of Sections 6.3.4 and 6.4.

The teachers who expressed feeling restricted or wanting to teach EE-related content further (Marley, Mario, Luz and Rori) beyond the syllabus suggested solutions that ranged from introducing environmental science-like explanations to the creation of a separate section or a subject in the curriculum to address EE. Marley considered that the curriculum approaches EE indirectly, hence, he suggested to have EE as a subject (B, Marley, II, turn 81). Rori made a parallel claim when she said, 'I feel that environmental education should be an explicit subject, not have it [EE] related to other themes where it is only superficially learned, but a subject that will always be there' (E, Rori, I, turn 82); then, in a later interview she restated that 'maybe it is better to have a single subject, because a lot of people consider it [EE] to be isolated' (E, Rori, III, turn 384). Rori said that the many extra-curricular activities in her school diluted the emphasis of EE and suggested something like a 'permanent school campaign' about environmental care (E, Rori, III, turn 412).

Similarly, Mario reflected that '[…] the State [state-regulated education] should guide the kid [students] through a subject or area in Natural Sciences maybe about Ecology. Mario said that more specific scientific explanations could facilitate learning about environmental problems. Where the kid is taught how to care for its environment correctly.' (F, Mario, I, turn 95). Focusing on her teaching, Luz expressed that EE should have a segment—in Natural Sciences mostly—and guidebook on the matter for teachers (A, Luz, I, turn 64-66; A, Luz, III, turns 182- 186). Although, Luz did have holistic or systemic notions of environmental issues (A, Luz, I, turns 91-92). Their solutions for emphasising EE by turning it into a subject or distinctive section do not, nevertheless, indicate that these teachers believe that current environmental issues are an isolated subject (see Section 6.3.3). In fact, all of them linked multiple factors and consequences when describing current environmental challenges.

Nevertheless, the suggestions of these teachers are counterintuitive since they also expressed concerns about the amount of content in the syllabus and the time they have allocated for

teaching, to which adding another subject would not help. Besides the solutions suggested by Mario, Marley, Rori, and Luz are perhaps more elaborate (as more levels of policy are involved) than using the expected learning outcomes more actively—as the teachers from School E suggested. Nevertheless, guiding teaching of EE-related topic through the expected learning outcomes is not a free-of-conflict solution since, for instance, Mario said **'**we have noticed that the expected learning outcomes have gaps between them' (F, Mario, II, turn 173); he thought that including scientific explanations would bridge some of these gaps in learning.

6.3.2 The curricular space for environmental education: links and connections across subjects

All the teachers participating in this project identified cross-curricular spaces and pedagogies for EE in primary school, mainly when speaking of the Year 6 programme (see cross-curricular in Section 2.2.6). Finding relevant subject content or skills to link EE is a pedagogic notion that indicates potential for a fully developed cross-curricular design. In fact, all the scenarios in which the participants described teaching EE with other subjects suggest acquaintance with some of Barnes' (2011) cross-curricular teaching types (see Section 2.2.6 in Chapter 2). The results, however, suggest that the cross-curricular notions shared by the teachers are potentially underdeveloped. The teachers suggested finding 'links' or 'connections' between EE and the Year 6 subjects and finding connections between subjects through EE-related content. These notions are illustrated by their examples of casually 'linking' EE to learning content or developing disciplinary skills whilst having EE-related content in the background, which are offered in the following paragraphs and the subsequent section.

Officially, EE is a socially-relevant theme in the 2011 National Curriculum that can 'form part of more than one curricular space or subject', allowing much room for interpretation (SEP, 2011a, p.36). From the 11 participants, José and Santiago clearly identified and articulated that EE is officially a cross-curricular theme in the National Curriculum:

> *Yes, we had heard [the term EE] before, since it is a very common term in the media, and because this part of the knowledge that we teachers have of the National Curriculum. The National Curriculum specifies 12 pedagogical principles and incorporating socially relevant themes is mentioned within these 12 pedagogical principles. And* ***environmental education is one of them*** *[the socially relevant themes]. [EE] is a transversal theme taught in different subjects and in all school years. (C, José, I, turn 102, researcher's emphasis: bold format)*

Likewise, Santiago indicated that EE is a theme which has been in the primary school curriculum for years:

> *I have been a classroom teacher for 12 years and in every [school] year that I taught we have talked about environmental care […] there is a specific part in the curriculum that determines it [EE] as a theme, as content for all the grades [school years] or it is repeated in most grades. (B, Santiago, I, turn 62)*

In the 2011 National Curriculum, EE is one of the 11 socially-relevant themes which are recommended to embed across the statutory subjects. The socially relevant themes stress the adoption of various specific values and attitudes, and they are meant to provide students with an opportunity to apply their learning in real life problems (SEP, 2011a). The socially-relevant themes are, therefore, an indication that the 2011 National Curriculum and Study Programmes for primary school associate cross-curricular content with creating meaningful learning experiences. As such, cross-curricular content and pedagogies were featured promoted by the official documents. Correspondingly, in her first interview Adela commented the following:

> *[I]t [the Year 6 Study Programme] is comprehensive [in relation to the subject content] and the subjects are interrelated. For instance, when talking about the responsibility of taking care of oneself and others in either Geography or Civics and Ethics Education. So, I would say that the study plan [National Curriculum] is comprehensive [.] (C, Adela, I, turn, 4)*

The National Curriculum in Mexico is an integrated pedagogical proposal that promotes connectivity in teaching and learning (see Sections 1.3, Chapter 1 and 4.1, Chapter 4). In fact, teachers from School C and School E, Betty and Rori, observed that the 2009 curricular reform to primary education had introduced the interrelation between subjects through learning outcomes and student projects (C, Betty, I, turn 71; E, Rori, I, turn 18). In primary school, additional strategies are generally adopted to encourage a cross-curricular treatment of the learning content. The Year 6 Programme, for instance, suggests using a subject as an 'axis' to orient other subjects and the socially relevant themes (SEP, 2011b, p.178), and it promotes a project-based learning model to motivate cross-curricular teaching (SEP, 2011b). In sum, the cross-curricular notions in the official documents are manifest.

Apart from the School E teachers, Isabela and Rori, cross-curricular pedagogies did not feature strongly in the teachers' interviews and observation sessions. This study found that most participant-teachers often suggested to link subject content in single lessons rather than creating cross-curricular learning sequences or cross-disciplinary projects. Adela and Rori, from School C and School E, expressed that 'linking' the syllabus gave students a sense of reality and knowledge applicability (C, Adela, I, turn 6; C, Adela, II, turn 143; E, Rori, II, turn 112), yet the data collection of this project only contains basic cognitions of cross-

curricular teaching. José, who is a teacher educator, expressed that identifying links between subjects was more common than cross-curricular teaching:

> *Not so much transversally [across the curriculum], **but we do look to link** [EE-related] **content**. We want students themselves to identify that what is being taught in a subject is VERY similar to what is being taught in another [subject] or it is the same knowledge. (C, José, I, turn 108, researcher's emphasis: bold format)*

Below, in the excerpt, Morelos identifies how EE can 'link' to other subjects:

> ***Researcher:** This activity about the drawing[28] is interesting. In which subject were you teaching it? Because I don´t think you had sciences yesterday.*
>
> ***Morelos:** No, no. We were working on it in Spanish [Literacy].*
>
> ***Researcher**: Ah okay.*
>
> ***Morelos:** Yes, this is because there are certain times where some topics can be linked. But it [the drawing activity] fits a lot in the environmental care project.*
>
> ***Researcher:** So, what subjects do you believe can be linked to environmental education topics?*
>
> ***Morelos:** Well, all of them… (A, Morelos, I, turns 110-117)*

Morelos' drawing activity asked students to reflect, narrate, and draw the potential changes of the landscape surrounding School A from one time to another. This lesson encouraged reflection upon the interactions and links between humans and the natural environment—which is the main object of study in EE. In most instances, Morelos showed that he had a predisposition to associate EE with Natural Sciences, but he also displayed, like Betty, José, Isabela, or Marley did as well, some of his attempts to embed EE in other subjects. Isabela, for instance, said the following:

> ***Researcher:** So, can you remember there being any connection between EE and the Year 6 programme? You mentioned before that…*
>
> ***Isabela**: [EE-related topics] are mainly addressed in Civic and Ethics or we [teachers] link it to other subjects as we go along [with the teaching]. (E, Isabela, I, turns 126-127)*

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[28] The activity referred in this excerpt was discussed more in detail in Section 5.2.1, Chapter 5.

Like Isabela, the participants rarely mentioned an intended approach to cross-curricular teaching; they were more used to talk about the possibilities of linking subject content instinctively. Barnes (2011) describes this strategy as a type of cross-curricular teaching that he calls 'opportunistic'. According to Barnes, this type of cross-curricular teaching involves exploiting unpredictable and child-led learning opportunities. Esteban, for instance, expressed that incorporating EE in his lessons was most likely the result of an unplanned or spontaneous teaching exercise:

> ***Researcher:*** *Okay. Since when do you remember teaching activities or topics that relate to environmental education?*
>
> ***Esteban:*** *Mmm I have taught Year 6 for many years now.*
>
> ***Researcher:*** *Yes…*
>
> ***Esteban:*** *In fact, you adapt your class based on the topic. I mean, environmental education is not very explicit, but you teach it depending on the topic. I mean, [the study programme or textbooks] doesn't specify that you have to teach environmental education—NO it doesn't. But when you see what's written in the text, you work with it. And,* ***that is how you unconsciously teach environmental education****. Examples emerge when they [students] comment something about pollution, maybe about rivers or about air pollution…or about water. I don't know, I mean, situations [to address EE] happen. But it's not specifically indicated that "because of 'X' air pollution must be imparted". NO.* ***I mean, it just happens****. (D, Esteban, I, turns 76-79, bold format: researcher's emphasis)*

Esteban did not identify that imparting EE was an explicit suggestion or aim in the curriculum. He did, however, identify that themes relevant to EE are implicit or could spontaneously be embedded to lessons. Later in this interview, Esteban expressed that EE topics could be studied in the learning activities of Spanish (while practicing reading comprehension) and in Geography (while discussing international economy and pollution) (D, Esteban, I, turns 82-89). The emphasis made by Esteban suggested that teaching EE was a consequence of covering disciplinary content from other subjects, and sometimes this was done in an opportunistic manner. In explaining how EE can be connected to the Year 6 programme, Santiago from School B displayed similar ideas about the curriculum:

> ***Researcher:*** *So, you have linked [EE-related] activities or projects [with other subjects]?*
>
> ***Santiago:*** *Yes, yes they can be connected because… in History, for example, there is a link when you talk about fossils. And so, one says "there is a connection there because you know that fossils are a way to locate particular eras or particular years, right?" [As if he was talking to his students].* ***It must be admitted that everything is linked together in the current reform [RIEB] I mean, there is nothing separated****. If you are teaching Mathematics you can devise a problem-situation: I don't know… about these many trees, which have been cut down, and that a fine – of I do not know how much money – is going to be charged. So, how much would a person have to pay if they dare to harm a forest or… or something like that, and one is link it [to EE]. For example, in Spanish, you can ask them [pupils] to write an opinion about environmental care and they would be making a composition. Geography is also connected to it, because Geography studies animals and natural regions. Also, we already talked about the values in regards to Civics and Ethics. In general, all activities are much related. (B, Santiago, I, turns 93-94, bold format: researcher's emphasis)*

Santiago said that he always tried to connect EE with Natural Sciences (Ob. field notes, BS-5), but the quotation suggests that he perceives potential to teach it in or through other subjects as well. Most importantly, Santiago's descriptive account suggests the envisioning of a hierarchical type of cross-curricular teaching, which was identified in many of the participants' accounts. According to Barnes (2011), 'hierarchical' cross-curricular teaching involves seeking for progress or improvement in one discipline by making use of aspects of another subject.

From the accounts of nine participants, EE-related content was mostly peripherally associated to the Year 6 subjects and not treated as part of a cross-curricular project. The examples, above, of Morelos, Isabela, Esteban, and Santiago illustrate how the participant-teachers, were often not proposing to analyse one environmental issue or topic through the lenses of different subjects, but to address environmental issues or concerns as background information in a lesson. This treatment of EE carries the risk of using it as a mean to an end, which reduces the chances of making EE the central aim of a learning activity (Tan and Pedretti, 2010, p.64).

Other teachers, like Isabela or Rori from School E, expressed explicit interest in giving EE a prominent place in their teaching activities. Isabela, Rori, and other teachers in School E, identified the expected learning outcomes relevant to EE and sustainability and made them focal points in learning activities. Isabela's, for instance, combined both learning about specific environmental problems and the expected learning outcomes of the Year 6 programme in developing a student-led project which was motivated by a local museum:

Researcher: What expected learning is being achieved [in the EE-related student project she was working on]?

> ***Isabela:*** *In Natural Sciences, I teach about recycling. In fact, recycling paper, the three R's—now they are five R's—are included in the learning outcome of Natural Sciences; and, that is what I think this project achieves […] Plus and depending on what I can fit [in the project], like, I can work Spanish into it. Currently, I am teaching the 'opinion letter'… we can include 'the conference' and make an opinion letter about the people who are conducting the conference and that is how they practice writing an opinion letter. Then, if I include figures, I am fitting Mathematics into it. So, it depends on how I plan it. (E, Isabela, I, turns 156-159)*

Later in the same interview, Isabela emphasised:

> *[The EE-related student project] is not another subject or an extra mark, because the project is embedded in all subjects. Maybe we focus a bit more on Natural Sciences. (E, Isabela, I, turn 169)*

The treatment of EE-related content that Isabela and Rori discussed at their interviews often suggested a multidisciplinary cross-curricular strategy—rather than, for example, using EE mostly as background information to learn about a subject or a skill. Barnes (2011) proposes that the multi-disciplinary cross-curricular approach is simpler since it attempts to improve performance in different subjects by focusing on a single topic or problem. In broad terms, the multidisciplinary approach uses a single topic or problem to motivate learning progress in various disciplines (Drake, and Burns, 2004).

In this section, the results present that the teachers displayed differences in the prominence given to EE in the learning activities. They suggest opportunistic and hierarchical cross-curricular teaching strategies (using EE-related content to improve skills in other disciplines) and multidisciplinary cross-curricular teaching (using different subjects to address EE -related content). Hence, the purpose of this section was to illustrate the type of relationship that the participants perceived between the Year 6 syllabus and EE. However, an overall readiness to link EE with certain subjects, like Science or Geography, was also displayed by the participants. In the following section, the analysis is furthered by shedding light on that relationship at the subject level, which attempts to be a more specific display of where they 'link' EE in Year 6. Hence, the next section shows the potential links that teachers identify between EE and the statutory subjects.

6.3.3 Specific associations between subjects and environmental education

All the interviewed teachers could grasp or describe links between EE and Natural Sciences and Geography, as these subjects include the teaching of natural and social phenomena. In

addition, half of the participants identified that EE could be addressed from Civics and Ethics Education as well. The claims of these teachers are divided between the opportunities provided by Civics and Ethics Education to promote sustainability and values essential to environmental care. In Spanish and Mathematics, EE was mostly described as a situation or problem in which students would practice skills pertaining to these subjects. History was mentioned by a few teachers; they said that past historical facts could shed light on the study of the environment and environmental issues. Arts and EE was not directly addressed by the teachers, but Luz, Betty, Rori and Isabela, for instance, gave examples of artwork made from reused materials. The rest of the subjects Physical Education, Second (or Foreing) Language Education or Information and Communication Technology were not mentioned in relation to EE, possibly because these subjects are taught by part time teachers specialized in these subjects and not by the classroom teachers. The next paragraphs offer more detail and data examples from these results.

When talking about the Year 6 programme, all the teachers associated EE with Natural Sciences, Geography, Civics and Ethics Education, revealing cognitions about the cross-curricular possibilities of EE-related content. Additionally, they often associated the three R's (i.e. reducing, reusing, and recycling), pollution issues, and broad notions of sustainability as EE-related content. For instance, José, from School C, associated the following topics as EE-related content:

> *Currently in Year 6 we are working with responsible consumption: they [pupils] identify when a consumption practice is responsible or when it isn't; [we also cover] some strategies for the preservation of species; what sustainability is… sustainable development. These are basically the topics we address the most. (C, José, I, turn 104)*

After this answer, José was encouraged to identify the relation of these topics with the subjects of the curriculum:

> ***Researcher:*** *It's not clear to me, where in the curriculum are these topics mentioned… In which subject?*
>
> ***José:*** *We work with them in Natural Sciences—because Civics and Ethics Education is the core of transversal [i.e. cross-curricular] topics—so [EE] is one of the transversal themes and is studied in subjects like Natural Sciences as well as in Geography. It might even be a little bit related to Spanish [Literacy] […] but, basically, these [transversal] topics are concentrated in Civics and Ethics Education, History, Geography, and Natural Sciences for Year 6. (C, José, I, turns 105-108)*

Marley from School B, for instance, did not agree that EE was largely included in the Natural Sciences. In the fragment below, Marley talks about the content in Year 6 Natural Sciences and EE:

> ***Researcher:*** *[…] how would you describe the Year 6 curriculum? Because you were telling me a little bit about that [.]*
>
> ***Marley:*** *Yes. Look, this curriculum, in regards to sciences—to the study of sciences— is focused on other phenomena: human evolution theories, natural selection, fossils, fossil records, sex education, but in regards to environmental education or environmental care there is nothing concrete. It is only mentioned in one single lesson and there is ONE project about environmental care. But it [the Natural Sciences curriculum] is more general and more focused on other areas of study in science rather than on environmental education. (B, Marley, I, turns 3-4)*

Marley's assertion that EE is only present in one lesson and one project is inaccurate since the Year 6 Study Programme contemplates cross-curricular aims and learning content, and at least 6 lessons in Natural Sciences (SEP, 2011b). Nevertheless, the relationship between EE and Civics and Ethics Education featured strongly in half of the teachers, suggesting a further depiction of EE as a socially-relevant theme for citizenship. The cross-disciplinary nature of EE-related content was also noted by students; Rori from School E, who tried to link her lessons across subjects, emphasised the cross-curricular role of EE-related content by expressing the puzzlement she has perceived in her students when teaching a topic across subjects:

> *[F]or instance, in this two-month period [block unit/learning unit] we are studying environmental care and protection, taking care of living beings, and we relate it to evolution and extinction. When we're talking about extinction, the kids say: 'Are we in History or in Science, teacher?' And I say: 'We are studying both, because science also has its history'. So, this is what I'm saying: the links between topics. I think more than anything else it's about making the kids ecologically aware. I mean, to be aware of the causes and consequences we have as human beings, right? (E, Rori, I, turns 120-124)*

In contrast to José's and Rori's view, at least four teachers, Luz, Morelos, Marley, and Isabela, showed a clear disposition to link Natural Sciences and Geography with studying environmental phenomena or the environment, which Marley indicated is different to the attitudinal and behavioural focus of EE (B, Marley, II, turn 83). The next fragment shows Luz's reflecting on how Natural Sciences compares to other subjects:

> *[…] They [the subjects different to Natural Sciences] are more descriptive. Geography, in some parts, is the only one that connects more with it [Natural Sciences]. Especially when it [Geography] deals with the environmental material […] in some parts, the similarities are such that you then think "it seems like I am talking about the same thing in Geography and Sciences". Whereas in History and in Civics and Ethics Education… well yeah, these subjects study society, humanity, but they do not study the environment, not so much. (A, Luz, I, turn 55)*

The outcomes show that the ability of the participants to identify and relate EE across the Year 6 programme depends on the familiarity they had with the National Curriculum, Study Programmes, textbooks, and their interest in EE topics. Luz, although she had more than 30 years of experience teaching, expressed that she was not familiarised with the Year 6 textbooks because she said there had been some changes in these resources and she was teaching in Year 4 the previous year (A, Luz, I, extended notes).

Luz's conceptions about EE, like most teachers, focus on conservation and management of local resources (see Appendix 17.1), which is highlighted in the EE-related content of these subjects. She associated EE to the study of natural and social phenomena related to environmental problems like climate change and global warming (A, Luz, I, turns 71-80; A, Luz, I, turns 89-92). However, in the following interviews, and as results of looking through the textbooks to locate EE, Luz extended her views about EE and its links in the curriculum. In the intermediate and final interviews, Luz suggested that Civics and Ethics Education could be linked as well. She indicated that Civics and Ethics Education includes sustainability and 'the four pillars of environmental care'—she quotes from the Civics and Ethics textbook—, which she understood are connected to the EE-related content in Natural Sciences (A, Luz, II, turn 284; A, Luz, III, turns 137-140).

Like Luz, Santiago connected Natural Sciences and Civics and Ethics Education with EE; he suggested promoting the value of respect is a potential link between these subjects and EE. Santiago in fact showed emphasis on promoting environmental awareness through pertinent values (see his profile matrix in Appendix 17.4). The emphasis of teaching EE across the subjects also stressed relevance with the local environment. For example, Adela linked Civics and Ethics Education and Natural Sciences when speaking about 'taking care of the place where you live'. The former points are illustrated, below, in two interview excerpts from Santiago and Adela:

> ***Researcher:*** *[…] where [in the Year 6 curriculum] do you think that environmental education themes appear more prominently?*
>
> ***Santiago:*** *Well, it [EE] is a bit more evident in Natural Sciences. But I was also telling you that it is linked with Civics and Ethics Education because it is [part of] the "culture of values"*[29]*. They are related [the culture of values] because one must have respect as a value [and] guidance to interact with the environment [.] (B, Santiago, I, turns 51-52)*

Similarly, Adela expressed:

> ***Researcher:*** *How do you consider the role of Natural Sciences in comparison to other subjects in Year 6? […]*
>
> ***Adela:*** Well, it [Natural Sciences] is very close to the reality we are currently living [...] *[Adela then describes a lesson about sustainability]*. That also makes them [pupils] see. For example, it's related to Civics and Ethics; that it [Natural Sciences] is not just about taking care of oneself; it entails taking care of the future of the place where they are living. *(C, Adela, I, turns 27-30)*

Cross-curricular teaching is particularly supported in Civics and Ethics Education because the nature of the subject allows more chances to conjugate knowledge, skills, attitudes and values in activities that, for instance, ingrate these aspects in a single project (SEP, 2011b, p.179). At least seven out of the eleven participants, clearly pointed out the possibility to teach EE in Civics and Ethics Education. Rori, Santiago, Adela, Marley and Mario highlighted the relationship of EE with the values that are promoted in Civics and Ethics Education (B, Marley, II, turn 83; B, Santiago, I, turn 92; C, Adela, I, turn 4; E, Rori, III, turn 362; F, Mario, I, turns 143-154), while José, Luz, and Betty specified that there are sustainability topics contained in the Year 6 Civics and Ethics Education syllabus (A, Luz, III, turn 130; A, Luz, III, turn 140; C, José, I, turn 104-108; C, Betty, III, turn 351). Together, Civics and Ethics Education and the values promoted in EE lessons foster the coexistence competence—a result discussed in Section 4.2.1. The following quotation presents a brief excerpt from Rori in which she asserts the link between environmental care and Civics and Ethics Education:

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29 In the research context having a 'culture' about 'x' refers to possessing a set of traditions and customs which are perceived as characteristic of an informed or educated person. In this case 'culture of values' means knowing and practicing a set of universal moral values that are considered important for coexistence.

> *For example, in Civics and Ethics Education, I include environmental care and protection a lot. It is there [in Civics and Ethics Education], and that makes the kid [primary school students] reflect…to try and make him [sic.] use empathy […] I mean you see the lesson, but also to make him [sic.] reflect. (E, Rori, III, turn 359)*

Some of the teachers described ways in which EE can be incorporated into learning activities for Mathematics and Spanish. The links between EE and Mathematics and Spanish were often focused on having EE-related content as the context of learning activities. For Mathematics (numeracy) the teachers' depictions include activities like counting trees (E, Rori, III, turn 364), devising a problematic situation where logical reasoning is necessary (B, Santiago, I, turn 92; E, Isabela, I, turn 151), or using recycling materials in a game that includes practicing numeracy skills (C, Betty, III, turn 319-325). The teachers claimed that, for Spanish, the learning activities could include a writing task (A, Luz, II, turn 376; A, Morelos, I, turn 110-11; B, Santiago, I, turn 92; C, Adela, II, turn 135; E, Isabela, I, turn 151; E, Rori, III, turn 364), reading comprehension practice (D, Esteban, I, turns 82-86) and planning a project (C, José, I, turns 104-108). Betty correlated teachers' creativity with introducing EE across the subjects:

> *[I] mean, to link subjects is all about letting your imagination run wild. Maybe there are themes not linked in the same block [two-month period], but they are in the same school Year […] Like the reusing theme [the three R's] is in a different block in Civics and Ethics [from Natural Sciences]. So, one says "I could have taken advantage of the fact that I was going to teach it [the three R's] in Natural Sciences since it is also in Civics and Ethics… and one could have even linked it with Maths and w.i.t.h Spanish". (C, Betty, III, turn 353)*

Betty was talking about how one of her peers who combines the environmental dimension with Mathematics by reusing material (for example, paper) in learning activities. The quotation shows Betty reflecting on the opportunities she missed to link EE content across subjects in the previous learning unit. This was the first time Betty was teaching in Year 6; and, she often expressed her concerns and the challenges of teaching older students since most of her career she had taught in Year 1 and Year 2 (e.g. C, Betty, I, turn 20; C, Betty, III, turn 99; C, Betty, III, turn 143; C, Betty, III, turn 399). Her lack of familiarisation with the Year 6 Study Programme seemed to make it harder for her to connect EE-related themes across the subject content. To Rori, the teacher's experience and creativity are relevant factors in teaching cross-curricular content:

> ***Researcher:*** *Have you been able to combine Natural Sciences with Civics and Ethics? Because I have heard that the blocks are a bit out of sync, but…*
>
> ***Rori:*** *Well, NO, even if they are in sync, I feel that one as a teacher must find a way […] for example, play writing in Spanish, erm in Mathematics, counting how many trees are needed to make paper. I mean, when ONE has [teaching] experience, you can make links even if it is not [explicit] in the content or even if it is not related. You must find a way to use, I mean, to manage the [subject] content. (E, Rori, III, turns 363-364)*

Rori cited examples of how to introduce EE in Maths and Spanish lessons to indicate that it is possible to overcome the challenges of teaching cross-curricular content. In her view, it was the teacher's experience and readiness that helped in finding solutions to cross-curricular teaching challenges. Some of the challenges of cross-curricular teaching EE featured in the interviews of a few of the teachers participating in this project. The following section discusses these challenges.

