From Policy to Practice: School-Based Assessment of Omani Students' Science Learning in Basic Education Schools

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Declaration

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Dedication

I dedicate this work to my precious country, the Sultanate of Oman, and to everyone who supported me in completing it: my parents, family, supervisors, colleagues, friends, and staff at the Ministry of Education.

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﴿رَبِّ أَوْزِعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي أَنْعَمْتَ عَلَيَّ وَعَلَىٰ وَالِدَيَّ﴾

"My Lord, direct me to be thankful for the blessings you have bestowed upon me and upon my parents"

In spite of feeling a combination of anxiety, fear, hesitation, enjoyment, frustration and satisfaction throughout the long journey of this research, it has been one of the most valuable learning experiences of my life and I have received support from various people, from the preparation of the proposal to the last stage of this study. I would therefore like to express my sincere gratitude, thanks and appreciation to those without whose generous support the completion of this thesis would not have been possible. First of all, I would like to express my gratitude and thanks to God, who eased all difficulties and gave me the confidence, hope, strength, patience and determination to accomplish this project. I would also like to express my great thanks and gratitude to my parents, who have prayed continuously for me. Similarly, I want to thank from the depths of my heart my wife and children, who had to be patient and endure my absence.

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be criticized and debated. In other words, I should not treat ideas as irrevocably final postulates.

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Abstract

This qualitative study focuses on understanding how science teachers in Basic Education in Oman enact a national initiative in the New Assessment System (NAS), which focuses on Assessment for Learning (AFL) in science education. It also examines the influence of contextual factors on teachers' actual practices while enacting the NAS policy.

Data-gathering methods were observations, interviews and document analysis. Ten Ministry of Education (MOE) policymakers and fifteen practitioners in Grade 5-10 schools participated. The research questions address the policy intentions behind NAS, how science teachers enact the system, the factors influencing their enactment and the extent of alignment between policy intentions and teachers' practices.

While the findings have pointed that although there is a concurrence between the MOE policy intentions that NAS should function as AFL, and practitioners' perspectives on them, the reality of NAS policy enactment was not entirely consistent with the NAS policy intentions, and the extent of this alignment depends on the contextual factors. This gap can be attributed to the absence of a consultation in the policy development process and the weakness of policy enactment reinforcement, such as the inadequacy of professional development. Moreover, this is due to the absence of a specific accountability framework, and of a particular body that enforces accountability, as well as the absence of self-accountability, a lack of interest in the teacher agency, and the influence of contextual factors on the adaptation of borrowed policy.

The most prominent of this study's contributions to the current literature is that it contributes towards filling a gap in it regarding both AFL policy enactment in science education in the Eastern context, and the consultation stage in policy development in educational studies. The study also extends the current literature with further examples of the influence of contextual factors on the professional development of practitioners. Finally, this study contributes to filling an important gap in the current literature regarding the critical aspects that are associated with the NAS enactment, such as policy borrowing, teacher agency, moderation, and self-accountability for the policy enactment.

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AFL	Assessment For Learning
AOL	Assessment Of Learning
BE	Basic Education
CA	Continuous Assessment
CPD	Continuing Professional Development
Cycle 1	Schools that include Grades 1 to 4
Cycle 2	Schools that include Grades 5 to 10
EFA	Education For All
GCSC	Global Chains of Science Curriculum
IEA	International Association for the Evaluation of Educational Achievement
MOE	Ministry Of Education
NAS	New Assessment System
OECD	Organization for Economic Co-operation and Development
Ofsted	UK Office for Standards in Education, Children's Services and Skills
SCL	Student-Centred Learning
SIPTT	The Specialized Institute for Professional Training of Teachers
TIMSS	Trends in International Mathematics and Science Study
TOSD	The Technical Office for Development and Studies at the MOE
UNESCO	United Nations Educational, Scientific and Cultural Organization

Chapter 1
Introduction and Context

The aim of this introductory chapter is to outline the development of Oman's education system in general and its assessment mechanisms in particular. It begins by summarizing the history and structure of the Omani education system and the shift from the previous education system to the current one. Next, it describes the implementation by the Ministry of Education (MOE) of Basic Education (BE) and of the New Assessment System (NAS) as part of the BE reform. There is then a brief account of the participation of Omani students in the Trends in International Mathematics and Science Study (TIMSS). This introduction also discusses the various challenges that seem to have impeded the implementation of NAS in Oman. After a discussion of the rationale for a study that adds to the literature on policy development concerning the implementation of NAS, the chapter ends with a set of research questions to be addressed.

1.1 Setting the scene

Prior to 1970, education in Oman was provided only for young learners from the ages of six to fourteen years. Learning took place in Quranic schools, mosques and public halls, under the shade of trees, or at the homes of teachers themselves. Under this system, groups of children were taught about the Holy Quran, the principles of Islam, reading and writing in the Arabic language and the basic skills of mathematics. Education of this kind was conducted in most villages, at levels which differed from one region of the country to another (Issan, 2005).

In 1970, when His Majesty Sultan Qaboos became the ruler of Oman, the people witnessed many changes and improvements in various aspects of life, with the education system at the forefront. HM Sultan Qaboos announced the following on the second Omani National Day, 18th November 1972:

> Education was my great concern, and I saw that it was necessary to direct efforts to spread education. We have given the Ministry of Education the opportunity and supplied it with our capabilities to break the chains of ignorance. Schools have been opened without taking into account the

> requirements. The important thing is that there should be education, even under the shadow of trees. (MOI, 1990, p.25)

Thus, the education sector changed dramatically and improved in quality as a basis for the building of Omani citizens, keeping up a steady transformation in modern life. The General Education System introduced in 1970 consisted of 12 years of schooling: six at the primary stage, three preparatory years and three years at secondary level. The MOE focused on the quantity of education, rather than its quality, by spreading schooling as widely as possible throughout all regions of Oman (Al Sawafi, 2014; Issan, 2005). Notwithstanding the MOE's apparent great success in the dissemination of general education in a relatively short period of time, making it available in all populated areas, many of the studies conducted during the later stages of implementation reveal certain shortcomings of this strategy of subordinating quality to quantity. More specifically, these studies argue that there were some deficiencies in the curricula, the teaching methods and the assessment system, which was based purely on memorizing information, as well as inadequate training of teachers and other school staff, and a failure to use modern technology in teaching (Al-Harthi, 2004; Al-Shukaili, 2007; Al Sawafi, 2014; Issan, 2005).

In March 1990, Oman participated in the World Conference on Education for All, held in Jomtien, Thailand, which adopted the Declaration on Education for All (EFA). All participants agreed to provide BE for all children before the end of the decade, aiming to intensify efforts to meet basic learning needs, such as strengthening the learning environment, the provision of essential learning tools and the acquisition of critical thinking and other skills (UNESCO, 2000). The Declaration recognized that all humans should "be able to develop their full abilities, to live and work in dignity, to participate fully in development, to improve the quality of their lives, to make informed decisions, and to continue learning" (Haddad et al., 1990, p.11). Consequently, the MOE adopted this global approach towards the development and reform of the education system when it began the implementation of BE in 1998/1999 (MOE, 2015a). The BE system started with Cycle 1 (Grades 1 to 4), with the official entrance age of Grade 1 being six years. From 1999/2000 onward, BE was gradually extended to incorporate all of Cycle 2 (Grades 5 to 10) (UNESCO, 2000).

1.2 Basic education in Oman

Education in Oman took a significant leap in development during the 1990s, as the MOE responded to the challenges of a knowledge-based economy by striving to prepare students to meet the requirements of the new economic reality. This involved pursuing qualitative improvements by introducing BE, with the NAS initiative as its main component, NAS in turn being based on assessment for learning (AFL). These reforms can thus be seen to have involved changes in the curriculum, the assessment system and teaching practices (MOE & The World Bank, 2012). The Government of Oman planned the introduction of BE in fulfilment of its Jomtien EFA commitment to education system reforms, as well as linking education with reality and the practices necessary to achieve the improvements needed to meet students' needs. More recently, the Ministry of Education (2015a) has claimed to have made significant effort to develop and improve the education system in the following ways:

- By following the stipulations of the government's Vision 2020 plan for the future of the Omani economy, which emphasizes that the cultural, economic and technological challenges facing Omani students today require them to be provided with a set of appropriate competencies and skills. This involves the diversification of teaching methods, the updating of curricula and assessment methodologies and the introduction of NAS to evaluate these competencies.
- By adopting the recommendations of many international conferences, national seminars and scientific studies, such as the study of the Reform and Development of Education (1995) which was conducted by the MOE in cooperation with a Canadian Educational Company, and the study conducted by the Scottish Examination Board (1996) on educational assessment in Oman. These recommendations agree on the need for teaching and assessing performance through NAS.
- By working on quality control, addressing weaknesses and enhancing strengths in students' learning.