6.3.4 Challenges in teaching cross-curricular content

Managing the cross-curricular learning content of Year 6 programme is not without challenges for the teachers. Challenges of teaching EE in Year 6 were mentioned by nine out of the eleven participants. The challenges mentioned by the teachers range from planning cross-curricular teaching to the impact of external and school-level policies. These challenges are a combination of external, school, and classroom level factors.

Marley said '[…] and that [teaching EE content across the curriculum] depends on the teachers' teaching; they must know when to link EE topics with the subjects' (B, Marley, I, turns 44). Marley, himself, seemed to struggle with finding links between EE and the statutory subjects; during field work it was documented that Marley found some Geography lessons unrelated to EE, although these lessons had evident potential for such relatedness (Ob. field notes, BM-3). Similarly, Rori indicated that the ability to 'manage the content' depends on the teacher's experience and creativity; according to her, the more experience the easier it can be to manage learning content and cover specific needs in class (E, Rori, III, turns 363-364).

Overall, teachers of various experiences expressed finding challenges in trying to address the learning content in a cross-curricular manner. For instance, Luz has been teaching for over 30 years whilst Isabela has been teaching over a decade, they described the challenges of managing the programme as follows:

> *Sometimes, when I follow my plan, after I finish I say: 'I should have done this…I should have put all that together in this [lesson] and it would have been easier'. Since there have been changes in plans and programmes, and BECAUSE one is also swapped across the school years then one does not have consistency in a school year, one does not become imbued with this [then she talks about changes in revised versions of the textbooks…] when one is about to grasp something, then it changes. So, I think, it depends a lot on experience. (A, Luz, II, turn 298)*

Isabela, like Luz, comments on these matters in the following excerpt:

> *We are using a 2011 NC and currently it [the Natural Sciences textbook] is still out of sync […] Some of the textbooks have already been coordinated [with the Study Programme]; like Spanish, which was just adjusted this year […] One topic, "the galaxies" is in Block 5 [of the Natural Sciences textbook], but it's in Block 4 of the syllabus. So, we got out of sync there [...] The Civics and Ethics Education textbook is another one that is now very well synchronised, with Natural Sciences – but NOT according to the syllabus. […] It is a bit messy and we must be well-acquainted with the textbooks to implement [them in line with the syllabus]. For example,* ***even though I have taught Year 6 for many years, I now have to go back to the beginning. I had to re-familiarise myself with the books*** *to see what had changed and then work them with the kids. But now Civics and Ethics is closely linked to Natural Sciences [textbooks], but last year it was different. (E, Isabela, I, turns 55-63, researcher's emphasis: bold format)*

The quotations from Luz and Isabela suggest that a key matter to manage the Study Programmes is to be familiar and well-acquainted with it. This becomes a challenge when they have to learn different Study Programmes (there are six, one per school year or grade) and when the Study Programmes are not coordinated with the student textbooks. The latter was explicitly mentioned by three participant-teachers from three different schools (i.e. A, Morelos, I, turn 45; C, Adela, I, turn 128; E, Isabela, I, turn 187). For instance, changes to the 2009 and 2011 the National Curriculum involved various adjustments and changes in the curriculum guidelines (Paredes-Chi and Viga-de Alva, 2017). During fieldwork, the teachers were still acclimatising to Spanish now being the 'axis subject' or 'pedagogical axis', considering that this role was previously assigned to Civics and Ethics Education. Adela (School C) and Isabela (School E) talked about this change and they expressed feeling disoriented at first, but eventually found solutions (C, Adela, I, turn 128; E, Isabela, I, turn 187). These issues are challenges for teaching which might impact on their ability to plan for lessons, including cross-curricular content like EE. Isabela expressed this point in the following when she talks about EE and the changes in official documents:

> *[T]his two-month period I will also teach about the environment in Civics and Ethics Education…they are also anchored in Geography […] but I believe that next year or in a year or two the National Curriculum will change again and JUST when the books are being adjusted [with the official documents]. **What we have these days is a total mismatch**. But we base our work with the kids on the expected learning outcomes. The questions in [student] assessments are also designed according to the expected learning [outcomes]. Sometimes we don't take the textbooks into account [for the assessments] because they are out of sync. (E, Isabela, I, turns 65-67, researcher's emphasis: bold format)*

Other issues were addressed by the participants when discussing the possibilities to teach EE content. Luz and Morelos expressed that teaching cross-curricular content was 'complex' (A, Morelos, I, turn 127; A, Luz, II, turn 298). On the one hand, Morelos said that teaching 'about the environment' is given less emphasis than the statutory subjects because, in Mexico, helping students to improve in Maths and Spanish is a priority. Luz, on the other hand, attributed the complexity of teaching cross-curricular content to inadequacies in her planning. Luz describes it in the following passage:

> *Unfortunately, sometimes we teach the Sciences' Lesson 1 with the Social Practice project 1; this topic from Geography with lesson 1 of another subject; and, [Lesson] 1 with [Lesson] 1, 1 with 1 [i.e. she guides her teaching according to the topic sequence in the Year 6 textbooks]. Then, one realises "My word! If I had taught [Block or learning unit] 4 instead of 1… I should have taught 2 and not 1". So that's when, with teaching experience, you say: "Nah… **I still have to teach them all anyway**". That is unfortunately what happens. (A, Luz, II, turn 394, researcher's emphasis: bold format)*

Luz said that when the curricular reform was introduced, she was informed that her planning should aim to find connections between the socially-relevant topics (cross-curricular content) and the statutory subjects (A, Luz, II, turn 390). However, Luz said that sometimes it did not work that way for her. The teachers are, generally, asked to cover all the learning content in textbooks, hence, cross-curricular teaching might—like in Luz's comment above—be perceived as an unnecessary strategy. The drive to teach all the content in the programmes or textbook is often related to preparing students for summative learning assessments in which EE, as a cross-disciplinary area, does not feature as a concern for learning assessments.

Preparing students for assessments, coordinating teaching between colleagues, and external supervisions of teaching are three circumstances that were mentioned in the interviews and noticed in the observation reports produced during the fieldwork of this project (see the observation reports in appendix A.18). For instance, a common practice among the teachers is to prepare students for regional and national learning assessments and this, for teachers and school authorities, seems to involve following the learning content as suggested in textbooks

(see examples of this in Appendix A.18, which includes a summary of the reports). As mentioned earlier in this chapter, the observation reports show that eight out of eleven participants taught Natural Sciences by following the sequence in the textbook. The other three teachers (Rori, Isabela, and Mario) presented a session in which they only used a few elements from the textbook and the rest were their own learning sequences (although these participants were only observed once).

The result of concentrating on following the sequence in textbooks is, nevertheless, counterproductive to teaching cross-curricular content (i.e. EE). Another result of the pressure on cross-curricular content and posed by student tests is the standardization of teaching. For instance, the participants from School C explained that having to teach at the same pace as their peers to prepare students equally for exams and this meant teaching the same content from the textbooks and doing it at a similar pace. According to José, this situation in School C limits his and his peers' opportunities to teach cross-curricular content:

> *[I]n this institution [School C] the curriculum is not presented to us as being very flexible. Since there are three [Year 6] classes—in this case there are three—we have to advance at the same pace. Even the Ministry of Education asks us to work with the same learning content from the blocks [learning units in textbooks]. So, let's say we work with a transversal [cross-curricular] topic that in another subject is in a different block. Sometimes it´s a bit MORE difficult to change and work with it [cross-curricular topic] if it goes beyond the block we're teaching. (C, José, I, turns 110-112)*

A little further ahead in this interview, José explained that this policy was a way to prepare students for assessments by making sure they (i.e. teachers) all had a similar progress in the programme (C, José, I, turn 114). He claimed that it could become 'a bit more complicated' when a teacher tried adjusting his or her planning to include needs of his or her class. This was described as 'complicated' because it might mean changing the group dynamic or teaching pace (from all the teachers teaching in the same year) and make further agreements to achieve such changes (e.g. a class needs) (C, José, I, turn 114). These tensions seem to be connected to factors external to teachers and their classroom—although they impact on teaching—, and they are detailed in Section 6.4.1. Regarding the challenges of teaching cross-curricular content, Betty, José's colleague, perceived similar difficulties:

> ***Researcher:*** *With regards to the assessments, what would be the impact of combining topics from different blocks?*
>
> ***Betty:*** *[…] I think that it wouldn't be so much trouble […] if there was only one class [in Year 6], because you're going to teach it anyway. Maybe, I don't know, when it came to teach a topic repeated in Block 5, you would skip it and you'd leave that topic or lesson behind and you'd be moving on. But if you skip a [lesson] from here to teach another one from there [from a Block further ahead], well the students wouldn't receive that class anymore. And that's where they are going to be affected, because there's three of us [teachers]… maybe if there was just one [teacher] it would be easier. I mean we have to teach all [the syllabus] anyway.*
>
> ***Researcher:*** *And, since you're three you must work at the same pace?*
>
> ***Betty:*** *Yes, and that's another thing that impacts us a little bit. I mean, because there's three of us, we have to finish [at the same time]. I mean, we have to teach x amount of lessons or topic in x amount of time. (C, Betty, III, turns 356-373)*

These results highlight that there was no mention of planning for the teaching of cross-curricular content prior to teaching. Betty could imagine that if there was only one Year 6 class in her school, then amends could be made to freely include teaching of cross-curricular content. The teachers in the full-time School E managed to teach cross-curricular content throughout the statutory subjects, however, having to follow a compulsory subject-based timetable made it a challenge for them. In the following fragment, Isabela describes how she responds to external supervision of her timetable from authorities of the Ministry of Education:

> ***Researcher:*** *So, do you still do what was the tradition with the timetables? For instance, one hour for Maths, one hour for Spanish, one hour for Sciences, or you do not do it like that anymore?*
>
> ***Isabela:*** *I put a timetable up because they are asking me to make a timetable, but I don't follow it. I can teach two subjects at the same time and it saves me space [teaching time] […]* ***People from the Ministry of Education come to the full-time schools and check that we are following a timetable; they are called audits****. They expect we do the following: "Kids, we're going to start with Spanish now. That's done. Now let's carry on with Mathematics". But that's not how I do it; besides if I do it like that the kid [students] wouldn't enjoy it. (E, Isabela, I, turns 238-247, researcher's emphasis: bold format)*

In the following passage—which is part of the intermediate interview—Isabela was asked to explain further how having to work with a timetable affected her work:

> ***Researcher:*** *This idea of transdisciplinary work and at the same time being asked to do a timetable…how does that affect the way you're doing things?*
>
> ***Isabela:*** *Well it affects me, for example, when they come to check on us. You say "Agh, now I have to work using the timetable", and we're not used to working by following a timetable. Right now, for instance, we have a visitor [she means an external auditor] that we weren't expecting; they are going to check a class. They are going to check that, well, it [class] has its timetable, and that we're working according to the full-time school guidelines […] So, I do not know, I quickly have to put everything back in its place [i.e. back to the timetable and put benches back in place] … work fast with the class and organize that in case they COME to check. Here [in School E] is like: "I have a timetable; I don't use it, but here it is" [laughs nervously]. (E, Isabela, II, turns 69-70)*

The fragments show that there is a conflict between the interest of the educational authorities (external to the school) to control what happens in full-time schools with cases like Isabela's and perhaps the rest of the teachers in School E. Isabela further detailed that the unexpected audit caused her to shift activities and pretend she was following the required timetable (E, Isabela, II, turn 76) while Isabela's students were working on a scale model—an Art project related to History. Isabela said, 'If they [external authorities] go now students are working in teams, and that is great, BUT that has to be in the afternoon' (E, Isabela, II, turn 78). During the afternoon, Isabela explained, is when Arts should be taught.

The outcomes of this and the previous section reveal that the teachers' conceptions about EE and its space in the curriculum are not isolated from the impact of their immediate context in schools. All the participants in one way or another talked about factors that stressed their ability to allocate time for teaching related to EE and design cross-curricular plans. The next section explores how leadership in schools, which is expressed in cultural practices and reflected in internal policies, is a key factor in providing teaching and learning opportunities for EE.

6.4 Implications of leadership, culture, and policies in schools for environmental education

The purpose of this section is to highlight the importance of leadership in schools to negotiate teaching and learning spaces for EE-related content. Sections 6.4.1 and 6.4.2 present the views of the participant-teachers from School C and School E—five teachers in total; almost a 50% of the participants—about factors in their schools that hinder or support teaching of EE-related content and activities. School C and School E are thriving schools in their context, although both have different cultures regarding leadership and student learning.

The theme of culture in schools is broad and idiosyncratic; the members of organisational and occupational cultures, like in schools, share, to some extent, similar worldviews, cognitions and behaviours (Wedell and Malderez, 2013). This is close to what Prosser (1999) considered as *generic culture* in schools; general and shared norms and policies, structures, rituals, traditions and values. Yet, because there is always a degree of autonomy to interpret generic cultures, schools often create their own *unique culture* (ibid.). Unique cultures are equally interpreted by its participants, who generate a *perceived culture* which is populated with the values and beliefs from its observers (ibid.). Therefore, this section presents the perceived cultures from teachers of Schools C and E from the point of view of the unique culture in their schools and the generic culture of primary schools.

The circumstances discussed in the sections ahead also represent similar issues that other teachers participating in this study suggested and that perhaps many teachers in the Mexican primary school system experience. Besides the generalised comments on factors affecting EE, like student learning assessments and extracurricular activities, other school-level perceptions were mentioned by the rest of the participants: the 'school improvement route', which is an official programme promoting schools' organisational autonomy that was mentioned earlier, in Section 1.1.2 (e.g. A, Luz, II, turns 314, 322; A, Luz, III, turn 188; D, Esteban, III, turn 4); paperwork (e.g. D, Esteban, II, turn 6); and the lack of emphasis on student projects (e.g. A, Luz, II, turn 336-342; A, Morelos, I, turn 81-85; B, Marley, II, turn 89). The results in the section ahead, do not explicitly cover these factors because they were not explored in detail by most participants. These factors are, however, directly relevant to the school cultures and educational climate suggested in the following sections because they are related to frequent practices of contemporary Mexican primary schools.

6.4.1 School C: views from Adela, Betty, and José

School C is a half-time morning school with a student population that oscillates between 600 and 650 students per school year (see more information in Table 3.7, Chapter 3). This study has three participant-teachers (Adela, Betty, and José) who oversaw, each, a Year 6 class in School C (see their professional profile in Table 3.8, in Chapter 3). The school authorities of School C are the Head Teacher and sub-Head Teacher; the work of these authorities is supervised by a 'zone' or district supervisor, which is a person in charge of supervising various neighbouring schools of a specific area. In Mexico, school authorities are generally experienced classroom teachers who have been in service for several years—as this is one of the profile features which are considered when selecting someone for this type of roles.

School C has a high demand volume of students as it is well-known by its nearby communities for being perceived as a thriving school; in fact, when describing time-constraints of working in School C, Adela said that School C has the fortune of being often visited by authorities from the Ministry of Education and local media (C, Adela, II, turn 75). Additionally, School C is one of the schools which offer placements for pre-service teachers to practice in a real school context. In fact, at the time of the fieldwork activities, José and Betty, had two trainee teachers working with them—although these trainee teachers only very briefly took part of the data collection activities of this project when, in two separate events, Betty and José had to momentarily leave the classroom during the observation sessions.

Part of School C's popularity is based on their internal accountability policies: institutional target-setting and monitoring procedures to reach those targets (Nixon, 2000, p.296 in Ben-Peretz, 2012). In School C, their internal accountability seems to be based on the results from student tests, which nowadays is generally perceived as a quality standard in schools (Schratz, 2013). The internal accountability of School C was much explained by José, see the following fragment:

> *[I]n every block we [his fellow teachers and him] have to apply three partial exams besides the two-month exam. We [he and his fellow teachers] have to follow a same amount of content for that exam [two-month exam]. As a result, often we end up preparing children just to answer an exam; after we are done with that exam, we prepare them for the next assessment [.] (C, José, II, turn 61)*

In Mexican primary schools, is general practice to assess students' learning at the end of each block or learning unit (these are taught in two-month periods, see Blocks in Section 4.1.3); these exams are, at least in In Nuevo León, designed at the school-zone level (neighbouring schools). Apart from these evaluations, there are other external (independent from schools) and national assessments that Year 6 primary school students go through. In addition to the aforesaid assessments, School C has an internal policy which asks teachers, as above indicated by José, to continuously create and apply assessments to test students' learning. This policy in combination with regular student evaluations has implications on teaching. For instance, an emphasis on student evaluation results can debilitate teaching autonomy, as lessons might be oriented to work towards desired exam results. About focusing on student evaluations, the participants of School C suggested the following implications: concern for covering all the content in the year programme (e.g. C, Adela, II, turn 67; C, Adela, II, turn 87); having to teach the same content and at the same pace with teachers teaching in the same school year (e.g. C, José, II, turn 62); and focusing teaching on revising for exams instead of providing more opportunities for meaningful learning (e.g. C, Betty, II, turn 22; C, José, I, turn199; C,

José, II, turn 85). Below, relevant excerpts from the three teachers in School C expand on some of the former points:

> *Well, first, time is a factor. Because, for example, throughout the week we have English three times a week, physical education, information and communication technology, school assemblies, and sometimes conferences. These are good for students […] But when* ***you have to cover all the programme****, fill in register sheets, do report grades…****then one has to go a bit faster*** *[with teaching], because you say "okay, I have to see this lesson on this date" and that is how you are impacted by time [constraints]. (C, Adela, II, turn 67, researcher's emphasis: bold format)*

In the fragment, above, Adela describes, among various other responsibilities, having to teach all the content in the Year 6 programme. This is a pressure closely related to preparing students for exams—as mentioned by José. Other time-constraining circumstances in School E is the administrative work given to teachers:

> *So, as I was saying, not personal matters or other issues. The only thing is, the pressure here [at the school] is the time; to keep up with [administrative] activities - suddenly the secretary comes [and says] "teacher you have to hand this in." "Teacher you have to do this" "And it's for right now or for tomorrow". So, if there are things I need to check with them [the students], these kinds of things [the administrative activities] distract you. (C, Betty, II, turn 60)*

Time constrains as such appear to have a discouraging effect on teachers in School C to conduct EE-related activities. In the paragraph below, José explains why he has not put into a practice a project called 'the eco-column', which he had learned some years ago:

> *[W]e have done some activities of that type [like the eco-column], but just some not the project as it is. We haven't made it [fully] as it is…because it requires a lot of time and, unfortunately, here, we cannot spare time. I mean,* ***here we even lack [time] to complete the [everyday] activities*** *in the best possible way. (C, José, II, turn 20, researcher's emphasis: bold format)*

The interview fragments of these teachers describe a similar concern: not having enough time to complete the Year 6 programme (this theme is addressed in Section 6.3.1). José's excerpt also suggests that he does not consider EE-related activities part of the daily or regular teaching activities: '[…] here we even lack [time] to complete the everyday activities in the best possible way'. This indicates that EE-related activities, like 'the eco-column' project, are not a priority in School C. In fact, when Adela was trying to recall EE-related activities in School C, she could only remember a few school campaigns of some years ago (C, Adela, I, turns 54-60). Although conversely, this fact does not mean there was an entire lack of interest

on EE. In the section 'comments for the researcher' in Form A, the Head Teacher of School C wrote the following:

> *We hope School C contributes with what is necessary to conduct this study and the researcher help us gain awareness of how we must improve the environment (School C, form A, the Head Teacher)*

Furthermore, the pressures perceived by Adela, José, and Betty are perhaps magnified in Year 6, since this year has more activities and assessments than the other years in primary school. For instance, national student assessments are generally applied to only Year 3 and 6. This was also asserted by Betty:

> *[T]he simple fact of having to work in Year 6, where you are told: "By this date or this other date you have to finish". I mean done and completed... but, then more contests and more contests... it does cause pressure. (C, Betty, II, turn 20)*

Betty implies teaching in Year 6 is demanding. Year 6 might be more challenging than earlier years of primary school because teachers prepare students for various evaluations often in parallel to participating in many extracurricular activities. In the excerpt, above, Betty suggests Year 6 is the final one of primary school, hence, there is no more time for breaching learning gaps in later years; this is what she means when she says: 'I mean done and completed'.

Like student assessments, Mexican primary schools generally have a fixed set of official extracurricular activities, but schools wanting to 'excel' usually become involved with various more of them. Extracurricular activities in Mexico include student clubs, official programs (fostered by Ministry of Education), conferences, and talks for students provided by external professionals, external and internal contests, and so on. Official extracurricular activities are those which aim to enhancing patriotic values such as the national anthem and flag escort contests. Overall, most of the teachers in this study expressed that extracurricular activities and administrative demands often interrupt their lessons. This was not an exception for the teachers in School C, for instance, Betty said:

> *Well, maybe the fact that we [teachers] aren´t informed about certain activities or that suddenly we are told "tomorrow this activity or activity is going to happen, the event will take place at this time". [...]Also, people have come to give talks [to children] that sometimes... last year I had Year 2 and a nutritionist [unexpectedly] came to give them a conference and we said: "there were themes related to that" [to content in the Year 2 programme]. I mean, for our benefit, the activities [teaching and the conference] could have been programmed together. (C, Betty, II, turns 32-38)*

Betty illustrates potential benefits of extracurricular activities can become a problem if they are not planned alongside with the school's and teachers' planning. Moreover, she indicated the school authorities of School C did not forewarn their teachers with enough time or provided enough information of extracurricular events (C, Betty, II, turns 32-36). Betty considered unplanned conferences are a 'factor out of our [teachers'] control' which impacts on teaching plans (C, Betty, II, turn 36). In fact, during one of Adela's lessons observed, her Natural Sciences lesson was reduced to ten minutes (although Adela took another ten minutes from the children's break) instead of the typical 40 to 50 minutes. This is because Adela had to unexpectedly fit an external student test in her timetable that she had not planned since she was not forewarned of it in advance; Adela told the researcher 'this is another unplanned activity…' (Ob. field notes, CA-2). The circumstances shared by Betty and Adela suggest that the School C's authorities (perhaps inadvertently) weaken the teaching autonomy of their teachers by occasionally neglecting their lesson planning and individual views.

José provided another example of the influence of School C's authorities over the teachers' autonomy and participation in decision-making processes:

> *We have to develop a 'School Improvement Route' [an official programme for internal and local school management] in which we have to consider the priorities of our institution [school], b.u.t that is n.o.t what happened. We [teachers in School C] were told: 'We have these projects, this is how we are going to distribute them, and this is what we will do'. (C, José, III, turn 252)*

In the above, José describes that the views of teachers in School C were not considered when deciding on the plans of school strategy for improvement. Another way in which the teaching autonomy of teachers in School C was debilitated is through an internal policy which asks them to teach the programme in parallel. A teaching policy of this type anonymises the individual work of teachers, hence, impacting their autonomy to make decisions in class. Adela and Betty did not mention having any discomfort with this policy; their concerns were focused on having enough time to cover all the programme. José, however, was visibly in tension with this policy:

> *[I] feel that sometimes we mistakenly believe that things [teaching] have to be done in the same way [...] We´re thinking about teamwork and collaborative work in the wrong way; we aren´t thinking about it as it really is**: professional collaboration should benefit pedagogic autonomy not to limit it** [...] In this school, that's the culture. (C, José, II, turns 60-64, researcher's emphasis: bold format)*

José said that his colleagues wanted to distribute amongst the three the workload of designing the teaching planning, making sure that the three of them would teach the same content and

activities in equal timing (C, José, II, turn 62). José disagreed with this, because every class and teaching style are different and different planning was needed accordingly. He said '[W]e cannot be equal in that sense [...] where is the autonomy as a teacher there?' (C, José, II, turn 62). Additionally, José shared that he had managed to negotiate with the head-teacher and his peers: he was, then, supported to work on his planning according to the needs of his students, yet he still had to teach at the same pace as their colleagues. The School C's policy to standardising the work of teachers and students limits EE—José explained. For instance, he described School C's burdensome process to plan for school fieldtrips:

> *One of the aspects that limits it […a limiting factor to EE teaching] is policy of the school itself [...] the regulations of the institution are… for example, field trip visits [...] because in order to have one, firstly, you have to include the whole Year or the whole school…and to do that you need to get permission and you have to make sure that all the teachers are willing to do it. So, I feel that it's one of the obstacles: that* ***sometimes you're not given the chance to make your own decisions****.* ***And you feel that they´re dictating your every move, and I'm not used to that****. So, I would normally do at least three school visits [a year], and sometimes they would last all day [...] that's why we don't have those kinds of visits here. I mean, here, who's going to want [to arrange] them? Who's going to want to do them like this [for a whole day]? (C, José, II, turns 50-54, researcher's emphasis: bold format)*

The views and perceptions of Adela, Betty, and José about School C suggest leadership, culture, and internal policies for teaching and student assessment are factors impacting on EE teaching. In School C, these factors seem to have a discouraging effect on teaching autonomy and potential teaching and learning opportunities for EE. In contrast, similar factors tell a different story for EE teaching in School E—as described in the following section.

6.4.2 School E: views from Isabela and Rori

School E, as it was mentioned before in other parts of the results, is the only full-time school in the sample. Therefore, this school does not share the building with either a morning or afternoon school since School E operates in the building till late in the afternoon. This means teachers and students have more liberties in how they use the installations of the school—something which is often an issue when developing EE projects that require space in the classrooms or somewhere else in the school grounds. Compared with School C, the building of School E is significantly less spacious; when the fieldwork of this study was conducted, the student population of School E was 305 students—which is less than the half of students in School C at that time.

This study has two participant-teachers from School E, Isabela and Rori, and each oversaw a class of Year 6 (see their professional profile in Table 3.8, Section 3.3.2 of Chapter 3). As in

most primary schools, the main school authorities of School E are the Head Teacher, sub-Head Teacher, and the district supervisor. Like School C, School E was a school that offered placements for trainee teachers; in fact, Isabela was training a pre-service teacher at the time she was participating in this project—this trainee teacher did not take part of the data collection activities, though she was supporting Isabel during the observation session.