- By improving students' performance and highlighting their talents and creativity. This requires the diversification of educational assessment tools.
- By putting the learner at the centre of the teaching/learning process and emphasizing the need for the participation of the learner in both learning and evaluation.
- By focusing on all aspects of learning, not only the cognitive element, through the integration of skills, knowledge and information in multiple applications.
- By developing learners' higher intellectual abilities and providing them with a set of competencies and skills which cannot be assessed by examinations but require ongoing formative assessment.
- By taking into account individual differences among students.
- By nurturing the relationship between schools and parents.

The ongoing nature of the development of the education and assessment systems in Oman and elsewhere is indicated by the reports of a wide range of studies, forums, conferences and seminars, such as the International Conference for the Development of Secondary Education (December 2002), the National Symposium for the Development of Secondary Education (April 2002), a study of assessment for the development project to evaluate the performance of students conducted in accordance with Ministerial Decree No. 64/2002, the Symposium on Educational Assessment (April 2003) and the Second Forum on Educational Evaluation (May 2005) (World Bank, 2013).

1.3 New Assessment System

It is clear from the repeated affirmations of the MOE that Oman strongly intends to follow the example of many other countries including the UK, the USA, Australia and Canada by developing its system of educational assessment through the introduction of NAS, based on the use of various assessment methods and tools (Al-Hammami, 1999; Al-Shukaili, 2007; Davison, 2013; Kennedy, 2007; Ministry of Education, 2015a). The educational assessment system operated in Oman before 1998/1999 was based exclusively on examinations at the end of term or year. Such

assessment appears to be designed to test only the memorization skills of students and thus seems unfair, both because it fails to evaluate their achievements throughout the year and because it ignores all of their other skills acquired and activities engaged in during their period of study (Al Sawafi, 2014; MOE, 2013s). Many Omani researchers have made criticisms of this kind, objecting to an assessment system which forces teachers to focus primarily on accustoming students to the memorization and recall of information, rather than teaching them other valuable skills, including leadership, reporting and role acting, and approaches to learning, such as practical work and projects, which cannot be measured by examinations (Al-Sarmi, 2005; Al Sawafi, 2014). From the outset, Al-Alawi (2003) states that through NAS, the Omani authorities were seeking to change the mindset of teachers away from the narrow traditional method of assessment towards an approach which would involve both teachers and learners being more aware of the real goals of learning. She argues that the implementation of NAS is thus intimately allied to positive changes in the curriculum materials and teaching methods used in Omani schools.

The MOE introduced NAS in response to the findings and recommendations of research into its education system in general and the assessment system in particular, to international experience reflected in empirical evidence of effective assessment systems and to the introduction of the BE system (UNESCO, 2011). Implementation of NAS began the academic year 1998/ 1999 for students aged six to nine years (Grades 1 to 4) and in 2005/2006 it was rolled out to the whole of BE (up to 10th Grade), entirely replacing the old assessment system. Importantly, NAS combines exam-style summative assessment with formative assessment, where the teacher is expected to take a guiding role for students (MOE, 2002).

Al-Harthy (2001) indicates that NAS consists of a variety assessment tools; in Grade 9 science, for example, these include short quizzes, projects, peer observation, oral dialogue and creative activities, such as drama and role playing. Accordingly, the MOE considers that NAS helps to meet the need for credible and comprehensive assessment, rather than placing complete trust in one method, especially the use of exams. By guiding teachers to use fairer

assessment methods, the Ministry believes that NAS helps to stimulate students and encourages them to learn (MOE, 2014a).

In parallel with NAS, Al-Ksabi (2005) states that the MOE has developed an ambitious plan to improve the curriculum and pedagogical methods to include a variety of knowledge, skills, strategies and activities, with the expectation that students will have the opportunity participate in creating and using knowledge, rather than just receiving it. In the same manner, official documents such as Ministry of Development (1995), Ministry of Education (2003), Ministry of Education (2015a), Ministry of Education and The World Bank (2012) report an aspiration that the role of teachers will develop towards a greater focus on guiding and directing students, while school principals will supervise more effectively, precisely and comprehensively through the tracking of teachers' practices and students' assessment activities. This reflects the MOE's vision of NAS, which emphasizes that learners should develop their learning, teachers should improve their performance and school principals should enhance their management and leadership roles, especially with regard to students' achievement and follow-up (Al-Kiyumi & Abdullah, 2005).

The BE assessment guide issued by the Ministry of Education (2003) indicates that through NAS, students are assessed both continuously and summatively. Continuous assessment occurs throughout the school year and has two main functions, formative and reporting, while summative assessment takes the form of exams at the end of each semester. Students are then graded for their end-of-year reports by awarding an overall score reflecting a balance of continuous and summative marks which varies from grade to grade. In science, for example, students at Grades 1 to 4 are assessed by continuous tools only, then at Grades 5 to 9 the end-of-semester exams represent a weight of 40 per cent, class tests 20 per cent and continuous assessment 40 per cent. In Grades 10 to 11, formal examinations account for 60 per cent, with the remainder allocated to continuous assessment. Finally, in Grade 12, the formal final examination is allocated a weight of 70 per cent and continuous assessment 30 per cent. The MOE considers the higher weight of upwards of 70 per cent for continuous assessment to be a good way

of enabling teachers to assess their students' progress in a cumulative procedure in order to gain continuous feedback, which can achieve AFL (MOE,2003).

Nevertheless, the MOE emphasizes the importance of employing assessment tools which favour the formative function, in order to guide assessment towards improved learning; that is, AFL:

> [AFL] is frequently neglected by teachers. Even when conducting continuous assessment, the most that they do is actually a kind of summarizing for the purpose of awarding marks, rather than formative assessment (MOE, 2013a, p.43).

Based on my 20 years of experience at the MOE, I believe that this failure of teachers to enact NAS as intended by the MOE is a crucial issue that deserves investigation in terms of NAS policy and the factors affecting its enactment.

1.4 Rationale for NAS reform

A fundamental principle in assessment system reform, as intended by the Omani MOE, is student-centred learning, where the student is the focus of the educational process. Therefore, the role of the teacher is to provide guidance for the students, creating an appropriate learning environment and collecting accurate information on their learning. This enables teachers to take account of individual differences among students and to recognize that they will be capable of learning at various different levels (Kazim, 2005). Furthermore, they need to consider the knowledge to be imparted in relation to students' skills; in other words, to focus on the development of these skills, encouraging students to be creative and providing them with direct feedback on their work, while allowing them to express their opinions about their own work and that of their fellow students (Kazim, 2005).

Many reports, studies and research articles on educational assessment, such as those of Al-Hadad (2001), Al-Harthi (2004), Al-Sarmi (2005) and Kazim (2005), report positive results of NAS, particularly when used formatively, as AFL. NAS was designed to benefit students by supporting their learning development through its ability to diagnose the extent of their individual knowledge and carry them forward to reach the required performance objectives. Moreover, as planned by the MOE, NAS acts to highlight the

strengths in students' performance to be reinforced, as well as their weaknesses to be addressed. The reports and studies referred to above show that NAS is expected to provide a relatively detailed and objective evaluation of students' performance because of the variety of tools and methods it comprises. It has also been found to enable the identification of students' higher-order skills, such as problem solving, and the development of different methods of thinking.