The staff in School E, through its various achievements, had gained popularity amongst its community. For instance, a few years before this study was conducted, the staff working in School E were granted a national quality award for its sustained managerial competence. The booklet describing School E's success in receiving this award, displays a clear outline of the factors securing their institutional leadership (E, item 6). According to this information, School E's success is based on their managerial strategy, which includes a systematic process of self-evaluation and analysis of their response to daily activities and challenges. School E, as portrayed in the booklet, emphasises professionalism and organization.

Isabela's and Rori's depictions of School E describe it as busy and overall successful, yet they talk about an overload of work—an aspect that, in fact, does not always indicate an efficient managerial strategy. The difficult allocation of time to fulfil their work activities was a significant concern for Isabela and Rori. For instance, Rori identifies this aspect as a factor impacting her teaching:

> *[T]his is a high-demand work area. Here, for example, teachers work against time. You [the researcher] have seen it, when you have come here to see us: we are running from one side to the other [and having] a thousand things to do. So, maybe this a factor. Sometimes you teach the [programme's] content really quickly. I don't like that. (E, Rori, II, turns 74-76)*

Isabela's data corroborates Rori's perception of the work culture in their school:

> *[M]any schools stick to the strictly official demands of the Ministry of Education, in this school we do it all. We do all the projects and, **regarding ecology**, this is one of the schools in the area which works more on environmental matters. (E, Isabela, I, turn 173, researcher's emphasis: bold format)*

In the context of the participant-schools, success is often evaluated by considering exam results and extra-curricular activities. This perhaps explains why the booklet describing School E's merit on managerial quality, highlight their student assessments' results and the school's engagement in extra-curricular activities. Merits and awards are considered important indicators of educational success in schools; in fact, both curricula vitae of Rori and Isabela have a distinctive section listing the awards their students and themselves have

won as result of participating in contests or other extra-curricular activities (E, item 2; E, item 3). Rori detailed their involvement in extra-curricular activities whilst reflecting on the teachers' struggle in School E fulfilling them:

> *We have the afternoon hours; other neighbouring schools don't have that [additional] time. Right now, we have the children's parliament contest—he [a teacher in the room] is preparing it. I mean, those are hours out of one's classroom. Then we had the flag escort contest. We also had an oratory contest: the 'round' [dance] contest, and the 'rhythm tables' contest erm* ***we have exam rehearsals***, ***two-month period exams.*** *We're having exams and we haven't finish covering the [programme's] content.* ***That's a very important factor: sometimes we don't finish teaching the content*** *or you have to teach it fast [.] (E, Rori, II, turn 78, researcher's emphasis: bold format)*

The fragments above indicate that Rori perceives the extracurricular activities, to a certain degree, keep her and other teachers from teaching her lessons. Such was Rori's belief that when a group of her students were called out for an extracurricular activity, Rori did not grant permission to leave the classroom because they were working on a group activity (Ob. field notes, ER-1). Like the teachers in School C, she mentions the two-month period exams and preparing students for exams, which she calls 'exam rehearsals'. As a strategy, Isabela said that School E and other schools in the area coordinated their planning for the two-month period exams (these tests are a regular practice in Mexican state-regulated primary schools) and other nation-wide student tests (e.g. E, Isabela, III, turn 148; E, Isabela, III, turn 194). Nevertheless, Rori considered primary schools were saturated with official programmes:

> *[W]e have to prepare MANY activities and [participate] in MANY contests which are sometimes independent of the programme. Sometimes they [the Ministry of Education] overload teachers with so many activities […] this sets aside what is MORE IMPORTANT. Because, to me, the curriculum is of the utmost importance. (E, Rori, II, turn 80)*

In relation to stressing factors, Isabela commented that national student assessments and contests were a concern for her. For example, she explained that they had to devote teaching time to allow rehearsals for the 'Children's Knowledge Olympiad' or the 'National Olympiad exam'—as the teachers called it. This is a student contest that has been 56 years in operation, and which is organised by the Sub-Ministry of Basic Education in Mexico. The focus of this contest is a summative learning assessment, and its objective is to reward the academic excellence of boys and girls who complete Year 6 of primary education, as well as encourage the participation of the main agents involved in the educational process of children (SEP, 2014). Isabela explained that to prepare for this contest, her colleagues and she had one exam per subject and each prepared by a different school in School's E district (E, Isabela, III, turn

148). Additionally, Isabela suggested she did not agree with the way student test were used to measure performance and effectivity in schools:

> *Now what we measured were, in some the exams (for the 'National Olympiad' contest), [the students´ understanding of] concepts. We're given [the results of] the evaluation "School E failed because it got this grade [attainment percentage] in such and such". And they start measuring us [teachers] and I say 'but my children can apply [their learning] in a project and they do it v.e.r.y w.e.l.l; I'm sure OF THAT. And they know how to work in teams and organise themselves.' And when I see [the results of] the evaluations, OBVIOUSLY, I do wonder: how? It even depresses me because I have been with them and I know they can achieve more. (E, Isabela, III, turn 152)*

These circumstances, however, did not keep Isabela and Rori from coping with the high-demand work in School E. The strategies they talked about in the interviews involved: using the expected learning outcomes as a guide for lessons and assessments (E, Isabela, I, turn 73; E, Isabela, I, turn 93); collaboratively working with neighbouring schools (E, Isabela, I, turn 73); collaboratively working with staff and parents (E, Isabela, II, turn 52; E, Rori, II, turns 88-90); and, increasing their pedagogical and subject skills through training (E, Rori, II, turn 88). Accordingly, Rori expressed the following:

> *[T]eacher Isabela and I have worked for many years in this school; so, we more or less have an idea of how to use the programmes [e.g. Year 6 Programme]. We feel much empathy for each other and are comfortable working together. New teachers coming in also join in and become excited in School E. One teacher said to me "Oh no, I am not changing schools. I learn a lot in this school […] other teachers say: "I'm not staying here, you work a lot here". (E, Rori, II, turn 92)*

Regarding the EE-related activities or 'ecology project'—as Rori and Isabela called them—School E has a well-stablished educational strategy. Isabela was an enthusiast of this project and commented much of its results in every interview:

> *Every year, this school has a new ecology project […] since I got to this school I have always heard "the environment this, the environment that" […] the 'ecologic club' has students from Year 1 to Year 6. There are children who have been in the club since Year 1; so, when they reach Year 6 one could say they love the environment. (E, Isabela, I, turns 107-109)*

The EE-related activities were emphasised in School E's extracurricular activities (E, item 4; E, item 5). In relation to these matters, Rori and Isabela both mentioned the Head Teacher was significantly involved in supporting the EE-related activities. For instance, the student projects on EE of Isabela's class (these are mentioned in the portrayal of Isabela's lesson in Section 5.6.1) were motivated by a call for a contest that the Head Teacher informed them

about. Isabela referred to the latter when describing her students' engagement with EE-related activities:

> *I only give them a little push and they carry on.* ***I told them [students] about the [EE] contest announcement the Head Teacher had sent me.*** *So, I went online and showed them what it was about and they quickly started forming teams. The Head Teacher asked me for: "a work team to develop a project", but all the six teams in my class wanted to participate. I didn´t want to take away their motivation, so I registered the six teams [.] (E, Isabela, I, turn 149, researcher's emphasis: bold format)*

Isabela had identified her students in Year 6 (who had been in the 'ecological club' for various years or during all their primary school education) were intrinsically motivated to participate in EE-related activities. For instance, she expressed herself motivated to support her students in the activity—the one commented in the former excerpt—because they were participating without any real incentive, neither a grade or a prize (E, Isabela, I, turn 155). In the case of teachers' motivation, Rori expressed 'being convinced of your responsibility to collaborate for the environment' is an important factor in fostering EE teaching (E, Rori, II, turn 112). Rori expressed the following when talking about EE teaching:

> ***Researcher:*** *Are there any factors limiting your work?*
>
> ***Rori:*** *Not right now. As I said it depends a lot on the Head Teacher. There are Head Teachers who say: "Stay in your classroom and do not do that, and do not do the other". Some Head Teachers do not emphasise the IMPORTANCE of these topics [EE-related themes] or contest calls. Our Head Teacher…she deserves my respects. She is always dedicated to these types of opportunities. You can see the results in students, so she showers you, she infects you [with her views], and that´s a positive factor. (E, Rori, II, turns 127-128)*

Similarly, Isabela believed developing EE-related activities depended on teachers and the Head Teachers' initiative:

> *I think it depends on every teacher and every school; for instance,* ***the Head Teacher´s the one who give us a lot of support us with all the ecology-related activities.*** *She loves everything about ecology and she is the one who has inspired us to like it. Consequently, we inspire children and children inspire their families [.] (E, Isabela, I, turn 173, researcher's emphasis: bold format)*

Rori's and Isabela's both frequently underscored the influence of the Head Teacher and the district supervisor in their work and in the operations of School E. Rori said the district where School E belongs owes much of its achievements to the supervisor of the district (E, Rori, I, turn 114). In fact, Rori had worked in other school districts, but she had only felt appreciation for her work in School E and the district where the school belongs (E, Rori, III, turn 186).

Additionally, it seems the influence of the Head Teacher assists teachers in School E in matters beyond the EE-related activities. During the second interview, Rori commented the Head Teacher in School E is flexible and this contributes to her teaching:

> ***Researcher:*** *Last week I was told that you were urged [by an external authority] to follow a timetable.*
>
> ***Rori:*** *OH, YES. Here at the school.*
>
> ***Researcher:*** *So that seemed interesting to me - might that also be a factor, the fact that you have to stick to a timetable?*
>
> ***Rori:*** *The thing is, it depends a lot on the Head Teacher. I mean, I don't know if it's just this area or in other areas too, but it depends on the Head Teacher. Here, we have an e.x.c.e.l.l.e.n.t Head Teacher; for example, she gives us f.l.e.x.i.b.i.l.i.t.y and that makes you [word missing]… well, when you're responsible [...] Here at this school we have that flexibility; so, for example, we have a lesson plan and the [head] teacher tells us: 'Yes, okay. The lesson plan is flexible: you can modify it; you can write on it, and let me know if you're going to do a different activity, when you're going to do it and what you're going to change", right? So, in that sense, we don't [have to stick to a timetable]. (E, Rori, II, turns 83-88)*

Rori clarified the Head Teacher did not impose her views, but that she was deliberate (i.e. by identifying teachers' abilities) when she suggested projects to teachers (E, Rori, II, turn, 92). Rori explained at length she found dealing with large amounts of work was somewhat a sacrifice for her, nevertheless, she felt with 'much freedom' in School E (E, Rori, II, turns 154-156). She suggested her sense of freedom was significantly enhanced by the support and trust of the Head Teacher (E, Rori, II, turn 158). Likewise, Isabela expressed there was a lot of trust from behalf of the Head Teacher, which supported her ample sense of autonomy (E, Isabela, II, turn 58). Isabela said: so far, she has never rejected any EE-related project or any other project in my plans (E, Isabela, II, turn 60). In School E, regardless the stress caused by the emphasis put on student assessments and extra-curricular activities, both Rori and Isabela felt supported to develop EE-related activities even outside the classroom (e.g. Rori's comments in: E, Rori, II, turn 88) and with teaching autonomy. Furthermore, their data do not suggest any awkward school policies; they, mostly, reflected on external pressures in which the Head Teacher is portrayed as helpful rather than as an obstacle.

6.4.3 Reflecting on the comparison between School C and School E

The cases of the School C and School E were chosen to illustrate how their distinctive leadership, cultural practices, and internal policy bear on EE and teaching in general. Mainly,

leadership and the unique cultures in these schools shape the work collaboration between teachers.

The participants of School C and School E emphasised the time pressures related to student assessments and extra-curricular work; these two circumstances are factors which have various implications over teaching and eventually on EE. On the one hand, stressing student assessments cause teachers and Head Teachers in School C and School E to feel pressured over covering all the content in the programme; adopting standardising measures for teaching the programme; and, revising for exams. On the other hand, adding extracurricular work to teachers' agendas (especially if it includes unplanned activities) affects their planning, which sometimes causes them to use classroom hours to fit in extracurricular work and increases the load of work.

The implications of extracurricular work for EE can be either beneficial or harmful. The extracurricular activities, if they are planned appropriately could enrich the EE-related content of the study program like Rori and Isabel showed that they did. However, if the extracurricular activities run in many different directions and are organised during teaching hours, they can reduce the time available for following other primary educational goals. This is relevant to cross-curricular teaching of EE, since 'covering all the content in a programme' usually involves following a linear or unidirectional approach to planning for the learning aims and teaching of the subject content.

Other implications of the factors addressed in Sections 6.4.1 and 6.4.2, include the utilization of teaching time for exam revision (a practice that is not mentioned anywhere in the National Curriculum and the Year 6 Programme) and the weakening of teaching autonomy. For instance, the internal policies on peer work and lesson planning in School C, caused tension between José, the other teachers in Year 6, and the school authorities. An aspect that is contrasting in the case of the teachers in School E where, despite having similar work pressures, Rori and Isabela expressed feeling an ample sense of autonomy and trust bestowed to them by the Head Teacher. This has facilitated the teachers' autonomy to introduce projects and carry on pedagogical practices which are not traditional.

Finally, the leadership of school authorities and teachers seems to be a significant factor in creating teaching and learning spaces for EE-related activities. The examples presented, above, include displays of both teachers and the Head Teachers. For instance, José's ability to negotiate with his colleagues and the Head Teacher to gain a little more teaching autonomy and Rori's and Isabela's depiction of their Head Teacher's leadership in promoting 'ecology' activities.

6.5 Summary of the outcomes for the third research question

The main factors identified in relation to teaching of EE-related content are summarised in the following points:

- Autonomy to teach EE-related activities is affected by content coverage demands in schools. The teachers displayed different views regarding the content coverage officially required of the Year 6 programme, yet, in practice, they all stressed the need to cover all the learning content in the syllabus.
- The teachers identified the cross-disciplinary and cross-curricular potential for EE-related themes, emphasising 'opportunistic', 'hierarchical', and 'multi-disciplinary cross-curricular teaching types as suggested by Barnes (2011) framework.
- The teachers saw possibilities to include EE-related content mainly in non-core subjects, but also in Spanish and Mathematics.
- The teachers identified challenges of teaching cross-curricular content like EE, including being able to identify connections between specific lessons and EE.
- The relationship of leadership, internal policies, and school cultures are factors which impact on the creation and support of teaching opportunities for EE-related content.

Chapter 7. Discussion of key findings

The research questions steering this investigation find their answers in the results that are reported in Chapter 4, Chapter 5, and Chapter 6. In these chapters, the research questions are answered through long narratives, which are enriched with the details of the participant-teachers. In contrast, in this chapter the purpose is to succinctly present a response to each research question by discussing key findings of the data analysis. The key findings in this section are the product of systematic analyses that were aided by creating concept maps based on the results chapters and reflecting upon the outcomes' broad landscape. This resulted in two key findings per research question, but the equal number of findings per research question is coincidental and not a requirement in the above-mentioned analysis. Moreover, the key findings represent results that featured strongly in the data and are distinctive in relation to the existing literature, as this chapter elaborates.

The research questions of this thesis do not focus on studying specific 'gaps' between rhetoric/theory and reality, however, these were considered and noticed in the results. The findings contribute to grasping actual gaps between the EE curriculum of Mexican primary schools and the participants' views and reality in their schools. These are, for instance, the EE aims in the curriculum against the actual teaching and learning opportunities available for EE in schools; also, the socially-relevant role of cross-curricular EE against the teachers' interpretation the priorities in students' learning. The findings also suggest confluences in how the curriculum documents represent EE and the patterns in teachers' conceptions about EE (see more on this in Section 8.1). Overall, the majority of the teachers, but those from School E, indicated through their narratives that EE has a marginal place in their schools.

The key findings are presented in the following sections, each section addressing one of the research questions and in ascending order. First, Section 7.1, as a summarised response to the RQ.1, presents the main findings of the documentary analysis in Chapter 4. Second, Section 7.2 discusses core findings of the teachers' conceptions about EE presented in Chapter 5, and these respond to the RQ.2. Finally, in relation to the results in Chapter 6, Section 7.3 discusses significant factors influencing EE teaching, which are relevant to the RQ. 3. Other broader, yet crucial, discussion points are offered in Sections 8.1 and 8.2 of Chapter 8, the conclusion chapter of the thesis.

7.1 Environmental education in curricular aims

In response to the RQ. 1 (see the question in Section 3.1.1), Chapter 4 presents the educational aims of the 2011 National Curriculum and relevant Year 6 official documents (see a summary in Section 4.3). The educational aims and learning goals of relevant EE content that are presented in Chapter 4 include a set of values, skills, and knowledge, however, this thesis emphasises the structure and main messages in them. First, in Section 7.1.1, this chapter stresses that the interrelation across educational aims and learning goals is important to conceptualising EE. Second, in Section 7.1.2, the emphasis is discussing the messages through which the 2011 and Year 6 Programmes represent EE.

7.1.1 Mapping environmental education in educational aims

RQ.1_Finding 1: *The multiple educational aims and goals related to EE in the Mexican curricular documents are interdependent.*

The results of the documentary analysis conducted for this investigation and the one carried out by De León-Rodriguez and Infante-Bonfinglio (2014) agree that EE has visible place in the National Curriculum. This thesis identifies that here are multiple references to EE or EE-related content across the 2011 National Curriculum for basic education, the Year 6 Study Programme, and the Year 6 Natural Sciences textbook. These are three broad educational aims in the 2011 National Curriculum (in Section 4.2.1), various references in the educational aims of the Year 6 Programme (in Section 4.2.2), and numerous learning goals in the Year 6 Natural Sciences textbook (in Section 4.2.3). Below, a list summarises all the places where EE was referenced in the documents under examination for this investigation:

- The competences for life (i.e. competence for coexistence)
- The graduation profile for students
- The socially-relevant themes
- The subjects' purposes for basic education and primary school education
- The competences for basic scientific education in Year 6 Natural Sciences
- The curricular standards of science for Year 6 Natural Sciences
- The expected learning outcomes in Year 6 Natural Sciences

In similar analyses, Peza-Hernández (2013) and De León-Rodriguez and Infante-Bonfinglio (*op cit.*) also identified EE references in the competences for coexistence, the socially-relevant themes, the curricular standards of science, and the expected learning outcomes of the 2011 National Curriculum. Then, Paredes-Chi and Viga-de Alva (2017), in a more detailed analysis

than the aforesaid authors did, found 211 evidences of EE across 39 official documents for basic education and primary school (i.e. the 2008, 2009, and 2011 National Curriculum; the 2009 and 2011 Study Programmes; and, 28 textbooks for Year 1, 2, 5, and 6). The results of Paredes-Chi and Viga-de Alva (ibid.) describe the implications of EE ideologies in the EE-related content. However, all these authors overlooked the importance of grasping the interrelation between the aims and other curricular elements when commenting on the representation of EE in the curriculum documents.

The identification of EE in basic education documents by the aforesaid authors mostly converges with the findings of this study; albeit, these studies have not stressed the organisation (also the occasional inadequacies) and interrelation of the educational aims and goals when assessing the EE-related content in the curricular documents. This study claims that each reference to EE in the curriculum is a helpful cue to conceptualising EE in a particular way. On the one hand, the EE-related aims in the competence for coexistence, the graduation profile for students, and the socially-relevant themes (see Section 4.2.1) expressed the type of relationship expected between students and the social and natural environment, placing emphasis on citizenship values. On the other hand, the Year 6 Natural Sciences programme and textbook do not emphasise these values, because the EE-related content is focused on facts about the environment and pollution (see Sections 4.2.2 and 4.2.3). Therefore, thinking of the educational aims and learning goals as an interrelated structure provides a better notion of the EE approach in the documents.

For instance, Paredes-Chi and Viga-de Alva (2017) claim the National Curriculum inappropriately divides human health and the natural environment, since they are presented as a separate socially-relevant topic each (p.7). In contrast, this study argues health and the natural environment are in fact associated in the ‘healthy lifestyles’ narrative of the EE-relevant aims (see, for example, the list of attitudes and values in p.126, Section 4.2.2). Similarly, if one only considers the Natural Sciences’ expected learning outcomes, one would conclude the curriculum presents EE mainly as education about the environment (see this model in Section 2.2.3). When, in fact, the various references to EE in the National Curriculum and Year 6 documents foster action in and for the benefit of the natural and social environments where students develop, which is a broader perspective than education about the environment.

The multiple clusters of aims and learning goals, arguably overwhelming and perhaps redundant in cases, do not seem to lack a structural logic or a coherent sequence for EE. This is because the Mexican curriculum documents have interrelated or interdependent sets of

educational aims and learning goals. As the results of Section 4.2 in Chapter 4 shows, the EE-related aims are broader in the 2011 National Curriculum in comparison to the specific learning goals in the Year 6 Natural Sciences textbook. Although this might sound logical to any curriculum developer, it can be easily missed when investigating how a field or a topic is addressed throughout a curriculum. The results in Chapter 4 suggests that the EE-related aims are suggested a sequenced structure, considering: a) different time scales; b) who the aims address; c) the range of impact (e.g. the student, local community, society at large, and so on); and d) different degrees of specificity. See a representation of the latter in Table 7.1 below:

Time scale / range of impact	Set of aims / set of learning goals	Examples
National Curriculum for Basic Education: educational aims		
Future-based and socially relevant. Participatory, context–specific, and socially-relevant.	The competences for life The graduation profile for students The socially-relevant themes	*Competence for coexistence: […] creating harmonious relationships with others and with nature [.] (SEP, 2011a, p.38, competences for life)* *Promotes and accepts health and environmental care as conditions that benefit an active and healthy lifestyle. (SEP, 2011a, p.40, graduation profile)*
Year 6 Study Programme: educational aims		
Knowledge-based. Pupil and teacher-centred.	The subjects' purposes for basic education and primary education The competences for basic scientific education The curricular standards of science	*Knows the typical characteristics of living beings and use this knowledge to infer some adaptation relationships that they create with the environment. (SEP, 2011b, p.84, Natural Sciences' purposes)*
Year 6 Natural Sciences textbook: learning goals for lessons		
Knowledge-based. Pupil-centred.	The expected learning outcomes	*Reflects on the importance of responsible consumption and its environmental implications. (Cervera-Cobos et al., 2014, p. 66, expected learning outcomes)*

Table 7.1 Interrelation of educational aims and learning goals relevant to EE in the 2011 National Curriculum and Year 6 Natural Sciences

Finally, the main features of the educational aims and learning goals in Table 7.1 suggest that future-based and socially relevant aims (such as the competences for life) and pupil-specific learning goals (i.e. the expected learning outcomes) are interdependent. For instance, the expected learning outcomes cannot be only focused on learning goals relevant to a lesson, they must be connected to a general outlook of what students are expected to achieve later in their post-basic education life. Similarly, future-based and context-specific aims cannot exist on their own. To attain future-based and socially relevant aims, more specific operationalisations such as the learning goals in subjects are necessary.

7.1.2 Curricular promptings to an environmental education approach

RQ.1_Finding 2: *The documents' conceptualisation of EE is characterised by anthropocentric and participatory principles, broadly focused on sustainability, and considered a cross-curricular theme.*

The 2011 National Curriculum mentions both EE and EES, however, the conceptual framework for these approaches is not clear in the curriculum. Despite the 'socially relevant themes' in the 2011 National Curriculum mention EES (see this in p.123, Section 4.2.1), the documentary analysis concluded that EE lacks articulation. In providing guidance to Head Teachers and teachers, the curriculum documents need to articulate what is implied in delivering EE as a theme and suggest a pertinent scope to approach EE. Chatzifotiou (2005) claims that a lack of articulation in the curriculum of primary school teachers might be problematic because her study of teachers' awareness of EE revealed that 'teachers need very specific references in the curriculum in order to consider teaching a certain topic' (p. 515).

Likewise, Paredes-Chi and Viga-de Alva (2017) reported that the contemporary curriculum documents (the 2009 version of the national guidelines and the 2011 version of the National Curriculum) propose a cross-curricular EE but claiming a lack of methodological and pedagogical strategies to develop it. Despite these absences, the results of Chapter 4 (see Section 4.3) and Finding 1 of this thesis, suggest that EE could be outlined through the EE-related content in educational aims and learning goals. The EE-related content in the 2011 curriculum documents studied here suggests a few consistent aspects which seem to convey the way EE is represented in the curriculum:

- EE is considered a cross-disciplinary or cross-curricular theme of social relevance, yet not an academic field (see this in p.123, Section 4.2.1).
- EES is suggested, albeit no definition or framework for EES is provided in any of the three documents (see this in p.123, Section 4.2.1).
- A few EE-related principles and concepts are frequently mentioned across the relevant aims (see this in p.124, Section 4.2.1).

Despite the lack of theoretical grounding for EE and pedagogical strategies, the results of Chapter 4 convey there are EE-related themes and principles in the content studied which associate with EE (see these in introduction of Section 2.2). These EE-related themes and principles are: *an anthropocentric view of the environment*, *supporting the sustainability of the natural environment and humans*, and *a participatory approach to EE* (these are especially visible in educational aims of Section 4.2.2). These are helpful to broadly conceptualise the EE approach promoted in the curriculum and unveil the values promoted by the curriculum documents. To illustrate these claims, consider the following logical sequence, which was were extrapolated from EE-relevant aims in Chapter 4:

a) *Healthy human lifestyles are associated with environmental improvement*. (See evidence in p.124 in Section 4.2.1 and p.130 in Section 4.2.2).
b) *Environmental improvement encompasses environmental care and human coexistence.* (See evidence in p.123, Section 4.2.1).
c) *Environmental improvement requires social intervention*. (See evidence in p.123, Section 4.2.1).
d) *Social intervention involves sustainable actions.* (See evidence in pp.127-128, Section 4.2.2 and p.130 in Section 4.2.2).
e) *The three R's strategy is equivalent to sustainable actions.* (See evidence in p.134, Section 4.2.1).

In the National Curriculum and Year 6 documents is unambiguous that humans (at personal and collective levels) are considered the main cause of contemporary environmental issues; accordingly, these documents motivate students to acknowledge their responsibility in solving environmental issues. This converges with Paredes-Chi and Viga-de Alva (2017) assertion that the curriculum promotes education for the environment because 'it mainly promotes actions to take care of the environment' (p.12), which is a strong principle in an education for the environment model. Although, this thesis argues, that environmental actions seem to be encouraged because they are beneficial to the sustainability of human life instead of

supporting intrinsic values of the natural and urban environments (see evidence in p.130, Section 4.2.2).

Anthropocentric values permeate the EE-related aims in the curriculum documents (see results in Section 4.2.1 and 4.2.2). EE ideologies predominantly ruled by anthropocentric values, intrinsically consider humans as the focus in human-environment interactions (Quinn et al., 2016, p.894; Wals, 2009, p.27). Conceptualised under these type of views, the environment is a vessel of resources and spaces necessary for human sustainability. The predominance of anthropocentric values can neglect other ways of conceptualising the environment, such as not needing utilitarian arguments to respect the natural balance of ecological systems (i.e. the eco-centric or nature-centred conception). There is, however, recognition of human-environment relationships in the curriculum, suggesting a systemic conception of the environment. Although, the systemic conception is mostly limited to local scales of interrelation, for instance, the Year 6 Natural Sciences textbook mentions only a few international treaties for environmental law and intervention (Cervera-Cobos et al., 2014, p.91).

The anthropocentric values are the threshold of other subsequent principles and concepts, like the importance of ecological sustainability for human life (which is suggested in the National Curriculum and Year 6 documents). This study sustains that a moderate degree of anthropocentric values seems necessary to our understanding of the current environmental problems. However, other approaches, such as ESD, are heavily anthropocentric and founded on maintaining the human systems (e.g. consumption habits motivated by profit-based economies) which have perpetuated the status quo of ecological degradation and increasing complexity of social issues. Paredes-Chi and Viga-de Alva (2017) sustained that ESD seems to be the embedded EE approach in the curriculum documents, yet the EE references found in this study does not support that claim. Since ESD, as depicted by UNESCO (2014), has a myriad of other topics, principles, and concepts that are not directly linked to the educational aims of the 2011 National Curriculum and Year 6 documents. For example, the economic and political dimensions are not addressed in the EE-related aims reported throughout Chapter 4, and these are crucial to ESD.

In terms of outlining the EE approach further, hints of ‘education for the environment’ are suggested because students are expected to participate in pro-environmental actions—which is an important principle of education for the environment. The hints of ‘education for the environment’ are manifest in the future-oriented and socially-relevant aims like the competences for life and the graduation profile for students. Another example of these hints

was found in the learning goals of the Natural Sciences projects at the end of Blocks 2, 3, and 5 in Section 4.2.3 of Chapter 4. In fact, student projects are key to achieve the aims involving participation, alas the training needs and difficulties involved in working with projects are absent in curriculum documents (Gómez-Galindo et al., 2014).

This study found EE is promoted as a cross-curricular and lifelong-relevant theme in the National Curriculum and Year 6 documents (see the educational aims of Section 4.2.1, Chapter 4). Similarly, Paredes-Chi and Viga-de Alva (2017) found that in both the 2009 and the 2011 versions of the National Curriculum for primary school EE is treated a theme to be addressed across the curriculum. They claim that from the 2009 of the National Curriculum to the 2011 edition EE changed from being considered a 'transversal theme' to being outlined as a socially-relevant theme of cross-curricular approach. Since EE is a cross-disciplinary field of study, the cross-curricular treatment of the EE-related content seems an appropriate suggestion to embed EE. In the following subsection, see how the non-core subjects complement the scope of EE in the curriculum documents.

Main cross-curricular links of EE across the disciplinary subjects of Year 6

As described in Section 4.2.3 of Chapter 4, the EE content in the Natural Sciences' expected learning outcomes attempts to provide students with a scientific perspective of the environment, about environmental problems and the role of technology in them, and the effects of decisions like unsustainable consumption. This result is consistent with the analysis of Guerra-Ramos and López-Valentín (2011) on the goals in learning activities from an earlier edition of the Year 6 Natural Sciences textbook —which has the same content structure as the newer one studied here. They report 48 teaching goals in the learning activities of Blocks 2 to V in which the descriptive categories *gaining new knowledge* and *theory application* are predominant. These results indicate that the learning activities from Blocks 2 to 5 in the Year 6 Natural Sciences textbook are likely to also concentrate on factual knowledge; and, in the case of EE-related content, this means promoting a model of 'education about the environment' (see this model of EE in Section 2.2.3) despite the encouragement of student projects for environmental improvement.

Year 6 Natural Sciences is meant to '[…] benefit the identification of relationships between science, technologic development and the environment' (SEP, 2011b, p.89). Accordingly, this study found that the Year 6 Natural Sciences textbook has EE-relevant themes, and it prominently features: environmental pollution; global warming; loss of biodiversity; national and international environmental treaties; energy generation and consumption; the three R's strategy. In fact, the teachers often related these topics to EE. For example, in Section 6.3.3,

José from School C mentions that ‘currently in Year 6 we are working with responsible consumption…’ Similarly, in the same section a quotation of Rori says ‘for instance, in this two-month period [block unit/learning unit] we are studying environmental care and protection, taking care of living beings, and we relate it to evolution and extinction’. Alas, the content and interrelations of these themes need articulation; for instance, the reference to living beings in Block 2 is too general or the links between changes in materials and waste production in Block 3 are not explicit.

The Year 6 Study Programme suggests teaching Natural Sciences by integrating the subject’s learning content in didactic sequences whilst considering the students’ personal, cultural, and social life (SEP, 2011b, p.89). However, the Year 6 Natural Sciences curriculum is not focused on sociological facets like identity, diversity, and participation, which relate to the students’ personal, cultural, and social life. Yet, the EE references in the subjects’ purposes of History, Geography, and Civics and Ethics Education (see the results in p.126, Section 4.2.2) invite the possibility to encourage students’ knowledge about their identity and place in the world. As Orr (1992) describes:

> *The physical and biological patterns of a place are imprinted on the mind […] Hence, knowledge of a place—where you are and where you come from—is intertwined with knowledge of who you are. Landscape, in other words, shapes mindscape. (1992, p.130)*

Studying identity is relevant to ‘education for the environment’, since recognising oneself in the environmental crisis is an element of any type—either constructive or detrimental—of participation and a component in pro-environmental behaviour (Benítez-Esquivel, 2007; Kollmuss and Agyeman, 2002). The notion of identity is also connected to having a system of beliefs and holding ideologies (e.g. teacher conceptions about EE) and is a key term in relation to positioning oneself regarding EE (e.g. the EE currents) and the contemporary environmental problems (e.g. having a stand about climate change).

The non-core subjects promote teaching various types of diversity (see the results in p.126, Section 4.2.2). Geography, introduces diversity from a spatial and social point of view, complementing the notion of ecological and biological diversities in Natural Sciences. In fact, Year 6 Geography provides a definition of the environment (SEP, 2011b, p.116). Civics and Ethics Education promotes the diversity of moral arguments and political systems. In this subject, students are meant to learn about democracy—as being relevant to the political system in Mexico—by becoming acquainted with the importance of respecting the diversity of views and consensus, which are two ideas that resonate across EE topics and the EE model of education for the environment.

Finally, the National Curriculum proposes that teachers in half-time schools can—ideally—teach History, Geography, Civics and Ethics Education, and Natural Sciences in 7 of the 22.5 hours a week; this is double of the time projected for Natural Sciences and approximately 30% of the total teaching time. Therefore, EE has a stronger (i.e. of being holistic or integral) conceptualisation and more chances to be practiced if taught across subjects.

7.2 Four patterns in teachers' conceptions about environmental education

In response to RQ. 2 (see this question in Section 3.1.2), this section focuses on discussing the relevant findings across the participants' conceptions about EE. The findings focus on how the teachers' conceptions were studied, and, most importantly, on the patterns that were identified throughout the teachers' conceptions. Ahead, Section 7.2.1 discusses the role of the parameters (the concept of environment, aims of EE, and teaching examples of EE activities) in finding the teachers' conceptions about EE. Then, Section 7.2.2 describes four patterns that were identified across the teachers' conceptions about EE.

7.2.1 Outlining the teachers' conceptions about environmental education through parameters

RQ.2_Finding 3: *The parameters from Sauvé's EE typology, and not the currents, are key to studying EE conceptions.*

To understand the participants' conceptions about EE, the researcher applied Sauvé's (2005) EE typology as an analytical framework (see Sections 2.2.5, 3.4.3, and 8.5 for further details). It was perceived by the researcher that using Sauvé's EE typology was useful to study the content of EE conceptions. However, focusing on the typology's parameters instead of the EE currents suggested by Sauvé seems like a more fruitful exercise when studying conceptions about EE (see the parameters in Table 3.11 of Section 3.4.3, Chapter 3). This point is evinced in the variety of EE currents that was identified in the teachers' conceptions about EE (see Table 5.2 of Section 5.2 in Chapter 5). Using the typology as a framework for analysis was also helpful to identify missing elements that were not explicit in the teachers' conceptions or in the typology itself, like the links of EE with health and healthy lifestyles.

The researcher studied three parameters (the concept of environment, aims of EE, and teaching examples of EE activities) which Sauvé also used to classify the various ways of conceptualising and practising EE into currents or approaches. Studying each of the parameters from Sauvé's typology in the teachers' conceptions about EE and associating these

results of each parameter with the EE currents, exposed that the EE conceptions of the teachers did not always fully match with all the parameters of a single current (see Section 5.2.1 in Chapter 5 and the profile matrices in the A.17 appendices). Hence, to explore the teachers' conceptions about EE, studying the parameters was more helpful than trying to strictly focus on full-length associations of the teachers' conceptions with one or various EE currents.

The way in which Sauvé's (2005) EE typology is applied bears on the depth and relevance of research results; therefore, typologies of this kind should be critically assessed before application (see further methodological reflections on this issue in Section 8.5). Scholars who have recently used this typology as a framework (e.g. Sim, 2014; Steele, 2014, and Viteri et al., 2013) focused on identifying or correlating the EE currents with EE-related data, though they seem to emphasise the individual parameters in the typology. For instance, Steele (2014) compared the application of Sauvé's EE typology (2005) with Pedretti's and Nazir's STSE framework (2011) for studying STSE lessons; she found the latter more pertinent for science lessons. Steele (ibid.) concluded Sauvé's EE typology 'is a compendium that identifies broad strokes in EE; its greater usefulness lies in analysing programs or courses, not specific lessons.' (Steele, 2014, p.245). However, Steele does not report using the individual parameters in Sauvé's EE typology and she focuses on equating teaching and learning situations with EE currents, which is not ideal since the typology does not include pedagogical components. This thesis argues that Sauvé's EE typology is useful in the study conceptions and ideologies (especially if one focuses on the individual parameters of the typology), but perhaps not so helpful in assessing the pedagogical design of lessons.

This study claims that when looking to grasp EE conceptions from primarily qualitative data is best to be systematic and flexible in the way we use analytical frameworks to study this type of highly subjective data. The analysis of a couple of quotations from Mario (School F) and Morelos (School A) in Section 5.2.1 of Chapter 5 illustrate this remark. In this study, individually focusing on the parameters instead of looking to match the full-length of EE currents with the teachers' conceptions was a finding in and of itself since this process revealed a larger and more complex landscape of the teachers' conceptions about EE than if the results had only reported the outcomes in Table 5.1 of Section 5.2. This is because the theoretical grounding of the teachers' conceptions about EE did not always appear to be a product of systematic and deliberate cogitations, therefore, the teacher 'invited' a plethora of ideas when speaking their mind about EE. Nevertheless, the participant-teachers did show some prominent intentions or ideologies supporting their EE conceptions (see the profile matrices in Appendix A.17).

A question remains regarding why the concept of environment, aims of EE, and teaching examples of EE activities (parameters in Sauvé's typology) are prominent in the teachers' conceptualisations of EE. This inquiry was not addressed during the data collection, thus, there is no data available in this project to provide further insights on this matter. However, the fact that the teachers implied these parameters in their conceptions, as EE scholars have done (e.g. Hart, 1981; Pedretti and Nazir, 2011; Sauvé, 2005), confirms that EE is overall outlined through such notions. Additionally, Sauvé (2004a) describes that there are three spheres of interaction in EE: the self, the other humans, and the environment; these spheres seem related to the parameters in the typology (see the parameters in Table 3.11 of Section 3.4.3, Chapter 3). Hence, the concept of environment, aims of EE, and teaching examples of EE activities appear to be ontological elements of EE as they seem to naturally emerge whenever contemporary persons try to explain what EE means.

Finally, the different references to the parameters in the teachers' conceptions about EE, the overall picture of the EE currents, and the cross-sectional analysis of the data were valuable signposts for identifying patterns (i.e. frequent themes) across participants and their views. There are four patterns which were identified across the teachers' conceptions about EE; these are explored in the following section.

7.2.2 Patterns across the teachers' conceptions about environmental education

RQ.2_Finding 4: *Teachers' conceptions about EE are focused on eliciting pro-environmental awareness and behaviour in students through knowledge about environment and by placing emphasis on the immediate and local impact of human action.*

The teachers' conceptions about EE are formed by patterns and singular nuances. The singular nuances of each participant and his or her context are conveyed in Chapter 5. This section focuses on discussing the patterns across the participants' conceptions about EE. In these patterns EE is: focused on students' awareness and behavioural change; resource-driven; knowledge-based; and, emphasises the improvement of the immediate and local environment. In the teachers' conceptions health is a missing element that was not directly associated to EE. These patterns were decided from studying the overall results of Chapter 5 and making sense of the teachers' conceptions about EE from a broader perspective to illustrate the case of EE in primary school.

Like the representation of EE in the 2011 the National Curriculum and Year 6 documents, the patterns in the teachers' conceptions are also closely linked to anthropocentric and participatory principles, especially as all the teachers emphatically associated a relationship

of care between humans and the environment (see findings in Section 7.1.2 and further comments on this confluence in Section 8.1). Additionally, considering the current scope of EE and the policy developments throughout almost five decades (see the Belgrade Charter and the Tbilisi Declaration in Section 2.2, in Chapter 2), the patterns in the teachers' conceptions resemble the initial 'configurations' of EE like emphasis on the individual change of values and behaviour, resource-focused and promoting (often loosely) participation in environmental improvement. The initial 'configurations' of EE was a time when EE stakeholders mainly promoted environmental awareness through knowledge from ecological and environmental sciences, when resource conservation was a capital priority. Similarly, the teachers often related EE with Natural Sciences, though, they all identified the cross-disciplinary character of EE (see the results in Sections 6.3.2 and 6.3.3 of Chapter 6).

In the following paragraphs, the patterns are discussed individually—although they are interrelated, stressing the implications and 'gaps' between the teachers' conceptions about EE and relevant claims from literature in EE. The analysis includes reflections about the potential sources of influence motivating these patterns in the teachers' conceptions about EE.

First pattern: focus on students' awareness and behavioural change

The aims most teachers associated with EE (see Section 5.3) reflect on the conservation of natural resources and management of the local environment. In different ways, all the teachers expressed EE is about making students aware of their impact on the environment, learn about resource scarcity and how this affects their life and the sustainability of future generations. The strong associations between the teachers' conceptions about EE and the references to the conservationist/resourcist current that is shown in Table 5.2 of Section 5.2 supports this claim. These outcomes revealed a focus on students' awareness and behavioural change, as supported by the results represented in Table 5.7 of Section 5.5, Chapter 5, which show the association of the teachers' cognitions about EE teaching with the value-centred current. Most teachers, apart from Rori, Isabela, and Luz, rarely described the role or involvement of other people in their conceptions about EE and its teaching. The pro-environmental awareness and participation of other people, such as students' families, was always mentioned as a 'by-product' of students' influence.

The focus on developing students' awareness and behavioural change stresses only one of the spheres of interaction (i.e. the self, the other humans, and the environment), as explained in Sauvé (2004a). All the teachers but Esteban refer to the three spheres in their interviews; albeit, they concentrate on students' interaction (i.e. the self) placing the interaction with other humans and the environment in a secondary place (see the quotations illustrating the EE aims

in Section 5.3). For instance, Morelos from School A said, 'To me, environmental education is working with students […]'. The human-environment interactions in this scheme can have different combinations, for instance, interactions of other humans with the self (this means opposite direction interactions to teachers' focus). Although it is generally expected that teachers would reflect about teaching in relation to students, to acknowledge the role of other stakeholders (e.g. school staff, parents, local council, and so on) and their two-way interactions is important for the understanding of environmental issues and developing EE programmes beyond textbooks (Monroe, Andrews and Biedenweg, 2008; Saylan and Blumstein, 2011; Silva-Mar et al., 2014).

Involving other actors is especially relevant if the EE approach of preference points at developing pro-environmental actions for improvement, in which case, students are likely to benefit from knowing the role and responsibilities of other people involved in the environmental crisis and asking for support from those others. A similar premise is suggested in a recent handbook produced by the NAEE (UK). This handbook identifies EE in the primary school curriculum, and it stresses the role of parents and careers in supporting EE-related activities in primary schools (Green, 2015).

The reach attributed to the EE aims and the spheres of interaction are indicators of the level of complexity in teachers' conceptions about EE. Cutter and Smith (2001) and Cutter-Mackenzie and Smith (2003) outlined indicators for ecological literacy and used them to assess primary school teachers' knowledge and beliefs about EE (see this term in footnote 13, Section 2.3.3, Chapter 2). According to their indicators, conceptions about EE which are centred on teaching children about the environment communicate a simple understanding of EE (Cutter and Smith, 2001, p.53). A more complex understanding of EE, Cutter and Smith (ibid.) claim, involves being able to explain environmental issues correctly and include future perspectives in relation to EE (p.53). This study does not support the latter, since teachers who showed ample understanding of EE (e.g. Isabela and Rori from School E) and teachers who communicated basic conceptions (e.g. José and Esteban from School C and School D respectively) both mentioned future perspectives in relation to EE, for instance, Esteban from School D said, '[…] They themselves should realise what they are, perhaps, going to face in the future' (see other quotations in Section in 5.3, Chapter 5)

Furthermore, the emphasis on promoting students' environmental awareness and pro-environmental attitudes and behaviours contrasted with the lessons observed during the fieldwork of this investigation, because these mainly displayed traditional teaching strategies involving the teacher and textbooks as the centre of the lesson (see Appendix A.18). Saylan

and Blumstein (2011) assert that enhancing students' autonomy and their centeredness in the learning processes are important for developing students' environmental awareness and pro-environmental attitudes and behaviours, which seems opposite to reading and following activities from the textbook. This contrast is not an inconsistency per se because, overall, the participants support that acquiring knowledge about the environment facilitates environmental attitudes and behaviours (see the results in Section 5.3.2 of Chapter 5); also, most teachers (eight out of eleven) seemed to associate acquiring knowledge with reading and discussing the information in textbooks (see Appendix A.18). This investigation concludes that nine of the teachers, excluding the teachers in School E, often used a traditional lecturing approach to teaching and concentrated on the provision of factual knowledge; however, EE research does not support this approach is effective to creating pro-environmental attitudes and behaviour—as discussed, ahead, in the third pattern.

Second pattern: the resource-driven emphasis

The resource-driven emphasis across most teachers' conceptions about EE was noticed in the analysis of the three parameters (EE aims, conception of the environment, and teaching examples). For instance, in Section 5.5.2 the researcher discusses that the activity-based examples offered by the teachers are predominantly based on collecting rubbish and environmental management of resources locally. Likewise, this a prominent notion in the EE-related aims of the Year 6 Natural Sciences programme. Apart from the parity with curriculum statements, the resource-driven pattern is prominent and consistent with previous claims on Mexican pre-service and in-service primary school teachers' understandings of EE (Peza-Hernández, 2013) and their emphasis on waste management and resource conservation activities (Silva-Mar et al., 2014).

The stress on conserving and managing resources ranged from tangible natural resources, such as water, to maintaining the quality of air. In Section 5.3.1, the results illustrate this point with José's conception of EE: 'Environmental education implies […] how we can preserve these resources we have.' In the EE conceptions of most participants, except of those from Morelos (School A) and Santiago (School B) who expressed the intrinsic aesthetic values of nature in their cognitions, addressed the quantity and quality of resources; and, emphasising how resources are necessary to maintain the status quo of human life styles and ensure future sustainability of the coming generations. This is another confluence between the teachers' conceptions about EE and the curricular documents, as it relates to the anthropocentric principle that was identified across the aims relevant to EE in the National Curriculum and Year 6 documents.

The resource-driven pattern in the teachers' conceptions might be explained by their association of the role of humans in the environmental issues which they believe threaten the current state of affairs. In Section 5.3.2, Marley from School B says, '[T]he planet is becoming more and more vulnerable to the actions of men, no?' and Rori from School E adds '[…] technologically speaking, we can advance, but so long as we do it without harming or damaging our environment […]'. For instance, Fernández-Crispín and Benayas-del Alamo, (2012) found that science and technology, as perceived in the social representations of Mexican primary school teachers, are considered contributors of the quality in human lifestyles, yet they recognised their potential for negative effects on nature. Likewise, the primary school teachers in this study emphasised the conservation and management of resources, as they seem to understand students, like other people, contribute to environmental issues of resource scarcity, pollution, and solid waste. Cutter and Smith (2001) assert there is a significant body of scientific literature suggesting the correlation between humans and environmental problems related to the exploitation of nature. Hence, the teachers' conceptions on this matter do not stand far from research findings, yet the approach based on resources is narrow considering the many factors and issues involved in the environmental crisis.

Agyeman (1998) asserts that the culture of social groups and the landscape influence the EE-related ideas that basic education teachers develop. Apart from the Natural Sciences' potential influence on the teachers' EE conceptions, the urban context, where most participants live and work, might have motivated the resource-driven pattern displayed in their conceptions (see, for instance, the content of Isabela's activities in the pastiche of Section 5.6 in Chapter 5). Apart from Esteban and Betty, all the participants lived and work in an urban setting (i.e. Monterrey and the surrounding towns). In accordance to this argument, Agyeman (ibid.) concluded that her participants' conceptions (primary school teachers) of nature and conservation were influenced by the cultural and rural landscape of the UK and the work of local urban wildlife groups; her participants displayed the premise 'environment equals countryside'. Similarly, Simmons (1996) reported the learning scenario (from wild to urban nature) has relevance to the planning and performing of EE activities; hence, the teaching examples encouraging the sustainability of resources and environmental management are likely to be informed by the needs of the local context, considering the urban environment is where students socialise.

Third pattern: knowledge-based teaching and learning

The emphasis on the acquisition of knowledge about the environment is another significant pattern across the teachers' conceptions about EE. Even though Section 5.5.2 discusses a few

activity-based EE teaching examples given by the teachers, the teachers' conceptions about EE are focused on the provision of EE-related knowledge. As suggested in the results of Table 5.2 in Section 5.2 of Chapter 5, this pattern suggests that all the participants envisioned teaching EE-related content by focusing on facilitating factual knowledge.

This pattern also shows a knowledge gap regarding what comprises environmental awareness and how to achieve pro-environmental attitudes and behaviours in students. Most of the aims that the teachers associated with EE and their conceptions of the environment (results in Sections 5.3 and 5.4) mention the importance of providing students with knowledge about the environment (which includes knowing about environmental phenomena and the impact of human action on the environment). In fact, the main purpose that nine out of eleven teachers associated with EE was to promote environmental awareness in students through knowledge (see the relevant EE aims in Section 5.3.2, Chapter 5). Similar, findings have been identified in other studies analysing the awareness of EE in primary school teachers from England and Greece (Chatzifotiou, 2005; 2006)

The main assumption in this pattern is that more knowledge about the environment equals environmental awareness; a premise, which at least nine out of eleven teachers communicated in their conceptions. Emphasised across the aims of EE, the concept of environment, and teaching examples, all the teachers also indicated that environmental awareness leads to pro-environmental attitudes and behaviours. Hence, most of the teachers emphasised exposing students to knowledge about the environment (often correlated to learning content of Natural Sciences); although, some of them (Luz, Betty, Isabela and Rori) did express general ideas about learning by doing practical work. It was not entirely surprising to find emphasis on the provision of knowledge about the environment in the teachers' conceptions since, traditionally, EE has been addressed as a topic in science education because this is where EE-related content is emphasised (see Section 2.2.6). Unfortunately, reducing EE to knowledge about the environment or to content in Natural Sciences belittles the importance and complexity[30] of the social factors involved in fostering pro-environmental attitudes and behaviour (González-Gaudiano, 2012).

The results in the EE aims and examples of teaching practices (these are in Sections 5.3 and 5.5) prominently show the teachers' interest on teaching students about the cause-effect relationships of their impact on the environment (e.g. references to the *ecological footprint*

[30] In the framework of EE, complexity refers to the various heterogeneous components interacting in the social and natural systems (Rolando-García, 2006 in González-Gaudiano, 2012).

by Betty and Isabela in Sections 5.4.2 and 5.6.1 respectively). This is because nine out of eleven participants suggested that if students learn about the environment and the effect of their actions in the environment, then this would foster pro-environmental attitudes and behaviour. For instance, in Section 5.4.1, Santiago from School B says, 'When students become aware of what the use is of every element in the environment or what it means for them to be there, then they will avoid polluting or damaging it.' However, EE research claims this premise of more knowledge about the environment equals pro-environmental attitudes and behaviour is simplistic and only relevant for achieving a few behavioural responses (Clark and Harrison, 1997; Kollmuss and Agyeman, 2002).

EE research literature has already documented this gap regarding what comprises environmental awareness and how to achieve pro-environmental attitudes and behaviours in students. For instance, in their meta-analysis of pro-environmental attitudes and behavioural research models, Kollmuss and Agyeman (op. cit.) explain 'environmental knowledge' (here this is associated with education about the environment) is a subset of environmental attitudes and awareness. In fact, on assessing 15-year-old students' competence on environmental science and geoscience, PISA 2006 found a correlation between high levels of student awareness and proficiency in environmental science (OECD, 2009, p.64). Therefore, the participant-teachers are right in associating environmental awareness and knowledge about the environment and its issues. Nevertheless, stablishing a direct link between environmental awareness and pro-environmental attitudes and behaviours is a problematic conjecture.