As to the roles of teachers, the MOE claims that NAS can further activate these through the development of clear assessment plans, which can be used to assess students' performance more clearly, accurately and comprehensively. Additionally, it asserts that NAS aims to facilitate teachers' daily and weekly planning to take better account of the competencies required for their school subjects. According to the Ministry's plans, NAS can help teachers with innovating and designing activities using whatever teaching aids are appropriate to their students' current level of performance. It seems that the MOE seeks to provide teachers with more freedom through NAS, yet at the same time to prescribe the assessment plans that they should follow. Another important point concerns the pedagogical aspect of assessment; the MOE expects NAS to be more objective, because it takes account of the extent to which students acquire educational competencies. In other words, NAS is designed by the MOE to focus on various educational principles, such as observation, research skills, report writing and relating what is taught to students' daily lives. In addition, it seems that one of the key innovations of NAS intended to serve the learning process is the creation of student portfolios, which did not exist before NAS implementation. Lastly, the policymakers planned an active role for school principals in ensuring a favourable environment for NAS to operate in. This role has pedagogical aspects, including the following up and supervision of NAS enactment, which the MOE considers a key task of school principals. In order to fulfil this role, they are required to be sufficiently experienced and to possess the appropriate knowledge and skills, for which they can be provided with professional development courses as required (Al-Habahipah, 2008; Al-Iwatya & Al Salmi, 2005).

The MOE intends the enactment of NAS in Omani schools to enhance learning by the addition of many valuable features and development actions, including the development of curricula, the use of multiple assessment tools and assessment types, and the introduction of new teaching methods and strategies. Therefore, according to the MOE (2015a), NAS is designed so that learners are subject to continuous assessment, which allows for them to be moved to higher grades when appropriate and for their special needs to be identified and addressed without them having to repeat grades, especially in Grades 1 to 4. In Grades 5 to 11, each school has an attainment follow-up committee headed by the principal, which evaluates students' learning status according to the elements included in their learning portfolios. Its main function is the investigation of students' responses for the provision of remedial plans and programmes. Continuous assessment provides the basis of detailed reports on students' performance, as well as to summarize their end-of-year performance. Consequently, teachers can identify their achievements as well as their weaknesses and can suggest appropriate remedial action to improve their attainment.

1.5 NAS policy intentions: purposes, enactment and accountability

When planning NAS, policymakers took into account the following general principles (MOE, 2015a):

- Linking assessment processes with learning objectives for each subject. There should be a link between real life and what is studied in schools, especially by linking science education to contemporary societal issues and by considering what should be covered in the future by science education. Some examples of these socio-scientific issues are the ethical questions arising from DNA analysis and GM food scares, and the employment of science in technological and manufacturing industries (Jenkins, 1999; Levinson, 2006).
- Empowering teachers to choose appropriate assessment tools for each learning objective and allowing them to chart the distribution of marks on the tools that are chosen, in a way that is explained in assessment

documents. The MOE assessment guidelines recommend giving teachers more flexibility to decide whether to choose one or more goals during a particular lesson. Since they have to choose appropriate assessment tools independently, there is no fixed weighting of marks for continuous assessment tools. Teachers are thus at liberty to modify teaching methods in response to feedback and to make appropriate plans for addressing learners' weaknesses so that they continue to be willing to engage in new learning (Al Sawafi, 2014).

- Practising assessment as a normal part of daily learning and working to direct students' learning, based on what is discovered in terms of strengths and weaknesses.
- Taking into account the different aspects of learning, such as problem solving, creative thinking and reasoning skills, as well as the promotion of good character.
- Taking advantage of cooperative learning, teamwork and peer learning in the assessment process.
- Encouraging students' self-assessment so that they can judge their own performance in the acquisition of competencies in light of the set learning objectives. Therefore, the MOE guidelines recommend giving students the opportunity to choose the number of goals during a lesson. These properties represent the components of an assessment which is thus a tool for reflection, learning and the self-monitoring of performance. Additionally, in self-assessment, students are supported in judging their work in order to be aware of their strengths and weaknesses and to recognize the value of their own work.
- Taking into account the principle of student-centred learning, which in turn helps to consider individual differences among students, so that gifted students and those with learning difficulties can be given the appropriate attention and assistance respectively.
- Providing immediate feedback on students' work.

According to the MOE assessment guidelines, the aims of the teaching and learning of science at different grades are for students to build their knowledge incrementally, to develop an understanding of scientific concepts and to acquire the diverse skills needed to research contemporary societal issues.

Thus, the intention behind NAS is to contribute to a global trend towards improving science education by the adoption of unified and universal standards, lending it unprecedented attention and granting it priority over other subjects (Osborne & Dillon, 2008).

For instance, the Grade 9 science curriculum builds on the concepts established in the preceding grades. As a result, some content areas from the eighth grade have been expanded and new ones added, in order to suit the students' cognitive abilities at different stages. In this sense, the content of the science curriculum at any grade fits together with the ideas of the curriculum in the previous and following grades. Finally, objectives and outputs in science are core for teaching and learning, so the teacher is considered when planning both teaching and assessment, to select the appropriate assessment tools for measuring performance through appropriate activities (MOE, 2015a).

The MOE assessment guidelines also emphasize that once the learning objectives have been achieved, this means that the student has achieved specified levels in retrieving, applying and combining information (Bloom et al., 1984; Huitt, 2004). These three levels include the necessary processes in the teaching of science and at the same time represent the necessary skills and knowledge of the student in a given grade; therefore, they constitute the basis for the assessment of student performance (MOE, 2014a).

The MOE's assessment documents indicate that teachers' recording of marks on the follow-up record has two main purposes: to provide feedback to students through the formative assessment, which can help their learning progress, and to provide evidence of the summative assessment for reporting purposes. The policy makes clear that "both formative and summative assessment are necessary and important; neither should be neglected" (MOE, 2015a, p.6). The assessment guidelines also state that monitoring and observing students' progress properly and accurately can help teachers in planning for the assessment system, identifying the needs of students, following up their performance, providing continuous feedback on their own progress, making decisions on awarding marks, constructing remedial plans and providing evidence of performance for supervisors, parents, senior teachers, moderators and other authorities (MOE, 2015a).

1.6 Challenges to NAS enactment

Many challenges to the successful enactment of NAS are evident from my personal experience at the MOE, from comments made in the periodic moderation and supervision reports, and from the results of studies in the Omani context, such as those of Al-Balushi (2009), Al-Kindy (2009), Al-Sarmi (2005), Al-Shukaili (2007), Al Kharusi (2007), Al Sawafi (2014), Ministry of Education and the New Zealand Education Consortium (2017b) and Ministry of Education and The World Bank (2012). These challenges are caused by several factors which influence practices during NAS reform, based on AFL. One of these factors is the top-down nature of the MOE's decision making and policy implementation, taking no account of the opinions or expertise of educators in schools. Although teachers are encouraged to reflect on the assessment system by means of meetings with their supervisors, this is of little value, since decision makers do not make use of such feedback, an omission which may negatively affect the practical application of NAS (Al Sawafi, 2014). Other contextual factors that may have effects on NAS enactment are the abrupt nature of the change to the assessment system, lack of knowledge, experience and training, insufficient resources and large class sizes.

In addition, teachers' poor awareness of the rationale for NAS and its significance may limit the success of its enactment. For instance, some teachers do not understand the difference between formative and summative assessment, using continuous assessment simply to award grades, which means assessment of learning (AOL) rather than AFL (MOE & The World Bank, 2012). Ultimately, this indicates the inadequacy of teacher training courses; Al-Shukaili (2007) asserts that teachers do not receive sufficient direct training courses in AFL, even though they are particularly important in preparing for NAS. Instead, heads of department (senior teachers) are trained by the MOE and then train teachers, through what is known as the cascade training model. All of the crucial distinctions referred to in this paragraph (formative/summative, AOL/AFL, direct/cascade training) are examined at length in Chapter 2.

1.7 Rationale for the study

In spite of the significant role of AFL—which is at the heart of the NAS initiative—in science teaching and learning, this has to the best of my knowledge not been studied in this way previously; therefore this study is unique. In particular, as far as I know, no previous studies set in Oman have investigated a change in the assessment of science so widely and deeply. This study will cover various related crucial points, such as the Islamic perspective and its relation to policy development in the field of education, moderation systems, and the accountability of science education in Oman and teacher agency.

There appear to be only four published studies conducted in Oman with some direct but partial relevance. Three of these do not concern science teaching. They are a small-scale study by Al-Kindy (2009), which investigated Grade 12 English teachers' attitudes towards continuous assessment, another by Al Sawafi (2014) into the relationship between the beliefs and practices of secondary school English teachers regarding continuous assessment reform and a third by Al-Alawi (2003), who examined teaching methods and curricula in social studies, with a very general and superficial mention of assessment methods and tools. Al Kharusi (2007) did address science teaching in Oman, but the study was of ninth-grade teachers only; it investigated the possible effects of their assessment practices on ninth-grade students' perceptions of the classroom assessment environment and goal orientations.