Simmons (1996) asserted that 'developing environmentally responsible citizenry' (an aim of the Mexican basic education curriculum and a suggestion in the teachers' EE conceptions) requires more than 'simple understanding of scientific or ecological principles' (p.149). Likewise, Summers et al. (2000**)** emphasise that scientific understanding of EE-related content is only one aspect of EE teaching. Similarly, Kollmuss and Agyeman (op. cit.) concluded that environmental knowledge and pro-environmental behaviour do not have a direct relationship. They found that demographic, external, and internal aspects (each having a subset of components) are determining factors for developing pro-environmental attitudes and behaviours in people. The conceptions about EE of most teachers but Rori, Isabela, and Mario indicate that simplified views of the circumstances and factors involved in developing pro-environmental attitudes and behaviours are predominant and prominent in this group.

Finally, another problematic implication of this pattern is the degree of pertinence between the EE-related content in textbooks and the knowledge required to participate in solving local environmental problems (the following pattern to be discussed). A Mexican study of the use

of teaching resources for EE primary schools reported 60% of the teachers interviewed asserted only using the official textbooks or other standardised guides that are nationally distributed (SEMANART, 2005 in Peza-Hernández, 2013). Likewise, it was noticed in some of the interviews (Luz's interviews, for instance) and the observation sessions of 8 teachers that the official textbooks are treated as crucial guides for teaching. The Mexican primary school textbooks are generalised guides for a nation that is multicultural and biologically megadiverse (CONABIO, no date); this means that the learning content in textbooks is not sufficient to solve locally-relevant environmental issues. Besides, Luz, in her final interview, said that her students would hardly relate to a case study in the opposite side of the country where her students live, supporting the relevance of offering locally-pertinent content to pupils learning EE-related content (look for her comments in Section 5.4.2 of Chapter 5).

Furthermore, researchers studying traditional ecological knowledge of indigenous people have observed modern and scientific conceptions about ecosystems are not necessarily attuned with the views of indigenous groups about their surroundings (Reid, Teamey and Dillon, 2004). This is because there are specific socio-cultural and geographical factors shaping the worldviews of the occupants in a region and which might not relate to modern conceptions of the environment. Likewise, the participant-teachers and their students belong to various cultural groups, are in a specific socio-economic environment, and live in a specific biophysical environment. Hence, the stress on providing knowledge about the environment or education about the environment to students needs to explore the conceptions of locals in consideration with modern and global ideas about EE and its issues. This includes the necessary information for understanding and participating in local environmental improvement. This leads to the following pattern that involves the teachers' interest on acting locally and improving students' areas and social circles of influence.

Fourth pattern: action for the immediate and local environment

All the teachers' conceptions about EE include stressed the improvement of immediate and local spaces (e.g. the classroom, the school, the house, and so on). Despite the knowledge-based pattern in the EE conceptions of the teachers, when they talked about EE-related activities the intervention and improvement of the local environment was stressed by all of them. This was suggested in the predominant conceptions of environment shown in Table 5.6 in Section 5.4, which are associated to the bioregionalist and ethnographic currents. Likewise, the EE-related teaching examples and learning activities commented in the interviews stresses the local environment. The association of these views with the bioregionalist currents in Table 5.7 of Section 5.5 in Chapter 5 support the prominence of this pattern. Additionally, some of

the records from the observations sessions in Appendix A.18 documented that Luz, José, Isabela, and Rori's lessons included EE-related learning activities, and all these were locally-relevant (i.e. carried out in the classroom, at the school or in the near community). The latter suggested visualisations of an education for the environment in the EE conceptions of the teachers, but not a consistent pedagogical approach to EE in the participants' contexts.

In contrast, Chatzifotiou (2005) identified that Greek primary school teachers' knowledge-based conceptions about EE were focused on teaching global environmental issues rather than local issues; her participants had also shown more interest for education about and in the environment than education for the environment. Chatzifotiou (2005) considered that the teachers had this focus because her participants had to teach a school subject called 'The study of the environment'. This might be further evidence of how curricula and programmes can influence how teachers perceive EE teaching. However, in a similar and subsequent publication, Chatzifotiou (2006) found that English primary school teachers were mainly concerned with the transmission of knowledge about the local environment, despite that the EE-related content in the contemporaneous English curriculum of that time dealt with general environment issues.

In the case of this study, the rationale for this pattern is perhaps that local environments and circumstances are considered relevant scenarios for students, and these are expected to elicit meaningful learning experiences—one of the pedagogical principles in the 2011 National Curriculum. Another possibility is that the teachers considered the age of development of primary school students when reflecting on pro-environmental activities, in which case, the local environment is the closest option for them; however, this was not made clear in the interviews. Also, the EE-related community projects and initiatives that teachers mentioned (see the outcomes in Section 5.5, Chapter 5) are influenced by institutions external to the school (e.g. museums, socially-responsible initiatives from a company of the private sector, non-lucrative associations, etc.) and which target local environmental improvement as in the case of Isabela's project (see her pastiche in Section 5.6, Chapter 5). The eco-club and EE-related community projects of School E were often encouraged through extracurricular contests that were promoted by institutions external to the school (see Isabela's comments in Section 6.3.2 of Chapter 6). Interestingly, none of the teachers, apart from Mario, mention any local EE-related organisations, initiatives or programmes for improvement, but those that promote school contests.

In this pattern, the emphasis on the local environment also suggests a connection with the *sense of place* that is studied in environmental psychology, and which Kudryavtsev, Stedman,

and Krasny (2012) claim is under-researched in EE. These authors explain the sense of place is a combination of the attachment and meaning people attribute to places. This involves the degree to which a place is important to people and the symbolic meanings people associate places with. Notions of belonging or a sense of place, according to what Kudryavtsev, Stedman, and Krasny (2012) suggest, are linked to pro-environmental behaviours. This is because having a sense of place is part of one of the factors (i.e. emotional involvement) Kollmuss and Agyeman (2002) identified as embedded in pro-environmental attitudes and behaviours. Pro-environmental attitudes and behaviour are a core aim associated with EE by most participants, therefore, it seems consistent they were also interested in encouraging students' involvement in activities that would stimulate their sense of place. Nevertheless, apart from Isabela and Rori (School E) and Mario (School F), neither of the teachers consistently conducted activities that would engage students in pro-environmental behaviour for improvement of local areas, as shown by the outcomes highlighted in Section 5.5.1 of Chapter 5.

7.3 Factors impacting environmental education teaching opportunities

Chapter 6 presents the results which are relevant to RQ. 3 (see this question in Section 3.1.3), which are summarised in Section 6.5. This section, like Section 7.1 and 7.2, concentrates on discussing the main findings of Chapter 6. These are discussed in Section 7.3.1 where the impact of teachers' interpretations of the cross-curricular role of EE is detailed. Following this finding, Section 7.3.2 discusses how leadership, school culture, and policies on teaching and learning are factors that shape teaching and learning opportunities for EE-related content. These findings discuss the teachers' cognitions on external and school-level factors shaping EE, which were predominant and prominent results in contrast to issues related with classroom-level factors and the teachers' education.

7.3.1 Teachers' cognitions of autonomy and cross-curricular content

RQ.3_Finding 5: *The participant-teachers communicate an existing, but underdeveloped cross-curricular treatment of EE-related content.*

All the teachers participating in this project could imagine and remember curricular spaces and teaching opportunities for EE in the primary school curricula—a finding that was also identified in Chatzifotiou (2005). In Sections 6.3.2 and 6.3.3 of Chapter 6, with higher or lesser degree of prominence all teachers identified that EE is a theme in the primary school curriculum and Year 6, and it can be linked to various subjects. Apart from the teachers in

School E, Isabela and Rori, all the teachers generally described dealing with EE-related content by making connections between one subject to another or by contextualising their lessons with EE-related themes. According to Barnes (2011) framework of cross-curricular teaching types, the teachers suggested experience and potential for developing 'opportunistic', 'hierarchical', and 'multi-disciplinary cross-curricular teaching (see the results in Section 6.3.2). This means that the cross-curricular understanding of EE was mostly limited to identifying linkages between subjects, when, in fact, the 2011 National Curriculum suggests linking various educational aims (which include values, skills, and knowledge relevant to EE) and learning content (Paredes-Chi and Viga-de Alva, 2017).

The National Curriculum and the Year 6 Study Programme depict the curricular space of cross-curricular themes as socially-relevant content that can run across all the compulsory disciplines of the syllabi. Although this reference is not a clear guide of what cross-curricular content is, and how it fits with the real and mainstream demands in classrooms. In fact, in this study, various teachers and from various schools, Morelos (School A), Marley (School B), José (School C), Rori (School E), Mario (School F), communicated that their concerns about covering the content of the compulsory subjects was a restriction to their teaching autonomy and to teaching EE-related content in their schools—as the results in Section 6.3.1 of Chapter 6 propose.

Additionally, the evidence in Section 6.3.1 of Chapter 6, shows that the teachers who characterised their autonomy as restricted by the National Curriculum and Study Programmes—e.g. Marley or Mario—were partial to EE, whereas Adela, Morelos, Santiago, and Esteban showed no signs of discontent with the content coverage that is suggested in these official documents. Adela, Morelos, Santiago, and Esteban generally described autonomy as their capacity to research and prepare their lessons, and, mostly within the limits of the syllabus outline. This suggests that teachers' cognitions and interest related to EE are potential factors influencing their ideas about EE-related lessons and teaching autonomy—as an illustration of Mario's and Adela's comparison in Section 6.3.1 of Chapter 6 displays.

In Section 6.3.1 of Chapter 6, Marley's and Mario's views about their teaching autonomy make a strong claim about the current demands of the educational climate (a climate characterised by accountability of teaching and constant testing of learning in statutory subjects), however, the National Curriculum and Study Programmes do not actually indicate that teachers should teach all the content in the syllabi, indicating a tension between policy documents and teaching. Additionally, in this investigation, out of the eleven participants eight performed a teaching style which consistently relied on the learning sequences that are

suggested in the Natural Science textbook (see the summary of the lessons observed for this project in Appendix A.18). The latter indicated the existence of a potentially generalised school-level demand on covering the full length of the Year 6 Programme.

The apparent demand to comprehensively cover the learning content and rehearse for summative learning assessments is related to the teachers' preference to dutifully follow the learning sequences in textbooks. In fact, one of the participants, Luz from School A, stated that 'textbooks are pretty much like the teacher's bible' (A, Luz, III, turn 102). Also, Luz made it explicit a few times that she preferred examining the textbooks and the Year 6 Study Programme to give more accurate responses during the interviews (A, Luz, III, extended notes). The centrality of the textbook is a well-known phenomenon of teaching in Mexico (Barraza and Walford, 2002), but the regularity of the practice does not mean this is a successful practice. This is because textbooks are generally designed in disciplinary style and a dependable use of them can hinder the development of cross-curricular teaching. Although, one of the participants gave evidence that this problem is being somewhat addressed in her context: Isabela said, 'We have always been told textbooks are not fundamental tools' since the expected learning outcomes (i.e. learning goals for students) are more significant to orienting teaching and learning (E, Isabela, I, turn 73).

As indicated by the above paragraphs there is an apparent gap between the curricular expectations in the Mexican National Curriculum for basic education and how teachers interpret and teach the EE-related content—which also depend on the various factors directly or indirectly impacting EE, see Section 6.4. This gap is potentially a result of how external policy—which is designed for general primary school cultures—is interpreted and translated into internal school policy by the participants of unique cultures in schools (Ball et al., 2012; Prosser, 1999). This gap suggests a typical division between the intended and the enacted curriculum, however, this is a relevant issue for primary education in Mexico since the National Curriculum is compulsory across the country.

The finding in this section indicates that at least nine of the participant-teachers depicted the cross-curricular treatment of EE as finding pertinent associations of EE with the subject matter and improving EE as equivalent to adding content to the curriculum. But in the context of the tensions mentioned above, this was perhaps a strategy devised by the teachers as way to cope with the pressure of covering the full content of compulsory subjects. Nevertheless, the cross-curricular teaching types that are illustrated in Section 6.3.2, especially the opportunistic and hierarchical styles, seem like anaemic notions of cross-curricular teaching when compared to specialised analyses (Dolors, et al., 1995; González-Gaudiano, 2000),

recommendations and proposals (e.g. Braus, 1995; Chatzifotiou, 2005; Drake, and Burns, 2004; Green, 2015; Palmer and Neal, 1994) for planning and teaching cross-curricular content like EE. Furthermore, neither of the teachers discussed cross-curricular views of EE across the educational aims and learing goals of primary school and Year 6.

In relation to the latter, Section 2.2.6 in Chapter 2 explains that, in formal education systems, EE is generally operationalised as cross-curricular content. Like the results of this study show, teaching cross-curricular content is often interpreted and enacted as adding content to the syllabus and establish links between them (Dolors, et al., 1995), but, Drake, and Burns (2004) insist that, in fact, when planning for cross-curricular content what matters is the way statutory subjects are organised around that cross-curricular element, which a different perspective to Barnes (2011) cross-curricular typology for teaching. Moreover, cross-curricular themes generally echo contemporary social concerns of priority and 'involve value conflicts in diverse situations of our social lives' (SEP, 2011b, p.178). Hence, Dolors et al. (1995) suggest that cross-curricular themes could be the axis around which subject matter is developed, using Civics and Ethics as the core transversal theme.

As suggested by Dolors et al. (1995), the Year 6 Study Programme describes a 'pedagogic axis' is choosing a subject or a theme 'to give sense to teachers' implementation of the programme and orient new skills and conceptions between knowledge and learning' (SEP, 2011b, p.202). The Yerar 6 Study Programme also indicates that Civics and Ethics is to be addressed through the cross-curricular themes (SEP, 2011b, p.178), although this suggestion changed within a few years of publishing the 2011 curriculum. In fact, at the time of this project's fieldwork, Adela and Isabela explained that Spanish (i.e. Literacy) had become the 'pedagogical axis', replacing Civics and Ethics Education (see their comments in Section 6.3.4 of Chapter 6). Pedagogical axes are similar to cross-curricular content in that they are embedded in learning content and can orient the course of teaching and learning content.

Using a theme or a subject as an axis for the rest of the subjects might require teaching in a multidisciplinary manner; this teaching and learning strategy focuses on organising disciplines around a theme (Drake and Burns, 2004). In this thesis from the 11 participants, only Isabela and Rori seemed to adapt a version of multidisciplinary teaching in their lessons. The evidence of this was suggested in Isabela's account on how she integrated an EE student project across the content of compulsory subjects (as mentioned in Sections 5.6 and 6.3.3 of Chapter 5 and Chapter 6 respectively). The rest of the teachers try, not without experiencing challenges, to link EE-related content to the compulsory subjects in a linear and improvised manner, allowing opportunistic and hierarchical cross-curricular types of teaching in their

lessons (see results in Section 6.3.4). What is more, the finding of Section 7.1.2 suggests the EE approach embedded in the National Curriculum and Year 6 Study Programme require the intervention of Natural Sciences and the non-core subjects to comprehensively develop EE as represented in the National Curriculum.

Potential teaching opportunities for EE-related content in Natural Sciences and Geography were not missed by the majority of the teachers; neither was the chance to address EE in Civics and Ethics Education. Likewise, practicing target skills from Spanish and Mathematics whilst including EE-references, reusable materials, or targeting environmental concerns was not overlooked. Even History was mentioned by a couple of teachers (Luz and Rori) who imagined how EE-related content could be addressed within this subject. These results are promising for a future development of cross-curricular teaching of EE, however, most of the examples of EE teaching that the teachers provided (except Isabela's and Rori's from School E) placed EE in secondary and peripheral role.

Despite the notion that EE is a cross-curricular theme among a dozen of socially relevant themes listed in the National Curriculum (see Section 4.2.1 of Chapter 4), there are substantial references to EE in the educational aims of primary education (see the findings of Section 7.1 in this chapter) and learning content which contribute to potentially developing robust and meaningful lessons. Nevertheless, external factors to the classroom, as suggested in the results of section 6.4.1 of Chapter 6, make the cross-curricular treatment of EE a complex endeavour; in fact, research has documented that the cross-curricular character of EE can be a factor breaching a wider gap between EE theory and practice (Grace and Sharp, 2000).

Planning the cross-curricular treatment of EE is a demanding task because it requires ample understanding of the EE approach (and the links with the EE model: education about, in, and for the environment) of preference, the EE-related aims for primary school (Palmer and Neal, 1994), and an overall understanding and support of EE in the school culture. Moreover, the cross-curricular treatment of EE requires being familiar with the main teaching guides (i.e. the National Curriculum, the Study Programmes, and textbooks), which Betty, Luz, and Isabela described as challenging because these are fairly often revised or changed. Additionally, discrepancies between the official documents (e.g. the programmes and textbooks) can increase the puzzlement of how to deal with the EE-related content in the curriculum (see Sections 4.2.3 and 6.3.4 in Chapters 4 and 6 respectively).

Furthermore, planning the teaching of cross-curricular content also requires having basic ecological literacy (Cutter-Mackenzie and Smith, 2003) and basic knowledge of EE. In this sense, all the participant-teachers did show consistent signs of having more than basic

conceptions about EE (see the results in Chapter 5 and the profile matrices in Appendix A.17) and a basic level of ecological literacy; yet again, some external factors to the classroom level (e.g. moving across school years and having constant changes in the teaching guides) made the enactment of EE teaching a difficult challenge for them. Hence, external and school level factors have a significant impact on the teachers' capability to provide EE learning opportunities for students in a comprehensive cross-disciplinary style—such factors are discussed in the following and last finding.

Finally, teaching cross-curricular content like EE challenges the traditional and disciplinary organisation of subject matter in schools and the format of assessments; but these are two basic elements of mainstream basic education. Hence, learning aims and goals related to EE, especially to a participatory EE approach, suggest a deep institutional reformation of the education system and the ways in which learning is assessed (González-Gaudiano, 2000). But even considering the rigid structures of the primary schools of nine of the participants (i.e. School A, School B, School C, and School F), there are available strategies to improve the treatment of cross-curricular content whilst respecting the unique cultures of schools; although, these are not simple, and they mostly depend on teacher training and planning (Palmer and Neil, 1994).

7.3.2 EE practice in school: a matter of leadership, internal policy, and school cultures

RQ.3_Finding 6: *School authorities' leadership and teachers' negotiation skills are crucial factors to allow EE teaching and learning opportunities*

In the National Curriculum for Mexican basic education, EE is a cross-curricular theme, which, ideally, Year 6 primary school teachers must organise around a wide range of educational aims and learning goals of nine disciplinary subjects and consider other eleven socially-relevant themes. Hence, despite the various relevant aims to EE in the official guidelines (see a summary of these results in Section 4.3) and the teachers' awareness of EE in the curriculum, EE currently has a marginal position in the primary school curriculum. The Mexican National Curriculum for basic education promotes the individual and personal development of students, for instance by introducing EE, yet the educational system saturates teachers and students with practices that anonymise and attempt to standardise student attainment. This results in a learning environment that is not conducive to the EE approach that is represented in the 2011 Curriculum and Year 6 Programme.

The marginal position of EE can be further aggravated by the competing priorities of internal and external stakeholders in schools. For instance, the examples of School C and School E (in Section 6.4 of Chapter 6) show that translations of policy into activities (an inevitable phenomenon in schools, see Ball et al., 2012), like mock tests or exam rehearsals, contribute to marginalising cross-curricular content like EE because this type of content is not tested in summative assessments, and it is often secluded in extra-curricular activities such as student contests (see the outcomes of Section 6.3.4 in Chapter 6). This indicates that, potentially, teaching EE in Mexican primary schools heavily depends on the following factors: the emphasis that teachers and school authorities give to EE; the negotiation skills of teachers and school authorities to balance internal and external priorities and demands; and the school culture and climate[31] that are fostered by the school authorities and staff. More importantly, the nature of these factors suggests leadership, of both school authorities and teachers, is a significant factor in allowing for potential EE teaching and learning opportunities to happen in schools.

Encouraged by transnational assessment regimes such as the Programme for International Student Assessments (PISA), the contemporary basic education systems and school cultures are generally driven by a centralised educational climate and practices (e.g. national curricula, emphasis on results of student tests, external school and teaching auditing, and so on). Accordingly, these practices create bureaucratic and standardised processes which can mechanise teaching for the sake of accountability (Bottery, 1992; Harris and Muijs, 2005). The standardised tests regimes communicate that they are the main source to test students' abilities, so they have internationally become beacons of educational quality, creating competition and comparison between educational systems across nations and within nations (Schratz, 2013).

Moreover, Ben-Peretz (2012) observes that the pressures of standardised student assessments lead school authorities and teachers to focus on the content of tests, ignoring other important learning content in the curriculum—as suggested by the results in Sections 6.3.1 and 6.3.4 of Chapter 6. Similarly, Saylan and Blumstein (2011) observed that the exam-oriented culture of the No Child Left Behind Act in the United States of America had a negative impact on EE, because EE was not a subject to be tested under this framework. In this thesis, consider, for instance, the evidence presented in 'Perceptions of autonomy to teach environmental

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31 In effective educational model's literature school climate refers to 'the extent to which a learning environment has been created in the school' (Creemers and Kyriakides, 2010, p. 267). In this thesis, this term is also used to refer to the general climate of educational systems.

education' in Section 6.3.1 of Chapter 6, which illustrates the content coverage demand that Marley, Mario, Rori, and Luz clearly experienced in their schools and that made EE teaching less feasible.

Nevertheless, general trends across the world indicate that local educational authorities have gained more control over internal policies and decision-making processes in schools (Pinot and Kelchtermans, 2016). Although a seemingly decentralised measure, more autonomy for school authorities is neither an equivalent of educational effectiveness or locally-relevant schooling (Ben-Peretz, 2012; Schratz, 2013). School authorities in Mexico, for instance, have significantly gained managerial and internal control of schools because since the last decade each school in Mexico has formed a 'technical board' formed by the school staff and a 'school improvement route' to attend the particular learning needs of the school population (see them further explained in Section 1.1.2). However, the decisions and initiates of technical boards and their 'school improvement route' are often led by the content of student tests—as José identified in Section 6.4.1 of Chapter 6. Nevertheless, if the symptoms of a centralised and bureaucratically standardised education cannot be avoided in the current climate, then, leadership, negotiation and decision-making skills of school authorities and teachers are crucial to balance the external demands and the local priorities and needs for students' learning.

Besides the external demands of the current educational climate, as seen in Section 6.4.2 of Chapter 6, the leadership of school authorities and their stance to learning and teaching also significantly influence the culture in schools and internal policies (Dean, 1999; Schratz, 2013). According to Dean (1999), Head Teachers influence the dominant culture in schools through what they praise, reward, encourage, and decide in the various dimensions of the school management and leadership. This is relevant to recent organisational changes in the Mexican basic education system since the last reform of basic education in Mexico suggested changes in the role of the Head Teacher. Generally, the Head Teachers were encouraged to change from being administrators of resources to becoming academic and social leaders in their community more prominently (Torres-Arcadia et al., 2016).

An example of the latter assertions is provided in Sections 6.4.1 and 6.4.2 of Chapter 6, where it is described that the authorities of School C emphasise the significance of orienting teaching towards standardization of results in student summative assessments. However, in School C, the standardising policies for teaching and testing of student learning undermine, directly and indirectly, teachers' autonomy and their decision-making capacity. The Head Teacher of School E, in contrast, supports the autonomy of Isabela and Rori by granting them trust and

supporting flexible teaching policies, aspects which are claimed to reinforce collegial work in schools (Day, Whitaker and Johnston, 1990; Schratz, 2013; Seashore-Louis and Wahlstrom, 2012). Moreover, Isabela and Rori suggested their Head Teacher has a significant role in EE-related activities because she endorses teaching and learning opportunities related to EE; the Head Teacher's input, according to Isabela and Rori, motivates them to work on EE and they, in turn, encourage students and parents to become involved in EE-related activities as well. Additionally, shared leadership, like the one suggested in the example of School E, is believed to strengthen communities in schools and have positive effects on student achievement (Seashore-Louis and Wahlstrom, 2012).

There are various taxonomies characterising leadership that focus on school authorities—from the typical distinctions between bureaucratic, autocratic, and democratic leadership styles (Day, Whitaker and Johnston, 1990) to the directive, distributed, and emergent leadership discussed in recent literature (Schratz, 2013)— yet leadership in schools is not limited to the school authorities when is learning-centred—i.e. showing concern for the learning of pupils', teachers' and staff's, as well as, the general learning networks in the school (Southworth, 2005). This is because leadership of effective schools is a process of social influence and a shared function, contingent upon the context, makes individual and collective distinctions in learning, and includes providing vision, directions and support for the staff (Harris and Muijs, 2005; Southworth, 2005).

Teachers and non-teaching staff (students and parents) can also be involved in decision-making processes and negotiation of policies at school and classroom levels. In fact, Harris, Day and Mark Hadfield (2003) correlate school effectiveness with schools in which the authorities encourage the leadership of all their staff. Similarly, in one of their studies on school effectiveness, Creemers and Kyriakides (2010) indicate that effective schools are 'expected to make decisions on maximizing the use of teaching time and the learning opportunities offered to their students' (p. 267), stressing school leadership—and not individual leadership—as a global endeavour and emphasising its relation to student learning.

Ben-Peretz (2012) asserts that teachers 'have scope for interpretation and choice in implementing external policies' (p.62); she suggests that adapting the implementation of external policies to specific context can balance the contemporary tendencies to accountability and the professional autonomy of teachers. Teachers are, however, also influenced—and occasionally constrained—by the culture in their school, the internal accountability and policies. Although creating a balance between the many external and internal forces shaping teaching and the professional autonomy of teachers is plausible if they

try and negotiate the application of external policies and the terms of internal policies in their school. Therefore, teacher leadership involves ‘a set of behaviours and practices that are undertaken collectively’ in schools (Harris and Muijs, 2005) because the relationships between the individuals involved in leading the school are crucial to negotiations and decision-making processes (p. 17). This was exemplified in Section 6.4.1 where the section conveys that José, a teacher trainer working in School C, managed to negotiate some of the terms in the lesson planning policy of his school, gaining more autonomy and decision-making power for his teaching; yet his negotiations were not directly related to EE teaching.

Teacher leadership is often related to the distribution of roles and tasks within the schools—e.g. teacher leaders who act as coaches for improving teaching or subject leaders who act as head of departments (Harris and Muijs, 2005)—, though, for nine of the primary school teachers who participated in this study, leadership needs to be focused on enhancing their negotiation and decision-making skills in teaching (Kagan, 1992). Because at least nine of the teachers participating in this study emphasised time constraints which prevent them from addressing EE-related activities more in-depth when teaching. These time constraints were often related to issues with external and internal demands related to accountability practices and the cultures of their schools. This indicates that teachers could address these problematic matters by making use of their negotiation and decision-making skills to refine their purposes with those promoted in their school.

Finally, considering the marginal character of EE in the National Curriculum and the Year 6 Programme and the results presented in Section 6.4 of Chapter 6, it seems that Head Teachers and teachers wanting to promote EE in their school would have to negotiate its teaching whilst in the current climate of accountability (which generally neglecting cross-curricular content like EE or health education). Therefore, the results of this study indicate that promoting EE in the participants’ primary schools, at classroom and school levels, requires cohesive and shared leadership interventions from both school authorities and teachers; besides, it requires finding an agreed vision of EE, a common purpose, and coherent plans that include a clearly articulated strategy for EE teaching.

Chapter 8. Conclusion

This final chapter, in Sections 8.1 and 8.2, identifies two relevant discussion points: the first, resulted from reflecting on the interrelation of the key findings on conceptions about EE; the second, emerged from thinking about the teacher cognition literature and the factors influencing EE teaching in the participants' schools (as presented in Chapter 6 and discussed in Section 7.3). After this, Section 8.3 offers recommendations for school leaders, policy designers, and teachers; following this, Section 8.4 presents the central implications of the thesis for future research in EE. The chapter continues with Section 8.5 and Section 8.6, these sections include a methodological reflection on the analytical framework (Sauvé's EE typology) and the acknowledgement of the study's limitations. The chapter concludes in Section 8.7 and some brief remarks regarding the researcher's fieldwork experiences.

8.1 Environmental education in the curriculum and the teachers' conceptions

The results of RQ.1 in Chapter 4 corroborated and outlined the presence of EE in the curriculum. Additionally, these outcomes opened the possibility to search for relationships between how the curriculum documents and the participant-teachers conceptualise EE. Searching for such associations, however, was not entirely feasible because of the way the analyses of RQ. 1 and RQ. 2 were developed. The analyses differ in depth; the analysis for the RQ.2 was more specific and used a different framework to the analysis in RQ.1. The analysis of the teachers' conceptions had other levels of depth, stressing the concept of environment, the aims, and EE teaching example and activities. In RQ.1 the analysis was designed to find EE-related content and 'unpack' the prominent messages from these. Hence, these differences make the results of both analyses inappropriate for an equivalent comparison. The analyses were not made compatible from the start because the researcher considered that the curriculum and the teachers' data were of different nature and range.

There are, nevertheless, visible relationships that can be made from the findings discussed in Sections 7.1.2, 7.2.2 and 7.3.1. There are four similarities between the findings of these sections: conceptualising EE as 'transversal' (i.e. cross-curricular theme); the anthropocentric view of the environment; the emphasis on resource-driven and conservation activities; and a participatory vision of EE. As the curriculum suggests, in the patterns across the teachers' conceptions about EE, the role of humans (or students, as the teachers indicated) in the environmental crisis is central for the sustainability of current lifestyles. The teachers' conceptions also stress teaching examples and learning activities focused on resource

management in the immediate environment or in local communities, indicating a resemblance with participatory approaches to EE.

These insights on the interrelation of outcomes suggest that the teachers, probably in a similar way this study did, have managed to grasp the curriculum's (rather loose) outlining of EE from the visible and explicit content in the documents, although overlooking the relationship between health and EE that the curriculum documents suggest. Other studies (Grace and Sharp, 2000) have identified opposition from behalf of teachers to enact a prescribed EE approach in their teaching; this circumstance did not feature strongly in the data of this study. However, the fact that EE is loosely outlined in the curriculum documents and that the teachers have other pressing and immediate demands might have facilitated their apparent acceptance of the EE-related content and EE approach.

8.2 Insights on the teacher cognition model and the findings

The empirical studies reviewed in Sections 2.3.2 and 2.3.3 suggested various constructs (e.g. beliefs, conceptions, knowledge) to study teachers' cognitions about diverse matters. Often, the implications of the results or the context, and not the construct itself, were core matters in the research articles reviewed. These insights lead this research towards the path of teacher cognition and a teacher cognition model proposed by Borg (2006). In his model, Borg (2006) focuses on the background and contextual aspects of teaching as bidirectional factors shaping teacher cognition. Borg's model seems to concentrate on classroom-level factors and does not concentrate on the type of psychological construct used to study teacher cognition of 'x' because he conveys that these are interrelated.

The empirical studies reviewed and Borg's model on teacher cognition were helpful in supporting the design of the research study presented in this thesis. The model reminds us that teachers' education has a role in shaping teachers' cognitions (an aspect that was only highlighted by the teachers in School E) and it broadly suggest that contextual factors have a bidirectional effect on classroom practice and teachers' cognitions. Therefore, besides contributing to the rationale of the research design, Borg's model was also a potential framework to interpret the findings of this study, yet it was not found significantly relevant to the results and key findings of this study.

The results of the RQ. 2 and RQ. 3, especially the results of the latter, report teachers' cognitions that emphasise the effect of external factors to the classroom-level practice. Issues to do with the allocation of time for teaching in a climate of educational accountability seem more pressing to the participants than other classroom-bound factors like classroom cultures

or students' backgrounds. This suggests that the study of teacher cognition certainly benefits from encompassing and communicative models like the one proposed by Borg (2006), though, it is essential to stress and specify further the impact of external factors to the classroom level. In this instance, models on educational effectiveness (Creemers and Kyriakides, 2008; 2010) and conceptual frameworks studying the role of school policy (Ball et al., 2012) and leadership in schools (Harris and Muijs, 2005; Schratz, 2013.) could complement the study of what impacts teacher cognition and its implications in practice. This is because the aforementioned literature on schooling effectiveness, considers the role of external, school and classroom level factors and their interaction with teaching and learning practices.

8.3 Recommendations to policy designers and the relevant educational community

Since there are models (education about, in, and for the environment) and various approaches to EE, it is important to learn and, if necessary, help teachers to clarify their conceptions about EE (Clark and Harrison, 1997; Cutter and Smith, 2001; González-Gaudiano, 2000; Sauvé, 2005; Scott, 1999). The design of the official curriculum guidelines for primary school could contribute to this by clearly articulating the desired model and approach to EE. This is considering that grasping the approach to EE from curriculum documents is not a straightforward task.

In agreement with Chatzifotiou (2005), this thesis supports that creating school policies for EE should be encouraged by the curriculum; nevertheless, school authorities and teachers can develop EE programmes without necessarily being prompted by an official document or prescribed policies (Grace and Sharp, 2000). This is relatively feasible in the context of Mexican primary schools since EE has kept relevant in the new curricular proposal for basic education whilst schools are being encouraged to increase their institutional autonomy (SEP, 2016). This means that the school managers and teachers could organise their preferred approach to EE basing their decisions on the EE-related content in the curriculum documents and integrating their personal conceptions about EE. The articulation of EE should include:

a) An explicit outlining of the preferred EE approach: the concept of environment, the aims and learning goals of EE considering the development stages of students, and potential ways to practice EE to motivate the achievement of those aims.
b) Clarification on how the human-environment relationship is perceived in the selected EE approach.

c) A strategy to develop the EE planning and teaching as cross-curricular content.
d) An overt manifesto explaining the policies related to how EE would be enacted in the school and classrooms (e.g. education for the environment in the framework of EES).
e) Inviting the local community to participate in the articulation and practice of EE.

Chapter 1 mentions that across Mexico there have been or there are scattered teacher training events and courses in relation to EE. However, the results of Section 6.3 indicate that there is also a need, perhaps even more pressing than EE itself, to prepare in-service teachers to deal with cross-curricular content in a framework of high accountability and demand in schools. Another important remark is that the training of EE should have short-term training options for teachers; it seems that in Mexico most of the training available for EE are master's degrees or long-term courses (e.g. Benitez-Esquivel et al., 2010; Peza-Hernández, 2013).

Additionally, primary school teachers could benefit from training that would enhance their autonomy to solve challenges in the classroom and school. The articulation of EE in documents, schools, and teachers' conceptions might not develop satisfactorily if it is not accompanied by supporting strategies targeting teachers and school leaders who need to cope with the pressures and inherent challenges of standardisation and accountability tendencies of formal basic education. For this reason, it needs to be widely acknowledged that EE teaching seem to involve the development of time management skills in teaching EE activities, leadership to organise and manage outdoor activities, and appropriate decision-making strategies. Finally, survey and mix-method studies could further the available knowledge of actual gaps between EE rhetoric/theory and the current school realities of the Mexican primary school system.

8.4 Suggestions for future research

The general results of this study suggest that future research could benefit the development of EE by studying the interpretation and translation of educational policies and the way EE is conceptualised and enacted in schools (e.g. using the framework and typology offered in Ball et al., 2012). It seems relevant to make the ideological relationships between schooling and conceptions about EE explicit (e.g. EE-related aims, studying them in their isolated and interrelated structures). This involves examining the interpretation and translation of educational policies at school and classroom levels and the relationship of these in unique and perceived school cultures in relation to leadership practices in schools (Prosser, 1999). In this study, it was found that school cultures and leadership are factors impacting EE teaching, yet these are bound to how teachers and school authorities work with external policies. Teachers'

cognitions are a resource to understand these complex interactions between EE, policy, and school cultures, however, there are other people also participating in the learning and political processes at schools. Therefore, future research could consider including the voices from other stakeholders like school authorities, parents and students.

Additionally, future investigation can contribute by further exploring how primary school teachers' conceptions about EE relate to their knowledge base of EE-related content. This is suggested because research on primary school teachers' literacy of EE-related topics (i.e. global warming, aesthetical values of nature, waste management, and so on) have identified that optimal EE teaching starts with developing a substantial knowledge base of the EE-related content in curricula (Cutter and Smith, 2001; Cutter-Mackenzie and Smith, 2003; Summers et al., 2000**)**. This includes the scientific understanding of the EE-related content as well as the knowledge, values, skills, and pedagogical knowledge associated with the EE approach of preference. New studies on these matters are advised to consider combining classroom realities and teachers' conceptions about EE. The study of these could be enhanced by perhaps adapting existing and pertinent EE frameworks, like those of Cutter-Mackenzie and Smith (2003), Sauvé (2005) and Steele (2014), to the needs of a classroom, lesson, or context—since testing these frameworks is also a potential contribution to EE.

Finally, in the outcomes of Chapter 5, there are topics that are part of the knowledge base of EE and that potentially reflect on significant aspects of the teachers' understanding about the human-environment relationship. Firstly, it was identified that the participants were unclear about the differences between sustainability and sustainable development. Secondly, it was noticed that a couple of teachers (Morelos and José) used the terms conservation and preservation interchangeably, yet the differences between these terms is not uncontested in environmental management literature (e.g. Minteer and Corley, 2007). Thirdly, the participants (and students as well) often confused terms like re-using and recycling; this was noticed in the interviews, but also in the non-participant observation sessions. Finally, some teachers expressed that economic, scientific, and technological progress have an impact on how environmental care is conducted by nations. These topics were not explored in depth in this thesis, but they can be studied further by future EE research. In fact, the results of the non-participant observation sessions indicate that using discourse analysis and conversational analysis methods would be beneficial to learn further about the speech interactions of teachers and students when they discuss EE-related material—a teaching activity that was much practised during the lessons observed.

8.5 Methodological reflections: Sauvé's environmental education typology as an analytical framework

Part of Sauvé's hopes for her EE typology are that 'it might be useful for teachers… may also assists educators to situate their own theoretical choices and their own practices on a map of the environmental education landscape' (2005, p.31-32). This section extends the findings in Section 7.2.1 and offers further insights about using Sauvé's EE typology as an analytical framework to study conceptions about EE. This study has identified a potential misrepresentation problem of EE conceptions which seems common in other studies using this typology as an analytical framework (see Sim, 2014; Steele, 2014; and Viteri et al., 2013 in Section 3.4.3). The reflections in this section are an attempt to engage with Sauvé's assertions which stress the typology is not exhaustive and critical engagement is necessary to improve it (2005, p.31).

Research using Sauvé's EE typology often focus on identifying EE currents in EE-related data. This results in overlooking the insights that individually looking at the parameters can provide (e.g. see Chapter 5 and Section 7.2.1). For instance, Viteri et al. (2013) analyses the presence of EE currents in primary school teachers' views about EE; one of their conclusions states the following:

> *Results showed that nearly two-thirds of the NSTs [natural science teachers] express concepts that align with a conservationist/resourcist EE current, while only one-tenth display both a naturalist and value-centred current[...] Just over half of the non-NSTs [non-natural science teachers] displayed a conservationist/resourcist EE current, which is similar to the results of the NSTs. While NSTs* ***use additional EE concepts*** *under value-centred and praxis (pragmatic) currents [.] (ibid., p. 587, researcher's emphasis: bold letters)*

The excerpt shows that Viteri et al. (2013) noticed something they called 'additional EE concepts' when they found partial overlaps with other currents, yet this result is not explored in more depth in the article. These authors clarify that 'currents can overlap but they are not mutually exclusive' (ibid., p.586), but that does not explain having different meaning for the same parameters (i.e. different meanings for the aims of EE). Conceptions about EE can be misrepresented if researchers do not consider that participants can have, for example, two different conceptions of the environment, one core aim of EE, and a large scope of teaching ideas for EE. Such conceptions can require more than a single EE current or two to explain someone's approach to EE.

Perhaps, how researchers of EE perceive Sauvé's EE typology might explain some of the ways in which the typology is accepted and used. For instance, Steele (2014, p.248) describes

Sauvé's typology as a 'comprehensive overview', and Sim (2014, p.54) depicts it as a 'fine-grain proposal'. Although Sauvé's typology helped in outlining the scope of EE in a time when the DESD was obliterating all EE references from public policy, her article does not report or document a systematic meta-analysis of the sources she used to conceive each EE current. Without knowing the details of her methodological strategy, it seems unfitting to affirm her typology is a 'fine-grain' or 'comprehensive' proposal. Instead, Sauvé's EE typology is an invitation for cultivating the critical effort she started by noticing different emphases across EE practices.

Finally, applying the typology to understand approaches of EE in qualitative data might not be as straight forward as it seems. The recommendation of this study, is to critically assess how one will use the typology, in addition to carefully considering how the design of the research instruments and analytical process will bear on the results. In this way, one could more assertively claim that a certain view about EE represents 'X' current, otherwise we must pay attention to the individual parameters and determine if a claim of this type is indeed representative of the data.

8.6 Limitations of the study

There were various worthwhile and valuable research opportunities that were seized during the development and conduction of this study. However, as Creswell (2013) explains, all research, upon reflection, is bound to unveil limitations and different potential courses of action. The researcher acknowledges this study is limited by the context and size of its sample to make universal claims; however, its results are useful to other similar contexts and for conforming or refining the literature consulted. Another limitation was the selection of the sample, which was not randomised since it was required by the local Ministry of Education to have prospective participants in advance. Nevertheless, the trustworthiness of the study was not affected greatly by this requirement since the selection of the participants had a degree of randomisation and it depended on the teachers' will to participate.

Another methodological and contextual limitation of this study was the teachers' proneness to link EE with Natural Sciences. The information sheet that was given to the participants displayed the motives of the study and discussed the observation sessions of Natural Science lessons. An event from which it is believed that this pre-empted the participants' expectations about the purpose of this investigation. This issue was tackled by using follow-up questions and exploring teachers' comments further throughout the interviews, although there were some inevitable predispositions at first.

A final limitation, during the first year of designing this project the researcher also concentrated on the relationship between Natural Sciences and EE, as EE-related content is explicit in the former (see researcher's reflexivity in Section 3.2.3); however, as she became more familiar with the field it was evident that EE needed to be treated as a cross-disciplinary field. The researcher tried to tackle this issue during fieldwork by asking teachers that besides inviting the researcher to their Natural Science lessons she would be happy to attend other lessons and activities they considered would have 'environmental content'. This only happened a few times when Luz (School A) took the researcher for a couple of walks around the school to observe their EE-related activities; also, when Marley (School B) invited the researcher to join him in a couple of his Geography lessons, although, he said it had not much to do with EE (Ob. field notes, BM-2). Hence, it is without a doubt advisable to consider the cross-disciplinary treatment of EE when preparing a study of EE.

8.7 Final remarks

The experience left by this investigations exceeds the accounts reported in the limits of these pages. This research journey was given a conclusion, but many of its stories are yet to be told. For instance, all the times when the Head Teachers invited the researcher into their offices to share some long chats about issues of interest in education. Also, it was amusing to notice how students generally showed a formal and respectful attitude towards the research activities; despite their evident curiosity, most classes understood the nature of 'non-participant observation' to the point they often forgot the researcher was amongst them. There were also post-fieldwork mesmerising recollections for the researcher. Some of them happened when she was asked to present her ideas about research and EE to students of the primary schools which participated in this investigation. This exercise was successful in all occasions and even exhilarating at times. Finally, one of the schools in the sample was once (more than twenty years ago) the researcher's primary school; so, the students' reactions, smiles, wide-open eyes, and turning heads, when they were told that she was once a student in their school are for sure printed somewhere in this thesis with an invisible ink.

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Appendices

A.1 Environmental Education Typology proposed in Sauvé (2005)

EE Current	Concept of environment	Aims of EE	Dominant approaches	Examples of strategies
1. NATURALISTIC	Nature	Reconstruct a link with nature.	Sensorial, Cognitive, Affective, Experiential, Creative/Aesthetic	Immersion; interpretation; Sensorial games; Discovery activities.
2. CONSERVATIONIST/ RESOURCIST	Resource	Adopt behaviours compatible with conservation. Develop skills related to environmental management.	Cognitive, Pragmatic	Guide or code of behaviours; 3Rs set of activities [i.e. reducing, reusing and recycling]; environmental audit; conservation project.
3. PROBLEM-SOLVING	Problem	Develop problem-solving skills: from diagnosis to action.	Cognitive, Pragmatic	Case study: issue analysis; Problem- solving project.
4. SYSTEMIC	System	Develop systemic thinking: analysis and synthesis [*sic*], toward a global vision. Understand environmental realities in view of enlightened decision-making.	Cognitive	Case study: environmental system analysis; construction of ecosystem models.
5. SCIENTIFIC	Object of study	Acquire knowledge in environmental sciences. Develop skills related to the scientific method.	Cognitive, Experiential	Study of phenomena; Observation; Demonstration; Experimentation: Hypothetic-deductive research activity.
6. HUMANISTIC/ MESOLOGICAL	Living Milieu (junction of nature and culture; place of existence and living habitat)	Know and appreciate one's milieu of life; better know oneself in relation to this living milieu. Develop sense of belonging.	Sensorial, Affective, Cognitive, Experiential, Creative/Aesthetic	Itinerary; landscape reading; study of milieu; investigation
7. VALUE-CENTRED	Field of values	Adopt ecocivic behaviours. Develop a system of ethics.	Cognitive, Affective, Moral	Analysis of values; Clarification of values; Criticism of social values.

8. HOLISTIC	*Holos*, *Gaïa*, All, The Being	Develop the many dimensions of one's being in interaction with all aspects of the environment. Develop an "organic" understanding of the world and participatory action in and with the environment.	Holistic, Organic, Intuitive, Creative	Free exploration; visualization; Creative workshops; Integration of complementary strategies.
9. BIOREGIONALIST	Place of belonging, Community project	Develop competencies in/for local or regional community ecodevelopment.	Cognitive, Affective, Experiential, Pragmatic, Creative	Exploration of our shared milieu; Community project; Project of local or regional ecodevelopment.
10. PRAXIC	Locus of action/reflection	Learn in, by and for environmental action. Develop reflexive skills.	Praxic	Action-research; Reflexive posture in activities or project.
11. SOCIALLY CRITICAL	Object of trans-formation, Place of emancipation	Deconstruct socio-environmental realities in view of transforming them and transforming people in this progress.	Praxic, Reflexive, Dialogic	Analysis of discourses; Case study, Debate, Action-research.
12. FEMINIST	Object of solicitude	Integrate feminist values into the human-environment relationship.	Intuitive, Affective, Symbolic, Spiritual, Creative/Aesthetic	Case study, Immersion, Creative workshop, Communication & exchange activity.
13. ETHNOGRAPHIC	Territory, Place of identity, Nature/culture	Recognize the close link between nature and culture. Clarify one's own cosmology. Valorise the cultural dimension of one's relationship with the environment.	Experiential, intuitive, Affective, Symbolic, Spiritual, Creative/Aesthetic	Fables, Stories and legends; Case study; Immersion; Modelling; Mentoring.
14. ECO-EDUCATION	Role of interaction [*sic*] for personal development, Locus of identity construction	Experience the environment to experience oneself and to develop in and through it. Construct one's relationship with the *other- than-human world*.	Experiential, Sensorial, Intuitive, Affective, Symbolic, Creative	Life story; immersion; exploration; games; introspection; sensitive listening; subjective/objective *alternance*.
15. SUSTAINABLE DVP. /SUSTAINABILITY	Resource for economic development, Shared resource for sustainable living	Promote economic development that takes care of social equity and ecological sustainability; contribute to such development.	Pragmatic, Cognitive	Case study; Social marketing; Sustainable consumption activities; Sustainable living management project.

A.2 Form A. School Information Form (English Version)

<table>
<tr><td colspan="4">School Information Sheet</td></tr>
<tr><td>School name</td><td>Region</td><td>Zone</td><td>No. of students</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>Address</td><td>Telephone (s)</td><td colspan="2">E-mail</td></tr>
<tr><td></td><td></td><td colspan="2"></td></tr>
<tr><td>System</td><td colspan="3">Website or social media</td></tr>
<tr><td>Estate / Federal</td><td colspan="3"></td></tr>
<tr><td colspan="4">Assessment system</td></tr>
<tr><td colspan="2">Teacher assessment(s)</td><td colspan="2">Student assessment(s)</td></tr>
<tr><td>Name of the test</td><td>Period</td><td>Name of the test</td><td>Period</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">School authorities</td></tr>
<tr><td>Head Teacher’s name</td><td colspan="3">E-mail</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td>Sub-head Teacher’s name</td><td colspan="3">E-mail</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td>Zone supervisor’s name</td><td colspan="3">E-mail</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td>Personal administrativo</td><td colspan="3" rowspan="2">How many teachers are currently teaching in Year 6?</td></tr>
<tr><td>Nombre de la Secretaria (s)</td></tr>
<tr><td rowspan="2"></td><td colspan="3"></td></tr>
<tr><td colspan="3" rowspan="2">Does the school have any projects in development and in relation to environmental education? Does the school belongs to any group/institution related to environmental education?</td></tr>
<tr><td>School’s porter</td></tr>
<tr><td></td><td colspan="3"></td></tr>
<tr><td colspan="4">Notes or comments for the researcher:</td></tr>
</table>

Thank you for your participation, ME Ana Benavides

A.3 Form B. Teacher Information Form (English Version)

Dear teacher,

Please answer the following questions as accurately as possible. Your information will be kept strictly confidential.

SCHOOL **A** **B** **C** **D** **E** **F** **G** **H**

Teacher _____

Please choose a short pseudonym of your choice. This pseudonym will be used to identify your data along the processes of data collection, analysis and presenting of results.

Gender:	Birthdate:
For how long have you been teaching in primary education?	Do you have a second teaching job? Or another profession? If yes, could you indicate which one?
How long have you been working in this school?	In which years –within primary education- have you taught?
Grade you are currently teaching:	Number of pupils in your current class:
How many natural sciences lessons do you teach a week?	Which is the usual weekly schedule for the natural sciences lessons?

If you agree, please could you provide the following contact information?

This information will be used in the case that the researcher wishes to communicate with you to set or confirm a meeting or event.

E-mail _____

Telephone number _____

A.4 Form C. Teachers' Education Form (English Version)

Dear teacher,

Thanking you in advance for your valuable participation, in the following format you are requested to provide information regarding your education. The information provided can be as detailed as you like, albeit, a summary of the degrees and training you consider relevant is sufficient.

Name _____ **Place of birth**_____ **Town/City**_____

INITIAL EDUCATION		
Degree(s)	**INSTITUTION**	**PERIOD**
CONTINUING PROFESSIONAL DEVELOPMENT		
Course or Programme	**INSTITUTION**	**PERIOD**

Signature _____ **Date**_____

A.5 Interview Protocols (English Versions)

A.5.1 Initial Interview (English Version), page 1

I. The Year 6 Natural Sciences Curriculum

- Could you please tell me how would you describe year six of primary school? What are its main characteristics?
- What do you think the aims of year six are? [If yes] – Can you give me a few examples? How did you become aware of them? [prompt]
- Which would you say are key themes/subjects in the Year 6 curriculum? Why?
- *I want to visualise all these you are telling me with the help of a concrete example…say with the natural sciences curriculum.* What role do you think the Year 6 Natural Sciences curriculum plays in the overall curriculum for year six? Are they linked? How? [prompt]
- *So*, how would you describe the Year 6 Natural Sciences curriculum?
- Are any themes that you consider relevant? [If yes] –*Tell me about these themes*, why are they relevant?
- How would you compare the Natural Sciences curriculum to other subjects?

II. About environmental education

- *There is another topic I want to explore in this interview; I want us to talk about environmental education.* Have you heard of it? [If yes] – Where have you heard of it?
- *So*, what does environmental education means to you? *…according to this that you are saying to me*, what are aims of environmental education? [prompt]
- What problems do you think environmental education can solve? [prompt]
- *I was wondering*, have you identified environmental education in the primary school curriculum (prompt)? [If yes] –Where have you seen it?
- Do you remember teaching any environmental education-related topics? [If yes] –For how long do you remember teaching these topics?
- *Reflecting on this, on teaching environmental education*. Are there any other subjects or other themes intertwined with the lessons that relate to environmental education?
- Do you remember any activity related to environmental education that you practice in class? [If yes] –Can you tell me about it?

III. About the last reform

- *Looking back to the last primary education reform in 2009.* Did you experience the last reform process in primary education? [If yes] – How would you describe your experience?
- How did you feel the reform impacted you or your work?
- *Narrowing our conversation down a little more*, do you think the reform had any impact on environmental education? [If yes] – What did it suggest? How did it impact?

A.5.2 Intermediate Interview (English Version)

I. Ideas about teaching

- How did you decide to be a teacher?
- What is teaching for you? ¿How do you feel about teaching?