An important way in which the present study breaks new ground is that unlike these previous studies, it is not limited to considering the practices and opinions of teachers. It offers a more comprehensive view of the topic by including in its population representatives of all key stakeholder groups having direct relationships with NAS, whether by enacting it or supervising the enactment process, namely decision makers, supervision specialists, curriculum and assessment specialists and school-level practitioners: principals, heads of department and science teachers. The study population also covers both urban and rural schools, as well as single-gender and mixed-gender ones. It is hoped that this broad scope will provide a more advanced

understanding of teachers' practices and the factors that influence NAS enactment.

A further rationale for this study is the number of very strong opinions expressed by teachers, members of the Majlis Al-Shura (Consultative Assembly) and the community about the poor results of Omani students in the TIMSS international studies of 2007 and 2011 (Al-Balushi et al., 2014; Majlis Al-Shura, 2012). For example, the TIMSS 2007 results indicate that Omani students received average scores in science of 377 and 420 at Grade 4 and Grade 8 respectively, significantly below the global scale centre point of 500 (Mullis et al., 2012). Teachers, the Majlis and the community have attributed these weak performances to shortcomings in the effectiveness of the education system in general and of the assessment system in particular. Their significance lies in the great importance of school science for preparing students to study scientific disciplines in higher education, to meet the needs of the labour market and to support sustainable development (Al-Ambusaidi, 2011). Furthermore, it appears that the TIMSS results reflect the extent to which NAS serves as AFL, strengthening the skills which students require both to learn better and to perform well in TIMSS. There would therefore seem to be a good opportunity to gain insights from the TIMSS results (as the first study of this kind in Oman) to support the present study, as they give an indication of the standing of the Omani assessment system in relation to the educational assessment experience of other countries which have achieved success in this field, in order to improve the quality of education (MOE, 2018a).

Research on assessment policies and their enactment by teachers broadens understanding of assessment in Oman, its shortcomings and the contextual factors that influence it. This has implications for all stakeholders—especially policymakers, the MOE's specialists in assessment, supervision and curriculum design, teacher educators and science teachers—related to the improvement of AFL policy enactment in Oman, with the potential to be useful for those planning similar AFL reforms elsewhere. The findings of the present study may therefore be valuable in identifying the steps that ought to have been taken before NAS was introduced, what is now necessary to improve its operation and what needs to be done to ensure the success of any future

change in the assessment system. Moreover, it is expected that this study will contribute new knowledge to augment the current literature.

The MOE intended NAS to have two main purposes: AOL and AFL. However, this study looks particularly at its operation in second-cycle science through the lens of AFL. In other words, it is essentially concerned with how policy is translated into practice, by investigating science teachers' practices in relation to AFL policy in Grades 5 to 10.

The section 1.8 of this chapter sets out the research questions to be addressed, then Chapter 2 elaborates the research design, explaining the methods and tools used to investigate stakeholders' views, make classroom observations and gather other relevant data.

1.8 Research questions

This study will be directed by the following research questions:

1. What are the policy intentions regarding the purposes of the New Assessment System in Basic Education in Oman, its enactment in science teaching and accountability for this?
2. How do science teachers enact the New Assessment System in Basic Education classrooms?
3. What are the factors that influence the New Assessment System practices and thus its functioning as Assessment For Learning?
4. To what extent do the Ministry of Education's policy intentions regarding the New Assessment System align with science teachers' practices in respect of the Assessment for Learning approach?

1.9 Organization of thesis

After this introductory chapter, Chapter 2 reviews the relevant literature, Chapter 3 sets out the research design, Chapters 4 and 5 present the study's findings and Chapter 6 offers a discussion of the study's findings in relation to the literature. Finally, Chapter Seven presents a conclusion to the study that includes contributions to current knowledge, the limitations of the research, implications and suggestions for further research.

Chapter 2
Literature Review

2.1 Introduction

As assessment for learning (AFL) has become a topic of renewed interest, education systems are now increasingly required to introduce changes to assessment systems in order to improve learning. Research has therefore recently increased into assessment reforms and their influence on teachers' assessment practices. However, relatively little attention has been paid to political intervention through the development and introduction of large-scale government-funded education reform initiatives that focus on AFL and to the way that contextual factors influence teachers' enactment of such reforms, particularly in science subjects. Thus, little data is available on science learning assessment practices during AFL reform, and even less insight has been provided into the factors that may influence teachers' actual practices, or into potentially crucial matters such as the Islamic perspective and its relation to policy development in the field of education, the moderation system, the accountability of science education and teacher agency. Therefore, in order to gain a broad understanding of the existing literature on AFL, the contextual factors that impact its enactment and related topics, I conducted a review of research, initially covering definitions of the assessment system, its characteristics and typology. The review presented here also focuses on educational trends in assessment systems and on assessment reform. The chapter then explores the connections between policy and practice, before investigating some related concepts, such as teacher agency, accountability, assessment moderation and the Trends in International Mathematics and Science Study (TIMSS). The review then considers the potential benefits and pitfalls of borrowing policies across cultures, as well as preparations for introducing policy. Finally, it highlights the challenges encountered in the enactment of AFL.

2.2 Definitions of the assessment system

In order to be able to distinguish clearly between AFL and other types of assessment, notably assessment of learning (AOL) (Section 2.3.4), it is necessary to begin by reviewing definitions of the term ‘assessment’ in general. Gipps (1996a) notes that assessment “does not stand outside teaching and learning, but stands in dynamic interaction with it” (p.261). Thus, it is a key component of the learning and teaching process (Goodrum et al., 2001). Educational writers have proposed many and varied definitions of assessment, as it is a broad term. Some of these can be summarized as indicating that assessment is a compound process which forms a major element of the learning process and consists of measuring and quantifying the knowledge, competence and attainment of students, in order to identify difficulties and to provide assistance in a timely manner (Lile & Kelemen, 2014). Alternatively, it can be seen as a comprehensive and systematic sequence of planning, designing and implementing tools, collecting data on student achievement, then analysing, reporting and employing the information obtained to develop teaching and learning (Dhindsa et al., 2007). In other words, assessment is a set of processes designed for reporting and accountability purposes (Genc, 2005; Goldman & Pellegrino, 2015; Shepard, 2000b). By the same token, Scriven (1967) explains that assessment is perceived to serve two distinct purposes, which are to improve instruction and to measure student achievement. In detail, Banta (1993) and Ewell (2009) argue that the assessment system is characterized as having two contrasting purposes, which are accounting and improvement. Given the inherent conflict between them, there has been intense debate about how to employ the assessment system to serve both of these purposes for the benefit of students (Palomba & Banta, 1999; Procello, 2008). However, it seems that this can be resolved by seeing the two purposes of assessment as integrated with each other, that is, by treating assessment as a cyclical process whereby the feedback from accountability can be channelled to improve the education system by using it to design and apply remedial plans during continuous assessment and vice-versa (Al-Shukaili, 2007). In addition, Stufflebeam (2004) argues that the most important purpose of assessment is to improve,

rather than to prove. Finally, it seems that any worthwhile assessment system involves the use of certain tools to achieve its main goal of enhancing learning.

2.3 Types of assessment

Students can be effectively assessed before, during and after teaching, for the purposes of diagnosing their capabilities, monitoring and reporting their progress, promoting students and teachers, and evaluating teachers' work (Irene, 2012). The MOE (MOE, 2015a) argues that one of the more positive attributes of Basic Education in Oman is that it is based on its New Assessment System (NAS), which consists of more than one type of assessment and can enhance cooperation between teachers and students. The following subsections define three main types of assessment: formative, summative and continuous.

2.3.1 Formative assessment

Black and Wiliam (1998) define formative assessment as classroom practices which continuously provide evidence about students' progress; the results are then used to improve their learning (Griffiths & O'Reilly, 2005). Formative assessment, which some educational literature refers to as structural assessment, is the use of tools and procedures during a successive period of time in the implementation of a programme, with the aim of generating immediate feedback which helps those in charge of the programme to make appropriate decisions on modifying it towards a certain aim (Kazim, 2005). In other words, as Looney (2011) explains, formative assessment works to identify learning requirements through classroom practices; therefore, it is AFL. In the specific case of Oman, the Ministry of Education (2013a) emphasizes that learning goals are pursued by formative assessment practices, using assessment tools such as individual and group projects, quizzes, practical exercises, applications, classroom discussion and homework. Moreover, the Ministry of Education (2015a) defines formative assessment as that which is used to improve students' learning and is usually applied through the adaptation of teaching, giving feedback and student self-assessment.