II. Factors influencing practice

- What sorts of things do you think influence your teaching in a positive or a negative way? If there is any.
- In what way these factors have impact on your teaching?
- Have you identified personal aspects that affect your teaching?

III. Factors impacting EES teaching

- Do you notice factors like the ones you mentioned before or other aspects, influencing the way you teach lessons with environmental education and sustainability content?
- When addressing environmental education and sustainability in your lessons, how do you perceive your teaching autonomy in this regard?

A.5.3 Final Interview (English Version)

I. Teaching Block II and III of the Year 6Natural Sciences Programme

- What do you think of how Blocks 2 and 3 were delivered?
- How would you describe your knowledge of the topics in Blocks 2 and 3?
- How do you gain knowledge in these (those in Blocks 2 and 3) topics? What have been your sources of information?
- How do you think the terms ‘environmental education’ and ‘sustainability’ relate in this term?

II. Environmental Education for Sustainability

- What does sustainability mean to you?
- How would you explain sustainability to students? Could you give me an example?
- Have you heard of environmental education for sustainability? [If yes] Where have you heard from it?
- In your opinion, are there any subject content in the Year 6 programme that is linked or could be linked to environmental education for sustainability? [If yes] Which ones?
- What do you think of this term? Do you think the term has a role in the teaching of Blocks 2 and 3?

A.6 Observation Sheet (English Version)

CODE	LESSON AND TEACHER	SCHOOL	DAY AND DATE	SCHEDULE

MIN	REGISTERED SITUATION	NOTE/REFERENCE TO
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EXPANDED NOTES OR REGISTERS IN SITU

A.7 Letter for the Sub-ministry of Education in Nuevo Leon (English Version)

Subject: Research project participation request
Leeds, United Kingdom; 20 June 2014

PROF. RAMONA IDALIA REYES CANTÚ
HEAD OF THE SUBMINISTRY OF BASIC EDUCATION
Nueva Jersey 4038, 1st. floor, Industrial Lincoln, Monterrey, N. L.
PRESENT:

May I venture to divert your delicate courtesies to introduce myself and express you the following. My name is Ana Ilse Benavides, doctorate student at the University of Leeds in the United Kingdom. As it might be of your knowledge, the National Council of Science and Technology (CONACYT by its acronym in Spanish) and the General Office of International Relations (DGRI by its acronym in Spanish) of the Ministry of Education support Mexican students to undertake their postgraduate studies. Thanks to these institutions I am currently carrying out my research Project at the Centre for Studies in Science and Mathematics Education (CSSME) in the School of Education.

Currently, the title of my research project is: 'Two Perspectives on Environmental Education from the Mexican Natural Sciences Curriculum: Curriculum Designers and Teachers. I plan to research how environmental education is understood through the voice of curriculum designers presented in the official documents, and the discourse of primary school teachers. The further intention of the project is to contribute to the improvement of environmental education teaching in primary school and the design of its curricular proposals in Mexico.

The beginning of the data collection stage of the project is scheduled for the month of October, 2014. For such reason, I come to you to request your support with regards to the required authorization to allow that six teachers of sixth grade working in the metropolitan area of Nuevo Leon participate.

The main methods of evidence collection will be: lesson observation sessions (40% of a block i.e. 12 hours per teacher) and one interview to teachers, after the observations. Efforts will be made for the research activities to be executed within the work schedule and the school, always agreeing with the schools' and the teachers' timetable.

Lastly, I assure you that the participation of the institutions and teachers involved in the project will be treated equally and according to the ethical principles and confidentiality demanded by the University of Leeds and the Mexican Ministry of Education. This includes the approbation of the University of Leeds' ethical committee to conduct the investigation; participants´ informed consent; anonymisation of schools and teachers, and the right to withdraw their participation at any time.

With no more for now I say goodbye, I thank you for your attention and I hope I can count with your valuable support.

YOURS SICERELY

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E-mail. edaibl@leeds.ac.uk
http://manosalaobra.cinvestav.mx/gpo_invest.html

PROFESSOR JIM RYDER
Project Supervisor
Tel. (+44) 0113 3434589
E-mail. J.Ryder@education.leeds.ac.uk
http://www.education.leeds.ac.uk/people/academic/ryder

A.8 Information Sheet for Participants (English Version)

Information Sheet for Participants in Phase II

Environmental Education in Year Six of Mexican Primary Education: Curriculum Design and Teachers Enactment

Invitation

You are being invited to take part in a research project. Before you decide whether or not to participate, it is important that you understand the purpose of the study and what your participation will involve. Please take time to read the following information carefully. You are free to ask for any clarification or seek further information before taking your decision.

The purpose of the study

The study aims to explore the curriculum guidelines and the practice of environmental education in the sixth year of primary education. The purpose is to obtain information to clarify in the role of environmental education and how this is interpreted in the practice. What is more, this research will contribute to the broad scientific literature of environmental education internationally and in Mexico.

Why you were invited to participate in this study

For the project to be successful your experiences are important, because this study considers teachers to be a significant influence in curriculum practice. Therefore, I am inviting in-service teachers to take part in the research activities. You have possibly taught in different years of primary school and probably have experienced change processes, like educational reforms, which suggest you as a potential participant for this study.

Participation is voluntary

Participation in the research is entirely voluntary and it is up to you to decide whether or not to take part. If you decide to participate, you will be asked to sign a consent form. It is important to remark, that even after consenting to participate, you can still withdraw your participation at any time. If you choose to withdraw, you do not have to give explanations about your motives to do it. In such case, it will be appreciated a message notifying the researcher responsible of the project in any type of communication that you think suitable.

Ethics Approval Reference: AREA 14-020 Date of Approval: 12/10/2014

A.8 Information Sheet for Participants, page 2

What will happen if you participate?

Primarily, you will be asked to participate in face to face interviews. These will be an initial interview, 2 or 3 short interviews as the data collection process progresses, and a final interview. The initial and the final interview will not take longer than 35 minutes. The discussion in these interviews will cover the year six curriculum, the natural sciences, environmental education and educational change processes. If you decline to answer any question because it makes you feel uncomfortable, or for any other reason, you will not be penalized. Privacy is important for maintaining discretion of your data, and for this reason interviews will be conducted confidentially.

Secondarily, I will be requesting your permission to observe and audio record a portion of the natural sciences lessons that correspond to block II and block III. You will also be asked to assist the research by providing a schedule guide of your classes or if you wish sharing your lesson plans to the researcher. It is planned to observe from 12 to 19 hours of your lessons, the researcher will not participate in the lessons to be observed, nor ask you to perform any special activity.

You will also be asked if you are willing to be contacted by email after the fieldwork in your school is finished. The need to contact you might happen because clarification is needed about something observed in a lesson or from excerpts of your interviews. Likewise, the contact is useful to share news and information about the results published of the research. If you say no to be contacted for these purposes, your participation will end once the research fieldwork in your school has finalized.

What will happen to your data?

The information collected, whether given by you directly or extracted from observations, will be coded and anonymised for data analysis. Your name will be changed to a pseudonym which you may choose, and the name of the institution where you are currently working will also be replaced with a code. Once this information is anonymised and analysed, it will be used for research reports, national and international research publications, and presentations of different kinds. Your data will not be used for other purposes without your written permission.

Ethics Approval Reference: AREA 14-020 Date of Approval: 12/10/2014

A.8 Information Sheet for Participants, page 3

What are the possible disadvantages and risks of taking part?

There is a possibility that you may be uncomfortable regarding the likelihood of information gathered being traced to you. To prevent this issue, as stated before, your personal data and personal views about sensitive matters will be anonymised and coded. Care will also be taken in storing the data to ensure that security and confidentiality is maintained. For this reason, electronic data will be stored in the university server which is secure. The manual data will be coded and stored separately in a locked place.

The disadvantages that you may find are: the demand on your time to participate in the interviews and you may also experience some distress by receiving an outsider into your classroom. I will make sure that if you decide to participate we will discuss ways to lessen any kind of discomfort you may feel.

Possible benefits

Working in a research project of this kind will encourage an exchange of experiences and knowledge between researchers and teachers, which will foster greater knowledge about educational practices from the teachers' point of view. This study will also give you the opportunity to express your point of view about these issues which could be communicated to a wider community. When finalising my studies, you will be offered a copy of my thesis upon request, and you will receive a copy of every publication associated with this investigation. Finally, as a gesture of appreciation for your work I will give you a book concerning the themes of this study.

Confidentiality

The interviews and data will be anonymised so that it cannot be traced to you or your institution. Neither you nor your institution will be identifiable in the dissertation. The information you will provide in this study with not be shared with anybody who is not a member of the research team. The research team is composed of a supervisor, a co-supervisor and I (the primary researcher). Both supervisors of the research team are experienced science education researchers and lecturers.

Ethics Approval Reference: AREA 14-020 Date of Approval: 12/10/2014

A.8 Information Sheet for Participants, page 4

What will happen to the results of the research

This research study has been designed to accomplish an academic requirement for a postgraduate degree and will be submitted as a dissertation to the University of Leeds. Reports based on this research will be published in research journals and presented in research meetings and conferences. The data collected in the study may also be used for subsequent research.

Research sponsor

This research is funded by a scholarship grant from the National Council for Science and Technology (CONACYT by its Spanish acronym) and by the ministry of education (SEP by its Spanish acronym) in Mexico.

Contact for further information

Should you need further information about this project, please do not hesitate to reach me or my supervisor (see contact details below).

ME Ana Ilse Benavides Lahnstein
CSSME, School of Education
University of Leeds
Leeds, LS2 9JT, U.K.
Email: edaibl@leeds.ac.uk

Professor Jim Ryder
CSSME, Level 10 EC Stoner Building
School of Education
University of Leeds
Leeds, LS2 9JT, U.K.
Email: J.Ryder@education.leeds.ac.uk

Ethics Approval Reference: AREA 14-020 Date of Approval: 12/10/2014

A.9 Informed Consent Form for Participants (English Version)

Participant consent form

Environmental Education in Mexican Primary Education: Curriculum Design and Teachers Enactment

Name of researcher: Ana Ilse Benavides Lahnstein

If you agree with the statement, please initial the box to the right

I was given enough information about the study and the opportunity to solve all my doubts.	☐
I understand what my participation in this study will require.	☐
I understand my responses will be kept strictly anonymous and that my name or that of my institution will not be identified or identifiable in the report(s) resulting from the research.	☐
I give permission for members of the research team to access anonymised information from me.	☐
I give permission to share my anonymised data to third parties or for future research.	☐
I understand that I am free to withdraw my participation from the project at any point and without giving any reason or there being any negative consequences.	☐
I volunteer to participate in this study	☐

Name _____

Signature_____

Date_____

Email (optional) _____

A.10 Confidentiality Agreement (General Format)

[Name of the Service, e.g. transcription] Services

Title of the research: Environmental Education in the Mexican Primary Education: Curriculum Design and Teachers Enactment

I, _____ , **[third party, e.g. transcriber]**, agree to maintain full confidentiality regarding all audio recording and documentation received from Ana Ilse Benavides-Lahnstein (i.e., the Researcher) related to her doctoral study named *Environmental Education in the Mexican Primary Education: Curriculum Design and Teachers Enactment*.

As a **[third party e.g. transcriber]** of this research, I understand that I will be hearing or/and reading documents or/and recordings of confidential interviews or self-accounts. The participants, providers of these data, agreed to participate on the condition that data collected from their interviews or self-accounts would remain strictly confidential; and therefore, protecting their data is crucial for this study. By providing my services I understand that I have a responsibility to honour this confidentiality agreement.

Having stated the abovementioned, I agree not to share any information of the documents or the recordings provided by the aforementioned Researcher to any party, but the Researcher of this project. Furthermore, I agree:

Unless it is required by the Researcher, to not make total or partial copies of any audio recording, nor electronic or manually written documents of the related evidence documents, i.e., interview transcripts.

To store all audio recordings or related computerised documents in an encrypted and secure location for as long as they are in my possession.

To hold in strict confidence the identification of any participant of this project that may have been accidentally revealed from the audio recordings or in related documents.

To return to the Researcher any audio recordings or documents when my services are finished. Similarly, I will not share with anyone, apart from the Researcher, or held in my power any study-related data after my services are provided in full.

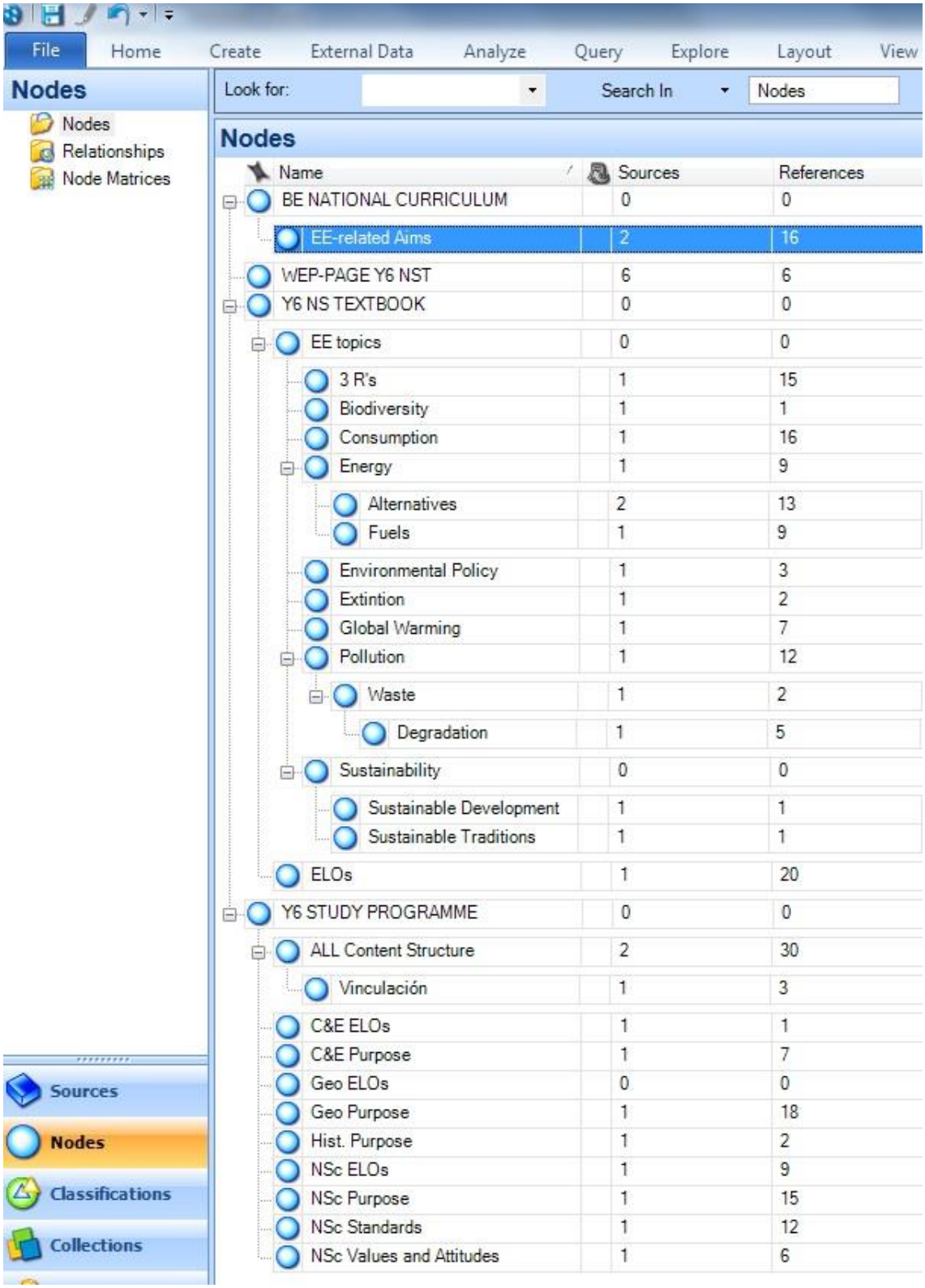
Any violation of these terms would constitute a breach of ethical standards and I confirm that I will adhere to the agreement in full awareness of my capacities. I am aware that I can be held legally liable for any breach of this confidentiality agreement, and for any harm incurred by individuals if I disclose any of the data provided by the Researcher, the audio recordings and any other study-related documents I may have received.

[Third party e.g. transcriber's name] (printed)_____

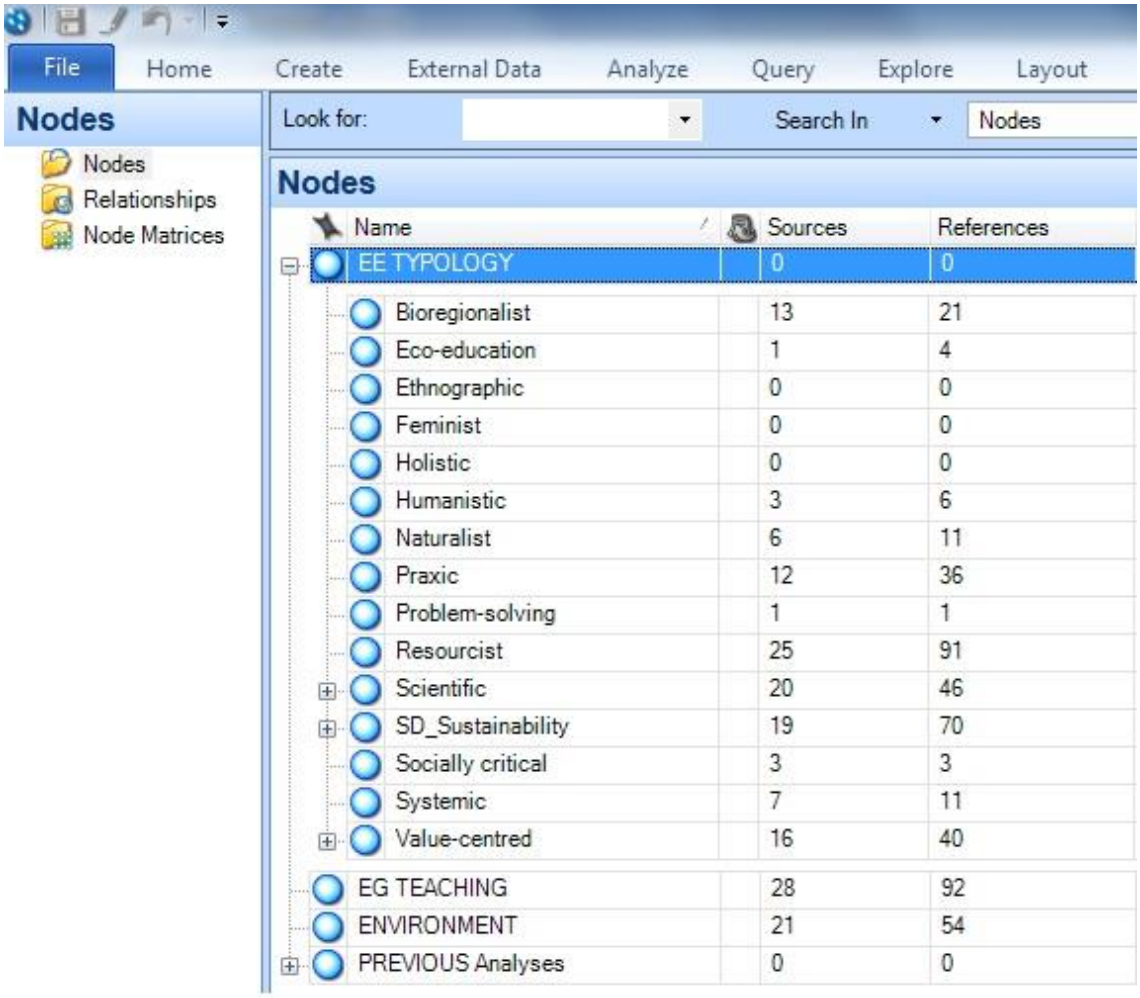
[Third party e.g. transcriber's] signature_____

Date (dd/mm/yy) _____

A.11 Evidence of Thematic Analysis for RQ.1



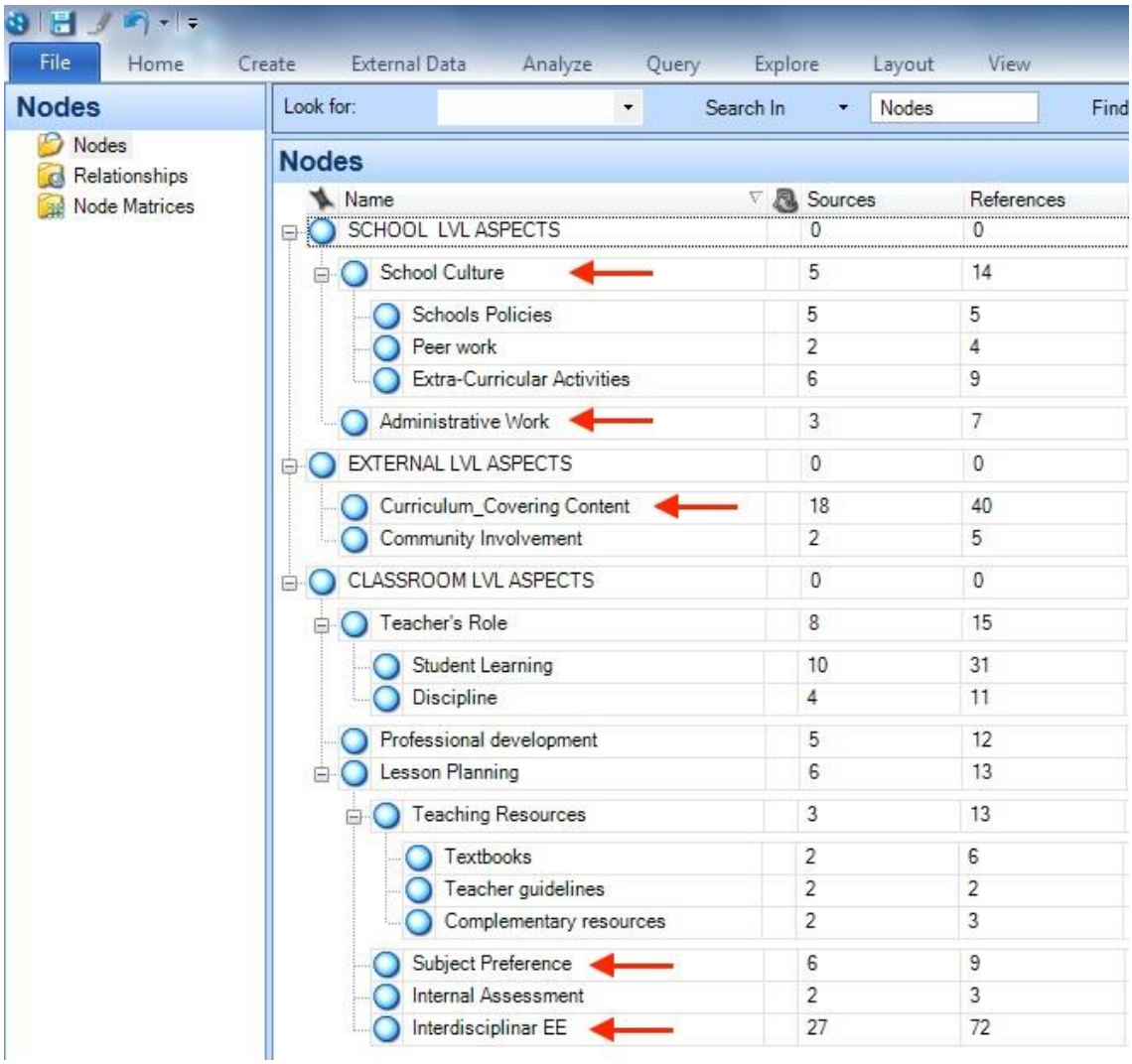
A.12 Evidence of Thematic Analysis for RQ.2



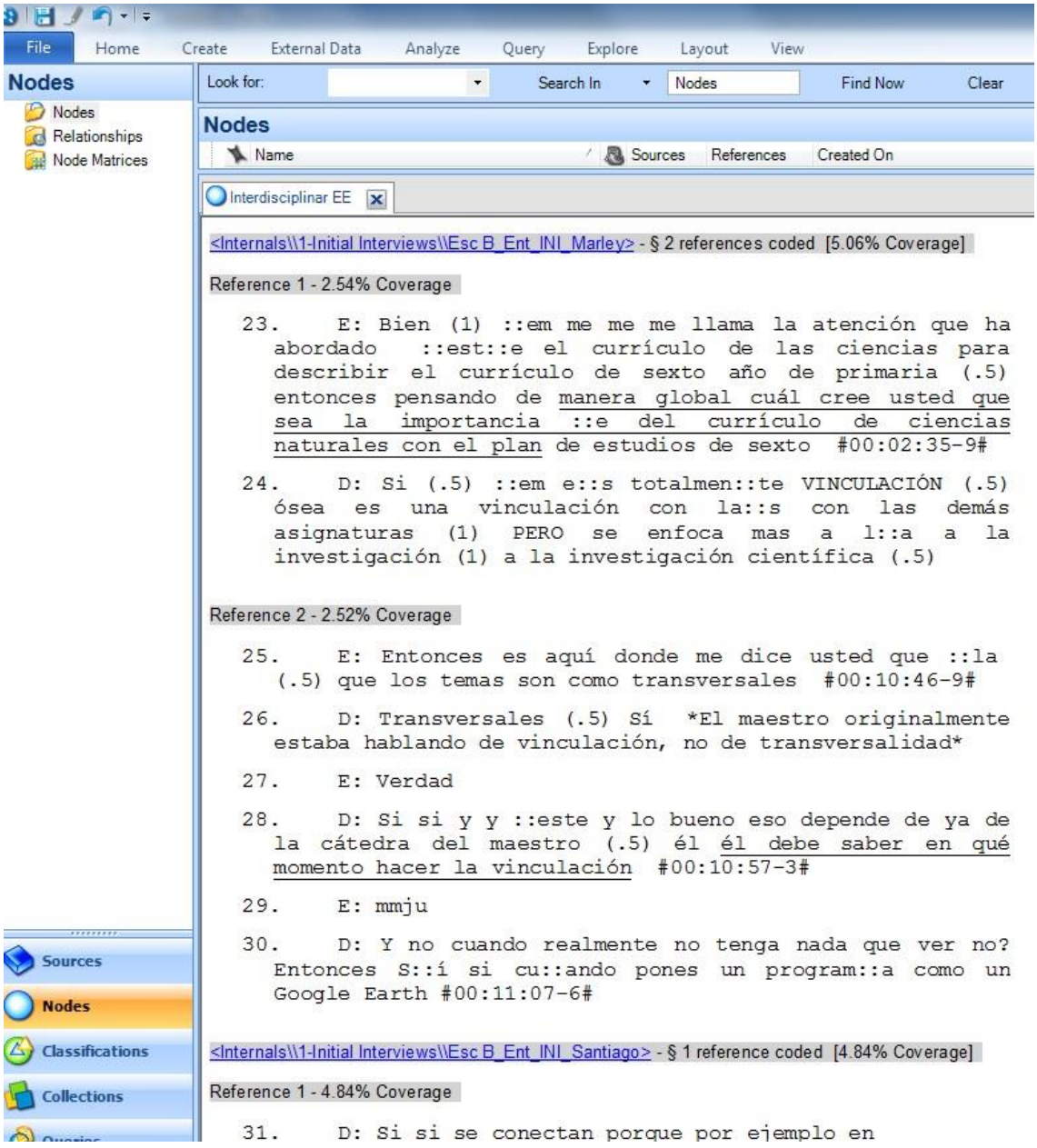
A.13 Example of Data Categorised in the Thematic Analysis for RQ.2

A.14 Evidence of Thematic Analysis for RQ.3

Note. The red arrows in the picture, below, denote the factors presented in Chapter 6; the content in the rest of the categories were not found relevant in the analysis of RQ.3.