2.3.2 Summative assessment

Summative assessment takes place at the end of a course and provides the final judgement by summing up learners' performance, the most common form being the final examination (Oxford English Dictionary, 2015). The Ministry of Education (2015a) states that its purpose is to measure and report on levels of learning. Typically, this can be done by awarding scores and reporting them to MOE officials and parents. However, summative assessment does not necessarily rely exclusively on examinations at the end of the semester, but may use any other assessment tool, as it is intended to measure the achievement of the student in terms of particular outcomes. For example, if science teachers want to assess students on the outcome of an instruction such as "Write the chemical formula and weigh it accurately", they can do so using one or more tools, such as a quiz or homework (Al-Sarmi, 2005).

On the other hand, Black and Wiliam (2009) argue that during term time, summative and formative assessment cannot be separated, as the purpose of summative assessment is to provide feedback to teachers and students, as well as supporting learning processes, which aligns with the purpose of formative assessment. In other words, the information from summative assessment can be used for formative purposes, that is, as Nitko (1995) puts it, "summative assessment may turn into formative assessment" (p.327). Finally, Clarke and Dawson (1999), Ghiatău et al. (2011), Heywood (2000) and Yorke et al. (2000) consider formative and summative assessment to overlap. It seems that the two concepts are closely related, not completely separate.

2.3.3 Continuous assessment

Airasian (2001) describes continuous assessment as a set of tools, sources and techniques that teachers use to gather information and interpret students' achievement, while Le Grange and Reddy (1998) define it as assessment conducted continuously over a period of time, such as a term or a school year, where learners' performance and abilities are judged cumulatively in order to facilitate learning. Likewise, the Ministry of Education (2013a, p. 2) in Oman defines continuous assessment as:

> An assessment that is conducted in schools by teachers, throughout the school year rather than just at the end. It provides a fairer, more balanced picture of students' attainment. Furthermore, it allows the inclusion of skills, which are difficult (practically) to assess by formal testing. It can also be used for both formative and summative purposes.

The Ministry of Education (2015a) adds that information is collected primarily by assessing students in regular classroom situations. Additionally, continuous assessment combines both AFL and AOL by assessing the learners in certain skills continuously during the term as well as at the end of term.

As the MOE (2015a) explains, continuous assessment is intended to differentiate students clearly by their learning levels, which can have a positive impact on learning. It can be deduced that the formative and summative functions of continuous assessment represents AFL and AOL respectively (see Section 2.3.4). For example, Hernandez (2012) believes that continuous assessment practices have two main functions, which are the formative function and reporting. It seems that this kind of assessment has a comprehensive role in assessment processes. In line with De Lisle (2015), Hernandez (2012) defines continuous assessment as a system implemented in the classroom, used for both summative and formative purposes. On the other hand, Le Grange and Reddy (1998) support the view that continuous assessment is more focused on summative than formative aims, describing it as a tool for learning which can produce feedback as well as testing tools to determine grades.

Reporting on the use of continuous assessment in the United Kingdom, Griffiths and O'Reilly (2005) explain that there is often confusion about the meaning of the term, because its use varies slightly in different parts of the world (Bolyard, 2003; De Lisle, 2010; Le Grange & Reddy, 1998). For example, in North America, continuous assessment encompasses all assessment tools used in the classroom and may also include end-of-year exams prepared by the teacher or the school. On the other hand, the official exams at the end of the year in Scotland, whether prepared by the teacher or the school, are not considered part of the continuous assessment programme. Other reasons for confusion include the use of multiple terms to describe continuous assessment, such as 'teacher assessment', 'internal assessment',

‘classroom assessment’, ‘alternative assessment’ and ‘authentic assessment’ (Group, 2002; Group, 2008). The terms ‘continuous assessment’ and ‘formative assessment’ are also sometimes used in the same sense.

Griffiths and O’Reilly (2005) add that in Scotland, continuous assessment usually refers to the full range of assessment mechanisms and techniques, other than official examinations, which teachers can use to gain a full understanding of their students’ learning, including pencil-and-paper exams, oral exams, projects and observation. It seems necessary, therefore, to distinguish between continuous assessment used for summative purposes on one hand and for formative purposes on the other (Obinna, 1997). It can be said that summative assessment is the assessment of learning that teachers synthesize when they determine the levels reached by their students and write their end-of-year reports. The purpose of summative assessment is to measure achievement based on learning standards, providing evidence that can be used to compare the performance of students, teachers and schools. All of these are ways of describing the use of continuous assessment for summation, in other words, to report on the achievement of students.

In conclusion, formative assessment scrutinizes the learning process, often in the form of continuous assessment conducted at regular intervals in the classroom, furnishing teachers with a benchmark against which to compare actual learning with intended learning, and its results are used to help students narrow the gap between levels of performance. Formative assessment can also be termed AFL and its purpose is to improve standards of learning (Mansell et al., 2009; Pennycuick, 1990; Puhl, 1997). It seems that the learning process needs both summative and formative assessment, which serve distinct purposes. Harlen (2005) prefers to use the terms ‘assessment of learning’ and ‘assessment for learning’, instead of ‘summative assessment’ and ‘formative assessment’ respectively. The next subsection examines the AOL/AFL dichotomy.

2.3.4 Assessment of learning vs assessment for learning

Gipps (1994) identifies two types of assessment based on their purposes: AOL and AFL. The former mainly serves the purposes of reporting, accountability and ranking, whereas the latter fulfils a formative purpose by

generating feedback to support students' strengths and remedy their weaknesses, which in turn can be used to improve and promote learning (Carlson et al., 2003; Hill, 2000). Wiliam (1998) asserts that AFL constitutes a paradigm shift in education, focusing as it does on students' learning, rather than just reporting on their achievements (Birenbaum et al., 2006; Hattie, 2008). Leung (2014, p.1512) characterizes assessment as "purpose-bound" and it should be noted that AFL can refer to any form or type of assessment, as long as its purpose is to improve and enhance the process of learning at all stages from the beginning to the end (Davison, 2013; Klenowski, 2009). In short, "the main aim of AFL is to contribute to the learning process itself" (Klenowski, 2009, p.263).

However, Frey and Schmitt (2010) discuss the potential for confusion between the concept of AFL and a new system consisting of multiple types of assessment, such as formative and continuous assessment, asking whether they are in fact the same. From this discussion, it appears that AFL is the most comprehensive term and therefore that any type of assessment leading to the development of learning is AFL. In this case, for example, formative assessment can be AFL, but need not be so. The main reason for the emergence of the concept of AFL may lie in the view of some educators, such as Black et al. (2003b), that the word 'formative' in the term 'formative assessment' does not apply to assessment processes but to assessment tasks which serve learning needs.

The meaning of 'assessment for learning' is evident in the name itself; thus, the Assessment Reform Group (2002, p.1) defines it as "the process of seeking and interpreting evidence for use by learners and their teachers to decide where learners are in their learning, where they need to go and how best to get there", while for Black et al. (2003b, p.2), AFL is "any assessment of which the first priority is in its design and practice to serve the purpose of promoting pupils' learning. Thus, it differs from assessment designed primarily to serve the purposes of accountability, ranking or certifying competence".

Equally importantly, AFL seeks to provide students and teachers with continuous feedback during the entire teaching and learning process, not just at its end, in order to enhance their strengths and transform their weaknesses

into strengths (Cooper & Cowie, 2010; Hattie et al., 1997; Hattie & Timperley, 2007). Consequently, Cowie (2005), Hattie and Timperley (2007), Klenowski (2009), Lindsay and Clarke (2001) and Stiggins (2002) declare that science teachers should provide clear, detailed and frequent feedback to students, which will allow them to take active measures to improve their learning. This in turn will make them more positive, confident in their ability and independent, encouraging them to take personal responsibility for achieving their learning goals (Chin, 2004; Klenowski, 2012; Naylor et al., 2004; Stiggins, 2002).

On the other hand, AFL plays a significant role in improving teaching, by collecting evidence of students' knowledge and skills, thus providing teachers with the opportunity to continuously develop their planning and adjust their teaching in line with students' capacities and needs (Black & Wiliam, 1998; Hattie & Timperley, 2007; Klenowski, 2009; Stiggins, 2002; Wiliam, 2011).

Duncan and Noonan (2007) assert that one of the fundamental aspects of educational reform is the assessment approach based on AFL, because it follows the educational principle that all students' learning can be improved (Shepard, 2000a). The Assessment Reform Group (2002), Black and Wiliam (1998), Davison (2013) and Jahan (2017) report that the development of AFL and interest in it began and was framed in the United Kingdom during the second half of the 1980s. Thereafter, it became an accepted approach to assessment systems in Western countries such as Canada, Australia, New Zealand, the UK and the USA (Cumming & Maxwell, 2004; Davison, 2013; Kennedy, 2007; Klenowski, 2012). Then, at the end of the 1990s, AFL's widespread success in improving both teaching and learning prompted many countries in other parts of the world such as the Middle East, including Oman, to introduce educational assessment systems based on it (MOE, 2015a). However, the current literature offers little data on AFL implementation, particularly in science. The present study seeks to fill this gap by examining the enactment of AFL in science education in Oman, with a focus on the impact of contextual factors.

2.4 Educational trends in assessment

As Poteet (1993) notes, there has been public dissatisfaction with traditional examination-based assessment, while educators have recognized the need for assessment systems which are representative of what students can actually do. Teachers strongly desire fundamental reforms to provide them with assessment systems on which they can reliably base pedagogical decisions. Anderson (1998) and Choate and Evans (1992) add that traditional assessment ignores how and why students learn, thereby failing to provide accurate and sufficient detail of their learning or adequate information about their responses to exam items. In response, the widespread application of a new approach to assessment, using tools which differ from the traditional ones, is expected to modify teaching methods in line with modern theories of learning (Coutinho & Malouf, 1993). Wiggins (1989) concludes that by choosing appropriate assessment tools, teachers can help students to understand what is required of them as learners, which is expected to lead to real educational reform, creating systems able to discover the capabilities of students and test them. Furthermore, Herman et al. (2006) describe the traditional assessment approach as focusing on lower-level thinking skills, because of its heavy reliance on examinations, a tool which alone cannot measure the multiplicity of skills that successful learners need.

The traditional assessment system described by some educators, such as Heron (1988), involves a hierarchical model where the ability to make assessment decisions rests with senior stakeholders, neglecting the roles of teachers and students. Such a system gives the teacher a role in very limited cases, but denies students any participation in deciding about the form or content of learning. Anderson (1998) describes this traditional approach as a negative process where students focus exclusively on memorizing knowledge, without any critical thinking, while the teacher's role tends to be as a supplier of information, without any interest in how to obtain it. Conversely, to achieve the main goal of assessment for learning, it is important to take a student-centred approach (Brown et al., 2013; Wiggins, 1990), where the role of the teacher is to direct students' learning, rather than indoctrinate them with knowledge (Simon, 1999). In other words, student-

centred learning seeks to achieve a marked improvement in interaction between students and teachers, as well as improving the students' role in the classroom, through what is known as 'authentic assessment' (Brown et al., 2013; O'Neill & McMahon, 2005; Wiggins, 1990).

Furthermore, it can be said that knowledge about objects and the purposes of any task or system no doubt helps to carry out what is needed. This is what really assists students in their knowledge of what is required of them, in accordance with the assessment system, helping to make it effective and more credible as the experience generates success (Harris & James, 2006). It follows that the assessment system is a cornerstone of the education system, being used to make "educational decisions about students, to judge instructional effectiveness and curricular adequacy and to inform policy" (Sanders & Vogel, 1993, p.41). Therefore, it appears clear that there is a need for an alternative assessment system serving the declared educational aims; in other words, an AFL system. Recognizing this global need for the development of education through the adoption of improved assessment tools, the MOE in Oman has been motivated to reform the national education system by the implementation of the NAS initiative, with AFL at its heart (MOE, 2015a).

2.5 Educational reform

While there is some interchangeable use in the literature of the terms 'policy reform' and 'policy change', a simple distinction can be made, whereby 'policy change' refers to any policy innovation within existing structures (Bennett & Howlett, 1992), whereas 'policy reform' indicates a major transformation. The NAS initiative can thus be considered a large-scale educational reform, because it was introduced at national level and was directed by top management at the MOE. On the other hand, Wedell (2009) explains that educational reform may include changes in assessment format and curriculum content. He also refers to change as an adjustment to the components of the education process. Therefore, I will use the words 'reform' and 'change' interchangeably in this study.

Cerna (2013, pp.4-13) discusses several theories of policy change, such as ‘path dependence’, ‘advocacy coalition framework’, ‘policy learning’, ‘policy diffusion’, ‘punctuated equilibrium’, ‘institutional change’, ‘multi-level governance’, ‘policy networks’ and ‘disruptive innovation’. She argues that each of these theories has its own strengths and weaknesses which depend on context and timing, on actors’ shifting beliefs and the vigour with which the reform is promoted. The ability to define change frames benefits, challenges, state budgets and costs, and the extent to which each theory can be generalized. Bennett and Howlett (1992) also note that policy change includes three processes, which are learning about policies, learning about organizations and learning about programmes.

While the applicability of these theories differs across policy areas and with the extent of change, they can all be said to assume that “introducing and assessing educational change is a political process” (Hargreaves, 2005, p.291). Indeed, Reich (1995) asserts that reform must be characterized by sufficient political will, appropriate timing, qualified planners and leaders, and well-equipped institutions, adding that to achieve the objectives of reform, there is a need to analyse the context and take account of the relevant circumstances.

Furthermore, a number of researchers, including Fullan (2007) and Ball (1994), believe that policymakers should present new assessment system policies, with careful and vigilant planning and arrangement. Sometimes, reform is imposed from the top down, being applied only to those at the lower end of the hierarchy, namely the teachers; however, they may not see any reason to change their practices and thus have no motivation to implement the reform. Bearing this in mind, scholars have identified various principles for implementing educational reform; for example, Wedell (2009) lists the following requirements for successful reform:

- It should be based on the interpretation of teachers, not written documents. In other words, teachers should act as agents of change, playing a central role in the reform process (Scottish Executive, 2006);
- It should not be effected by politicians;
- It should enhance teachers’ confidence;

- It requires the devotion of time and effort by all personnel involved.

Successful reform depends on the provision of adequate time and a high level of support. Several authors, including Cuban (1998), Eisner (1992) and Sarason (1990), warn that the extent to which teaching practices change in line with the reform cannot be judged instantly. They understand that a small change in practice in the short run can lead to major changes in teachers' reasoning, with considerably greater consequent changes in classrooms at a later stage. In any case, it seems that most teachers are experimenting more and questioning more, seeing students' thinking and learning from a new angle; however, they may not presently understand what they see.

On the other hand, a key element is the development of a greater trust between teachers and those who make and transmit policy (Darling-Hammond, 1990). Therefore, at the outset of any project, some important points must be made about policy. Firstly, to ensure understanding of the policy, better communication is essential, as are significant discussion and comprehensive professional development. Secondly, new policies will come to replace other previous policies, so policymakers must take responsibility for the consequences of their actions. Thirdly, teaching practice will always be based on teachers' pre-existing knowledge. Finally, the process of reform is never easy (Darling- Hammond, 1990).

2.6 Policy development

A considerable amount of research has indicated that policies are usually developed in several stages: identifying and defining needs, gathering information, drafting policy, consulting with stakeholders (interested parties), reviewing, finalizing and approving the policy (Anderson, 2014; Benoit, 2013; Brewer & DeLeon, 1983; DeLeon, 1999; DIY, 2019; Jones, 1997; Michael et al., 2003; Sabatier, 1986; Smith & Larimer, 2009). The consultation stage is recognized as most likely to happen in Western countries such as the UK, the USA and Australia. However, those consulted do not necessarily have a strongly active role in policymaking as a whole (Bowler, 2010; Cheung, 2011; Hall et al., 2013; Hallsworth, 2011; Joseph, 2016; Walker et al., 2019). Instead, it has been argued that policymakers in the UK, for instance, often

wish to demonstrate that some ostensible consultation has taken place, whereas the process actually has no significant role in policy development (Linsley et al., 2016; Walker et al., 2019). However, there is still a consultation stage in most policy development in Western countries, although not in many other countries, including Oman (Al-Shukaili, 2007).