A.15 Example of Data Categorised in the Thematic Analysis for RQ.3



A.16 Environmental Education-Relevant Standards in the Basic Scientific Education Standards

Year 6 Curricular Standards of Science: EE references* Natural Sciences, third period	
Category: Scientific knowledge	
a)	Can explain the overall functioning of the human body based on the interrelation of systems that form it, and identifies factors that affect health.
b)	Recognises the diversity of live beings, including fungi and bacteria, in terms of nutrition and reproduction.
c)	Can explain the concepts of biodiversity, ecosystem, food chains, and environment.
d)	Can explain the importance of fossil evidence for learning about the development of life over time and environmental changes.
e)	Can identify some causes and consequences of the deterioration of ecosystems, as well as global warming.
f)	Can identify temporary and permanent changes in environmental processes and natural phenomena, as well as some of their causes.
Category: Applications to scientific knowledge and technology	
g)	Can explain some factors that affect the functioning of the human body, and the importance of developing a healthy lifestyle.
h)	Can identify how science and technology contribute to investigation, health care, and environmental care.
i)	Can identify the advantages and disadvantages of current ways of generating and using thermal and electric energy, as well as the importance of developing renewable alternatives aimed at sustainable development.
Category: Attitudes associated to science	
j)	Shows curiosity towards natural phenomena and processes in a variety of contexts, and shares and exchanges ideas about them.
k)	Values scientific knowledge and its approaches for studying and explaining natural phenomena and processes.
l)	Demonstrates willingness for and makes decisions in favour of environmental care.
m)	Values and respects different forms of life.
n)	Demonstrates agreement with the idea of interdependence between humans and nature, and the need to look after natural wealth.
o)	Enjoys and appreciates natural areas available for recreation and physical activities.
*(SEP, 2011b, pp.87-88)	

A.17 Profile matrices: teachers' conceptions about EE

A.17.1 Luz's matrix

Luz's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC				**0**
2. CONSERVATIONIST/ RESOURCIST	**Suggested**	**Suggested**	**Suggested**	**3**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**		**1**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED			**Suggested**	**1**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**		**Suggested**	**2**
10. PRAXIC			**Suggested**	**1**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY			**Suggested**	**1**
Total references	**3**	**2**	**5**	**10**

A.17.2 Morelos' matrix

Morelos' conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC	**Suggested**			**1**
2. CONSERVATIONIST/ RESOURCIST		**Suggested**	**Suggested**	**2**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC	**Suggested**		**Suggested**	**2**
6. HUMANISTIC/ MESOLOGICAL			**Suggested**	**1**
7. VALUE-CENTRED			**Suggested**	**1**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**	**Suggested**	**Suggested**	**3**
10. PRAXIC				**0**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC			**Suggested**	**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY				**0**
Total references	**3**	**2**	**6**	**11**

A.17.3 Marley's matrix

Marley's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC	**Suggested**			**1**
2. CONSERVATIONIST/ RESOURCIST	**Suggested**	**Suggested**		**2**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC	**Suggested**			**1**
5. SCIENTIFIC	**Suggested**	**Suggested**	**Suggested**	**3**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED			**Suggested**	**1**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**		**Suggested**	**2**
10. PRAXIC				**0**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY				**0**
Total references	**6**	**2**	**3**	**11**

A.17.4 Santiago's matrix

Santiago's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC	**Suggested**		**Suggested**	**2**
2. CONSERVATIONIST/ RESOURCIST	**Suggested**	**Suggested**	**Suggested**	**3**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**	**Suggested**	**2**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED		**Suggested**	**Suggested**	**2**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**	**Suggested**	**Suggested**	**3**
10. PRAXIC				**0**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**		**Suggested**	**2**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY				**0**
Total references	**4**	**4**	**6**	**14**

A.17.5 Adela's matrix

Adela's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC				**0**
2. CONSERVATIONIST/ RESOURCIST			**Suggested**	**1**
3. PROBLEM-SOLVING		**Suggested**		**1**
4. SYSTEMIC	**Suggested**			**1**
5. SCIENTIFIC				**0**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED			**Suggested**	**1**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**	**Suggested**	**Suggested**	**3**
10. PRAXIC				**0**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY				**0**
Total references	**3**	**2**	**3**	**8**

A.17.6 José's matrix

José's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC	**Suggested**			**1**
2. CONSERVATIONIST/ RESOURCIST	**Suggested**	**Suggested**		**2**
3. PROBLEM-SOLVING			**Suggested**	**1**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**	**Suggested**	**2**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED				**0**
8. HOLISTIC				**0**
9. BIOREGIONALIST			**Suggested**	**1**
10. PRAXIC			**Suggested**	**1**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC				**0**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY	**Suggested**			**1**
Total references	**3**	**2**	**4**	**9**

A.17.7 Betty's matrix

Betty's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC				**0**
2. CONSERVATIONIST/ RESOURCIST		**Suggested**	**Suggested**	**2**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**		**1**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED			**Suggested**	**1**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**	**Suggested**	**Suggested**	**3**
10. PRAXIC				**0**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY			**Suggested**	**1**
Total references	**2**	**3**	**4**	**9**

A.17.8 Esteban's matrix

Esteban's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total References**
1. NATURALISTIC				**0**
2. CONSERVATIONIST/ RESOURCIST	**Suggested**	**Suggested**	**Suggested**	**3**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**	**Suggested**	**2**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED				**0**
8. HOLISTIC				**0**
9. BIOREGIONALIST				**0**
10. PRAXIC				**0**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY			**Suggested**	**1**
Total references	**2**	**2**	**3**	**7**

A.17.9 Isabela's matrix

Isabela's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC		**Suggested**		**1**
2. CONSERVATIONIST/ RESOURCIST	**Suggested**	**Suggested**	**Suggested**	**3**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**		**1**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED		**Suggested**	**Suggested**	**2**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**		**Suggested**	**2**
10. PRAXIC	**Suggested**	**Suggested**	**Suggested**	**3**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST	**Suggested**			**1**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY			**Suggested**	**1**
Total references	**5**	**5**	**5**	**15**

A.17.10 Rori's matrix

Rori's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC			**Suggested**	**1**
2. CONSERVATIONIST/ RESOURCIST		**Suggested**	**Suggested**	**2**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC				**0**
5. SCIENTIFIC		**Suggested**		**1**
6. HUMANISTIC/ MESOLOGICAL				**0**
7. VALUE-CENTRED		**Suggested**	**Suggested**	**2**
8. HOLISTIC				**0**
9. BIOREGIONALIST	**Suggested**		**Suggested**	**2**
10. PRAXIC			**Suggested**	**1**
11. SOCIALLY CRITICAL	**Suggested**			**1**
12. FEMINIST				**0**
13. ETHNOGRAPHIC				**0**
14. ECO-EDUCATION				**0**
15. SUSTAINABLE DVP. /SUSTAINABILITY	**Suggested**	**Suggested**	**Suggested**	**3**
Total references	**3**	**4**	**6**	**13**

A.17.11 Mario's matrix

Mario's conception about EE				
EE Currents (Sauvé, 2005)	**Concept of the Environment**	**Aims of EE**	**Examples of lessons and activities**	**Total references**
1. NATURALISTIC		**Suggested**		**1**
2. CONSERVATIONIST/ RESOURCIST		**Suggested**	**Suggested**	**2**
3. PROBLEM-SOLVING				**0**
4. SYSTEMIC	**Suggested**			**1**
5. SCIENTIFIC	**Suggested**	**Suggested**	**Suggested**	**3**
6. HUMANISTIC/ MESOLOGICAL	**Suggested**	**Suggested**		**2**
7. VALUE-CENTRED			**Suggested**	**1**
8. HOLISTIC				**0**
9. BIOREGIONALIST			**Suggested**	**1**
10. PRAXIC			**Suggested**	**1**
11. SOCIALLY CRITICAL				**0**
12. FEMINIST				**0**
13. ETHNOGRAPHIC	**Suggested**			**1**
14. ECO-EDUCATION	**Suggested**	**Suggested**		**2**
15. SUSTAINABLE DVP. /SUSTAINABILITY			**Suggested**	**1**
Total references	**5**	**5**	**6**	**16**

Class Info.	Data Codes and Lesson Length	Followed textbook sequence?	Teaching activities		
			(a) Class discussion **(b)** Class exposition (student) **(c)** Games **(d)** Group work **(e)** Homework discussion	**(f)** Notebook exercise **(g)** Outdoors activity **(h)** Practical work **(i)** Reading out loud (student) **(j)** Teacher lecture	**(k)** Textbook activity **(l)** Watching/listening audio-visual material **(m)** Whiteboard activity/demonstration **(n)** Worksheets
School A Luz Class size: 35 students	**Ob. AL-1** 65mins.	**YES**. Block II, Topic 3.	1. **(j)** *Previous lesson recapitulation.* 2. **(a)** *Students' conceptions of air pollution*. 3. **(f)** *"What do we understand as air pollution?" and* **(a)** *Air pollution and climate change.* 4. **(i) (m+l)** *Textbook: The industrial revolution and* **(j)** *Air pollution and fossil fuels.* 5. **(b)** *Composition of the atmosphere.*		
	Ob. AL-2 75mins.		1. **(b)** *Air pollution* and **(a)** *Contribution of human activity in environmental issues: local focus* 2. **(a)** *Environmental solutions and participation.* 3. **(b) (h)** *'The environmental thermometer' (suggested in the textbook)*; **(j)** *Explains activity.* 4. **(i) (m+l)** *Textbook: International/national treaties for EE.* 5. **(e)** *Individual actions to reduce and prevent pollution.*		
	Ob. AL-3 30mins.		1. **(e)** *Individual actions to reduce and prevent pollution.* 2. **(i)** *Textbook: Fragment from the Geography textbook and* **(a)** *Sustainability and human intervention* 3. **(h) (g)** *'The environmental thermometer' (suggested in the textbook) (10 minutes).*		
	Ob. AL-4 40mins.	**YES**. Block III, Topic 1.	1. **(a)** *"How do we know nature is transformed" and* **(k)** *Materials' properties.* 2. **(a)** *Conceptualising a waste management campaign and* **(e)** *Campaign for plastic collection* 3. **(h)** *Materials' properties (suggested in the textbook).* 4. **(k)** *Answering questions of the practical work activity.*		
	Ob. AL-5 45mins.		1. **(i) (m+l)** *Textbook: The properties of materials.* 2. **(a)** *"How do we use these materials in the environment" and* **(m)** *Properties of materials* 3. **(h)** *Categorising materials from home:* **(k) (a)** *Properties of materials.*		
	Ob. AL-6 90mins.		1. **(i)** *Textbook: the three R's strategy and paper fabrication* **(a) (m) (f)** *Reducing, reusing, and collection for recycling of paper: differences between them.* 2. **(k) (a)** *Usage of objects (questionnaire).* 3. **(i) (a)** *Textbook: degradation processes of inorganic and inorganic materials.* 4. **(e)** *Permanent and temporal changes.*		
	Ob. AL-7 75mins.	**YES**. Block III, Topic 2.	1. **(n) (l)** *Student co-evaluation Topic 1, block III.* 2. **(a)** *Responses to co-evaluation.* 3. **(a) (e)** *Previous lesson recapitulation.* 4. **(i) (j) (e)** *Textbook: Permanent and temporal changes.* 5. **(i) (a) (m+l)** *Textbook: the water cycle.*		

			6. **(i)** *Introduction to textbook experiment and* **(n)** *Permanent and temporal changes.*
	Ob. AL-8.1 60mins. **Ob. AL-8.2** 55mins.	**YES**. Block III, Topic 2. Topic 3.	1. **(j)** *Previous lesson recapitulation*. 2. **(i)** *Textbook: energy and* **(a)** *About car fuels and air pollution.* 3. **(i)** *Experiment instructions (suggested in textbook) and* **(a)** *Guess work about the experiment.* 4. **(i) (a)** *Textbook: alternative energy in automobiles.* 5. **(k)** *Student evaluation of Block III.*
			1. **(i)** *Experiment instructions (suggested in textbook).* 2. **(h) (g)** *Evaporation: making a water filter (suggested in the textbook).* 3. **(f)** *Registering observations from 2.* 4. **(a)** *Debriefing of 2 and 3.*
School A Morelos Class size: 36 students	**Ob. AM-1** 55mins.	**YES**. Block II, Topic 3.	1. **(j)** *Interrelation between air pollution and human health and* **(l)** *Textbook image: the atmosphere* 2. **(a)** *Air pollution in relation to the industrial revolution, pollutants, and consumption.* 3. **(a)** *Individual proposals to reduce pollution.* 4. **(i)** *Textbook: Air pollutants and* **(a)** *Teacher introduces: Implications for health and cleanliness of surrounding spaces.* 5. **(i) (e)** *Textbook: fossil fuels* **(a)** *Reflections on local pollution.*
	Ob. AM-2 55mins.		1. **(j)** *Previous lesson recapitulation*, **(e)** *Textbook: fossil fuels and* **(a)** *Responsible of air pollution: locally and nationally. Impact of air and water pollution on health.* 2. **(a) (m)** *Urbanity (local and national territories), consumption habits and pollution: promotion of environmental and health awareness though education.* 3. **(e)** *Environment at home and cleanliness*.
	Ob. AM-3 55mins.	**NO**. Block II, Topic 3. (In the general outline of the lesson)	1. **(j)** *Previous lesson recapitulation* and **(e)** *Environment at home and cleanliness.* 2. **(m) (a)** *Greenhouse effect and atmosphere's pollution: drawing of local area.* 3. **(l)** *Singing along video: song for environmental awareness.* 4. **(a)** *Emotions elicited by the song and environmental care and awareness.*
	Ob. AM-4 45mins.	**YES**. Block III, Topic 1.	1. **(a)** *Materials and every day usage: waste production and cleanliness.* 2. **(i) (a)** *Textbook: Applications of materials properties in everyday life products.* 3. **(i) (a) (m)***Textbook: the three R's and environmentally friendly habits.* 4. **(k)** Making notes from the textbook.
	Ob. AM-5 50mins.		1. **(i) (a)** *Textbook: degradation of inorganic and organic materials. Linked to separation of rubbish.* 2. **(i) (a)** *Textbook: International/national treaties for EE.* 3. **(f)** *Classification of inorganic and organic materials (Morelos provides individual feedback).*
	Ob. AM-6 30mins.	**YES**. Block III, Topic 2.	1. **(i) (j)** *Textbook: Permanent and temporal changes.* 2. **(h)** *Experiment demonstration.* 3. **(l) (a)** *Public Video: Permanent and temporal changes.* 4. **(i) (k) (e)** *Highlighting information.*
	Ob. AM-7 30mins.	**YES**. Block III, Topic 3.	1. **(b) (a)** *Simple machines.* 2. **(j) (h)** *Simple machines.*

			3. **(a)** *Simple machines.*
School B Santiago Class size: 36 students	**Ob. BS-1** 40mins.	**YES**. Block II, Topic 2.	1. **(i) (j) (a) (m+l)** *Textbook: Interaction with components in the environment. National biodiversity, natural resources, sustainability, the three R's and local nature reserves.*
	Ob. BS-2 40mins.	**YES**. Block II, Topic 3.	1. **(i) (a) (m) (m+l)** *Textbook: Interrelation between air pollution, global warming and climate change. Car emissions and responsible maintenance of a vehicle. Effects of air pollution on health. Levels of responsibility.*
	Ob. BS-3 35mins.	**YES**. Block III, Topic 1.	1. **(i) (a) (m+l)** *Textbook: Applications of materials properties in everyday life products. (Expected learning outcomes)* 2. **(i) (j) (a)** *Textbook: Production of solid waste in Mexico. The three R's.* 3. **(i) (j) (a) (m+l)** *Textbook: The properties of materials.* 4. **(n)** *The properties of materials.*
	Ob. BS-4 40mins.		1. **(i) (j) (a) (m+l)** *Properties of materials and the three R's.* 2. **(i) (j) (a) (m+l)** *Textbook: degradation processes of inorganic and inorganic materials and land pollution. Implications of using and maintaining an automobile.*
	Ob. BS-5 40mins.	**YES**. Block III, Topic 2.	1. **(i) (j) (a) (m+l)** *Textbook: Permanent and temporal changes. Chemical and physical changes of matter. Waste from automobiles (tires) and their changes in the environment.* 2. **(i) (j) (a) (m+l)** *Textbook: the water cycle. Potable water available and water pollution. Local effects of pollution: acid rain.*
School B Marley Class size: 36 students	**Ob. BM-1** 35mins.	**NO.** Block II, Topic 2. (In the general outline of the lesson)	1. **(m+l) (j) (a)** *Interrelation between air pollution, global warming and climate change. The atmosphere, the greenhouse effect and consequences of the greenhouse gases.* 2. **(m+l) (j) (a)** *Individual and collective actions to care for the planet.* 3. **(l)** *Video: About global warming.*
	Ob. BM-2 60mins.	**YES.** Geography lesson.	1. **(m+l) (j) (a) (k)** *Natural resources for life. Human needs, economy and resources. Sustainability and depletion of resources. Examples of sustainability: saving energy consumption.*
	Ob. BM-3 45mins.		1. **(m+l) (j) (a) (k)** *World population and its environmental effects.*
	Ob. BM-4 40mins.	**YES**. Block III, Topic 1.	1. **(i) (j) (a) (m+l)** *Textbook: The properties of materials. The three R's and individual behaviour and responsibility towards the environment.* 2. **(i) (j) (a) (m+l)** *Textbook: degradation processes of inorganic and inorganic materials. The three R's.* 3. **(l)** *Video: How paper is made.*
School C José Class size: 40 students	**Ob. CJ-1** 40mins.	**YES**. Block II, Topic 2.	1. **(c) (m+l) (a)** *Interrelation between air pollution, global warming and climate change: alphabet soup***.** 2. **(i) (a)** *Textbook: Interrelation between air pollution, global warming and climate change.*
	Ob. CJ-2 35mins.	**YES**. Block III, Topic 1.	1. **(i) (a) (k)** *Textbook: The properties of materials (expected learning outcomes).* 2. **(m)** *Properties of materials.*
	Ob. CJ-3 45mins.		**YES**. Block III, Topic 1.2. **(i) (k) (a)** *Properties of materials and the three R's.* 3. **(k)** *The three R's.*

	Ob. CJ-4 45mins.		1. **(i) (a) (k) (m+l)** *Textbook: degradation processes of inorganic and inorganic materials.* 2. **(f) (m)** *Inorganic and inorganic rubbish.*
	Ob. CJ-5 55mins.	**YES**. Block III, Topic 2.	1. **(i) (a)** *Textbook: Permanent and temporal changes and learning outcomes.* 2. **(i) (a) (k) (m+l)** *Textbook: the water cycle.*
	Ob. CJ-6 45mins.		1. **(i) (a) (k)** *Textbook: energy and combustion.* 2. **(e)** *Energy and combustion.*
School C Adela Class size: 38 students	**Ob. CA-1** 45mins.	**YES**. Block III, Topic 1.	1. **(i) (a) (k)** *Textbook: the three R's and environmentally friendly habits.* 2. **(i) (a) (k)** *Textbook: degradation processes of inorganic and inorganic materials.*
	Ob. CA-2 20mins.		1. **(l) (a)** *Video (from national T.V. channel): the recycling of rubbish in Mexico and the three R's.* 2. **(i) (a) (k)** *Textbook: degradation processes of inorganic and inorganic materials.*
	Ob. CA-3 50mins.	**YES**. Block III, Topic 2.	1. **(i) (a) (k)** *Textbook: Permanent and temporal changes.* 2. **(i) (a) (k)** *Textbook and (old) Year 6 workbook: the water cycle; attention to available percentage of potable water in the planet. Students reflect on the importance of water for life.* 3. **(f) (i) (a)** *Project 2: Expected learning outcomes, dictation and questions (Activity independent from the textbook).*
School C Betty Class size: 42 students	**Ob. CB-1** 30mins.	**YES**. Block II, Topic 3.	1. **(a)(l)** *Global warming.* 2. **(i)(a)** *Textbook: Relationship between air pollution and global warming.*
	Ob. CB-2 35mins.	**YES**. Block III, Topic 1.	1. **(i) (a)** *Textbook: the three R's and environmentally friendly habits.*
	Ob. CB-3 50mins.		1. **(i) (a)** *Textbook: the three R's and environmentally friendly habits.* 2. **(i) (a) (m)** *Textbook: degradation processes of inorganic and inorganic materials** * Due to an interruption, the lesson was taken over by a trainee teacher at this point.
School D Esteban Class size: 22 students	**Ob. DE-1** 45mins.	**YES**. Block II, Topic 1.	1. **(i) (j) (a)** *Textbook: Darwin's work on evolution.* 2. **(f)** *Questionnaire dictated by Esteban.*
	Ob. DE-2 85mins.	**YES**. Block II, Topic 2.	1. **(i) (j) (a) (m) (f)** *Basic environmental conditions for human life.* 2. **(i) (j) (a)** *Textbook: Interaction with components in the environment. Teacher introduces: Resources for human life; resource scarcity and pollution; and sustainable development and environmental issues.*
	Ob. DE-3 60mins.	**YES**. Block III, Topic 1.	1. **(i) (j) (a) (m) (f)** *Textbook: Production of solid waste in Mexico: emphasis on paper, plastic and pollution.* 2. **(i) (j) (a) (m) (f)** *Textbook: Properties of materials.*
	Ob. DE-4 60mins.		1. **(i) (j) (f)** *Previous lesson recapitulation.* 2. **(i) (j) (m) (a)** *Textbook: Properties of materials (Teacher provides individual feedback).* 3. **(e)** *Defining reducing, reusing, and recycling.*
	Ob. DE-5 20mins.		1. **(l) (f)** *Video: the three R's strategy (technical issues playing the video).* 2. **(i) (f)** *Textbook: the three R's strategy (focus on reusing things).*

	Ob. DE-6 80mins.	**YES**. Block III, Topic 1.	1. **(l) (f) (a)***Video: the three R's strategy. Teacher introduces: environmental care is contemporary in basic education; environmental culture vs economic interest of enterprises; education for environmental care; individual actions; and air pollution and the greenhouse effect.* 2. **(f)** *Based on the video: the three R's strategy.* 3. **(i) (j) (m) (a)** *Textbook: degradation processes of inorganic and inorganic materials. Teacher introduces: solid waste production and cleanliness.*
	Ob. DE-7 60mins.	**YES**. Block III, Topic 2.	1. **(i) (j) (a) (f)** *Textbook: Permanent and temporal changes.* 2. **(i) (j) (a)** *Textbook: Permanent and temporal changes.*
	Ob. DE-8 50mins.		1. **(i) (j) (m) (a) (f)** *Textbook: energy and combustion. Teacher introduces: contribution of (local) cars and fossil fuels to air pollution.*
School E Isabela Class size: 24 students	**Ob. EI-1** 55mins.	**NO**. Block III, Topic 1. (In the general outline of the lesson)	1. **(a)** *Problems studied in Natural Sciences (expected learning outcomes) and the five R's (revaluate, reject, reduce, reuse, and recycle)* 2. **(l) (a)** *Video: A Letter to earth.* 3. **(m+l) (j) (a)** *Textbook: degradation processes of inorganic and inorganic materials and emphasis on reusing things.* 4. **(l) (a)** *Video: The five R's.* 5. **(m+l) (j) (a)** *Recent images showing pollution in local areas. Focus on resource consumption: energy.* 6. **(n) (d)** *Developing extra-curricular student project on environmental improvement.* 7. **(d) (b) (a)** *Student discuss their projects on environmental improvement.* 8. **(a)** *Reflection of the lesson's expected learning outcomes.*
School E Rori Class size: 22 students	**Ob. ER-1** 65mins.	**NO**. Block III, Topic 1. (In the general outline of the lesson)	1. **(n) (d) (a)** *Environmental destruction and protection.* 2. **(l) (a)** *Video x 2: The five R's (same as in Ob. EI-1).* 3. **(n) (d) (b) (a)** *Recognising the five R's.* 4. **(n) (d) (a)** *Reading: Recognising the five R's.* 5. **(n) (d) (a)** *Properties of materials.* 6. **(a) (e)** *Conceptualization of a project and expected learning outcomes.*
School F Mario Class size: 29 students	**Ob. FM-1** 40mins.	**NO**. Block II, Topic 2. (In the general outline of the lesson)	1. **(j) (m) (a)** *Big and elaborated drawing on the board: Interaction with components in the environment and human health. Various examples of pollution at national and local levels. Environmental laws and different levels of responsibility in the environmental crisis.* 2. **(a) (l)** *Resource exploitation and individual solutions.* 3. **(j) (a) (e)** *Issues with resources, environmental pollution and emphasis on role of humans in the crisis.*