In the case of Omani education, policies are developed without the involvement of practitioners from the lower tier of the organizational structure, such as school staff members, who are excluded from all stages of the decision-making process except for enactment; more precisely, there is no initial drafting of the policy on which to consult with stakeholders in order to review and approve it (Al-Hadad, 2001; Al-Hammami, 1999; Al-ksabi, 2005; Al-Sarmi, 2005; Al-Shukaili, 2007; Al Khatib, 1988; Almoharby, 2010). It appears that policy development is based on the belief that the government knows what is best.

Because Oman is a Muslim country, decisions affecting people's lives, such as on education issues, are supposed to be taken through Alshura, a decision-making mechanism put in place by the Islamic religion. Alshura means the participation of stakeholders in decision-making through consultation (Alansari, 1996; Albadawi, 1994; IbnAlarabi, 1957). In other words, it is a participative and consultative approach that is applied through an open discussion which enlightens stakeholders about the situation of their organizations and developmental plans, in order to make appropriate decisions, especially as it provides an integrated discussion of many aspects of the decision, involving all categories of stakeholders with diverse talents and interests (Alkhalili, 2000; Almoharby, 2010). Aljazairi (1995) argues that this approach can minimize autocracy in policymaking, in line with the words of Prophet Mohammed as translated by Almoharby (2010, p.7): "Those who seek what is best shall never fail, and those who consult shall never regret". Furthermore, this consultation is considered to strengthen the relationship between policymakers and practitioners, fostering a sense of belonging and ownership which in turn supports proper policy enactment (Almoharby, 2010; Giacchino, 2003; Giacchino & Kakabadse, 2003).

Finally, the topic of consultation as one of the key stages in policy development is a broad area of research in political science and public policy, but has been explored to a lesser extent in educational studies, particularly in the context of Islamic culture (Cerna, 2013). This study seeks to fill this gap by examining the consultation stage in educational policy development in Oman as part of the Islamic world, as well as investigating its effect on policy enactment as a cultural factor.

2.7 Policy enactment

Enactment is the interpretation and translation of policy into practice by practitioners, who in the education context include teachers (Braun et al., 2010). There has been a recent increase in research into policy enactment and outcomes, due to its importance for both policymakers and implementers (Darling-Hammond & Wise, 1981). By the same token, policy enactment goes hand in hand with policy change (Mazmanian & Sabatier, 1983). Pressman and Wildavsky (1984) argue that policy enactment dominates policy outcomes; in other words, policies must be enacted well to guarantee the fulfilment of their aims. Payne (2008) observes that some of the manifestations of successful policy enactment and achievement of policy goals in schools are coherence, stability, training, peer support and engagement. The success of enactment depends on contextual factors such as the political, cultural, social and economic conditions, including the availability of resources and clear goals (McDermott, 2011). According to Reich (1995), any broad reform also needs sufficient political will, as well as qualified planners and managers. He adds that to achieve the goals of reform, there is a need to analyse the context and relevant conditions, to ensure that these support the stakeholders in working flexibly (O'Toole, 2000; Stoker, 2000).

The critical variables for effective policy enactment are listed and explained by Gornitzka et al. (2005, p.42) as follows:

- Policy objectives: Effective enactment depends on the nature of policy and the factors that contribute to the realization of its objectives.

- Policy resources: The allocation of sufficient budget is needed for policy enactment to reach its objectives.
- Communication and enforcement activities: Assistance and advice should be provided, and managers should rely on negative and positive sanctions (accountability).
- Characteristics of organization: the competence of an organization's staff, degree of control, and monitoring of processes within the organization.
- Cultural, social and political circumstance: These are crucial for the relationship between objectives and results.
- Disposition of practitioners: This relates the attitudes and motivation to the responsibility for enactment of the reform.
- Time span of policy enactment: the period of time that is necessary to enact policy and make it part of the normal daily practices of practitioners.

Sabatier and Mazmanian (1980, p.553) offer a more succinct list of factors that should be taken into account during enactment:

- The policy decisions of the enactment organization
- The compliance of practitioners with those decisions
- The actual impacts of organization decisions
- The realized impacts of those decisions
- The evaluation of policy regulations by revising their contents.

Equally importantly, Darling-Hammond and Berry (1988) identify two main reasons for challenges to top-down reform initiatives (as in the case of NAS). First, there is no consideration of conflict with local policy, based on a set of community concepts and resources. Second, teachers' values and beliefs are essential components in the process of teaching itself, yet there is no interest in them during the reform process. Therefore, Sarason (1982) insists that top-down policies should focus on local motivation and leadership for reform, which are essential to policy success. Local policymakers must adapt policies, rather than adopting them, thus creating space for teachers to develop their experience during implementation, as well as working on the success of the new policies being enacted in schools.

However, the MOE in Oman appears to believe that it can overcome the effects of teachers' beliefs, values, knowledge and practice during NAS policy enactment, by controlling teaching with prescriptions for practice represented in tests, texts and monitoring schemes. From this perspective, the teacher is a mere channel for instructional policy, not an actor, with the consequence that policymakers have tended to give significantly more weight to the exercise of control and the creation of control systems for teaching than to the improvement of teachers' knowledge (MOE, 2015a). On the other hand, gradual policy implementation may help to overcome some of the challenges of the enactment process; Blignaut (2008), Cerna (2013), Dewatripont and Roland (1995), Hoekstra and Kaptein (2014), Lindblom (1959), Meerkotter (1998), Roland (2000) and Roland (2004) argue that policy enactment is perceived as needing to be gradual in order to avoid any kind of shock to practitioners which might affect their performance. In other words, these authors emphasize the significant role of preparation for policy enactment and its reinforcement. Likewise, Wedell (2009) cites Fullan (2007) as suggesting that "large-scale change may take five to ten years to become part of normal classroom life in the majority of schools".

As mentioned earlier, policy enactment is a relative matter that depends on the circumstances of each school and each teacher, such as their length of experience in this field (Datnow & Castellano, 2000; Hargreaves, 2005; Nielsen et al., 2008; Rosenholtz, 1989; Schmidt & Datnow, 2005; Stuart et al., 2011). Furthermore, policies are often transmitted from policymakers to teachers in the form of orders and directives, rather than discussion, so that many teachers will have inadequate knowledge of the components of the policy and its advantages for students. In this case, teachers work with the guidance provided through what is familiar to them in terms of knowledge, which can create a so-called 'mélange' of practices (Tyson-Bernstein, 1988).

It is important to understand how teachers enact NAS policy intentions in their context, as well as how contextual factors influence their assessment practices. Accordingly, there is a need to investigate certain critical aspects of the enactment of a new educational assessment policy, on which little data is available in the literature. This study seeks to fill this gap by investigating

factors such as teacher agency, accountability, assessment moderation and TIMSS. These are the topics of the next four sections of this chapter.

2.8 Teacher agency

Agency is a Western concept that initially emerged in the social sciences and was used in anthropology, psychology and gender research, then more recently in the educational field (Archer & Archer, 2003; Ecclestone, 2007; Eteläpelto et al., 2013; Freire, 1973; Habermas, 1984; Holland et al., 2003; Mezirow, 1981; Silbereisen et al., 2007), where it is often defined as “the teachers’ capacity to act purposefully and constructively” (Priestley et al., 2012, p.194). In other words, in case of policy change, it can be defined as teachers’ capacity to act as the main players in the enforcement and enactment of policy. It seeks to overcome the usual work routine structurally through teachers’ contributions to creating what they see fit to improve in their students’ learning (Biesta et al., 2015; Emirbayer & Mische, 1998; Goodson, 2003; Priestley, 2011).

Furthermore, Eteläpelto et al. (2013) argue that understanding how to conduct practices that reflect the manifestations of agency, identifying the resources needed to do so and determining how these practices are affected by contextual factors are fundamentally to examine professional agency in working life contexts. Figure 2.1 illustrates their understanding of professional agency in a subject-centred sociocultural framework, which can be explained as follows:

- Professional agency is manifested when professional communities take action and make choices in ways that affect their work.
- Professional agency is always directed for specific purposes and within certain sociocultural conditions, such as material resources, work culture and power relations (Ryder et al., 2018)
- Professional agency is interconnected with work-related identities, including their ethical and professional commitments, motivations, goals and interests.
- Competencies and knowledge work as individual resources for the practice that lead to the emergence of professional agency at work.

- Professional agency is necessary for developing practices and for introducing creative initiatives.

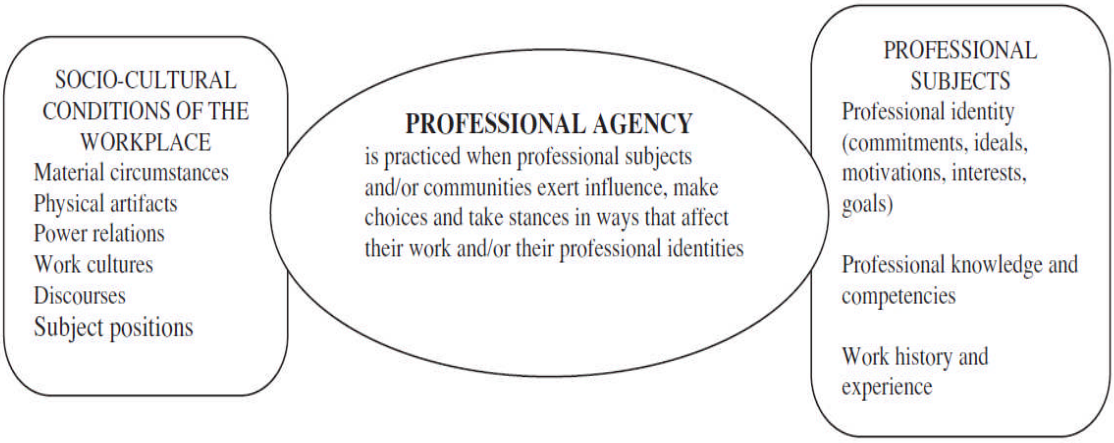


Figure 2.1: Professional agency in a sociocultural subject-centred framework (Eteläpelto et al., 2013, p.61).

Equally importantly, manifestations of teacher agency depend primarily on teachers' values (Biesta et al., 2015; Eteläpelto et al., 2013; Priestley et al., 2012; Ramanathan & Morgan, 2007; Ryder et al., 2018). Therefore, teachers' values control their practices; for example, some teachers may partially resist a change of policy, while some may enact it only as a compliance strategy and others as they see appropriate for their students. In other words, teachers perform various forms of agency for diverse motivations, such as believing that it is too difficult to change their usual practices, or that there would be no extra pay involved. Their own principles and professional knowledge may also not happen to align with the policy, prompting them to make their own decisions regarding policy enactment. These aspects of agency represent a real challenge to the fruitful balancing of local autonomy and accountability with external policy (Ryder et al., 2018).

Another consideration is that teachers may lack awareness of the philosophy behind a policy, which could have an effect on their practices and lead in turn to a blurring of the manifestations of teacher agency (Biesta et al., 2015; Riveros et al., 2012). Likewise, the strict imposition of policymakers' instructions will strengthen the power of the policy itself to shape and constrain teachers' practices, thus limiting their agency by denying them sufficient time

and opportunity to exercise the creativity which is considered fundamental to its manifestation (Eteläpelto et al., 2013; Glăveanu, 2010; Littleton & Miell, 2004; Sawyer, 2007).

Moreover, becoming used to practices in a given context for an extended period of time makes it difficult to develop and transform them easily and completely. This relates to the level of professional development and experience of each teacher, as well as the influence of the school context, such as resources and work culture (Eteläpelto et al., 2013; Ryder et al., 2018). Therefore, practitioners must be given the required training and the opportunity to gain experience, to change their beliefs and transform their attitudes, which will in turn boost their confidence and may have a positive impact on accelerating the desired transformation (Biesta et al., 2015; Ryder et al., 2018; Tarnoczi, 2006). Ryder et al. (2018) also argue that teacher agency is not the result of one situation, but rather an ongoing development; therefore, many aspects of teacher agency can be observed among experienced teachers' practices.

In summary, although a significant body of research into teacher agency and its theoretical development has taken place in the West (Archer & Archer, 2000; Archer & Archer, 2003; Emirbayer & Mische, 1998; Giddens, 1984; Pignatelli, 1993; Priestley et al., 2015b; Priestley et al., 2012; Pyhältö et al., 2012), there is to the best of my knowledge very little published research into teacher agency in the context of enacting new assessment policy, especially in the Arab world (including Oman). This constitutes an important gap in the literature that the present study has sought to contribute to filling.

2.9 Accountability

Romzek (2000, p.22) defines accountability as "answerability for performance"; alternatively, it is defined as explaining and justifying ways of using resources and the effects of their use (Trow, 1996). These definitions focus on four interrelated questions (McDermott, 2011): Who is to be held accountable, to whom, for what and through what means and resources? In the field of education, Anderson (2005) distinguishes between accountability as compliance with regulations, such as those of the UK's Office for Standards

in Education (Ofsted), as commitment to standards, such as those governing psychological and educational testing, as commitment to collaboration with their peers (American Educational Research Association, 1999) and as results-based accountability. Importantly, Gill and Lerner (2017) and Ofsted (2019) criticize sole reliance on outcome-based accountability due to its negative effects, such as teaching for the test, narrowing the curriculum and cheating. Other forms of accountability are needed in order to temper these negative effects, so these authors suggest using accountability based on the observation of practice and feedback, in order to achieve improvement through peer-learning. Anderson (2005) sees practitioners as accountable for student learning and accountable to the general public, arguing that each of these forms of accountability should include five components: objectives, instructions, resources, assessments and rewards or sanctions.

Romzek (2000) goes on to distinguish professional and political accountability from hierarchical and legal accountability, the former being more relevant to the education sector. Professional accountability relates to individual autonomy regarding decision-making on practices appropriate to internal norms and principles, based on practitioners' commitment to professional standards and to their peers, while political accountability refers to the commitment of officials to do what is best for society (Anderson, 2005; Hoecht, 2006; Huisman & Currie, 2004; Romzek, 2000). There are strong calls for professional accountability, through which teachers would be granted support, training and collaboration. It is important to note that professional accountability does not mean professionalism, because it involves external observation, whereas professionalism seeks to meet standards, even in the absence of observers (Gill et al., 2016). On the other hand, Kickert (1995) and Marceau (1993) state that there is a movement from professional to political accountability, where governments decide to steer practice more remotely by granting local authorities and schools greater autonomy, simultaneously making them more accountable. Kickert (1995), Marceau (1993), OECD (2010) and Romzek (2000) explain that professional accountability can operate via two main integrated models, one focusing on achieving outputs and the other on improving quality (Elliott, 1981; Hopkins, 2007).

According to Huisman and Currie (2004), accountability mechanisms can be described as either ‘hard’ or ‘soft’. The former rely on sanctions as a primary tool and tend to focus on regulation, redress, audit and inspection. In contrast, soft accountability is based on working closely with policymakers, featuring engagement, cross-respect and advice. Huisman and Currie (2004, p.547) add that in the Western context, “soft accountability measures are favoured over hard measures that involve rewards and sanctions”.

At the school level, Leithwood et al. (1999, p.11) argue that

> …educational accountability appears to have begun in most developed countries in the 1960s, acquiring significant new energy during the mid- to late-1980s. The reasons for these calls for greater accountability, furthermore, are to be found in the wider economic, political, and social context of which schools are a part. These contexts are not uniform across all countries.

In England and Wales, for example, the concept of school accountability dates back to the 1980s. Specifically, Gilbert (2012) dates the establishment of accountability in the education system of England and Wales to 1988, with the aim of raising education quality by reinforcing the accountability and responsiveness of schools. Behn (2001) notes that there is a movement from accountability for fairness and finances to accountability for performance in the education field, where research indicates that the relationship between outcomes and school autonomy is positive, but only when sufficient accountability exists (OECD, 2010; 2011). Therefore, the UK government took the following action towards the end of the 20th century:

- Legislation was provided for a balance between autonomy and accountability which thus become embedded in current culture and practice.
- The enactment of the Education Reform Act 1988 defined the public accountability framework.
- Ofsted was established in 1992 as a new national inspection regime.
- Adequate space and freedom were given to teachers to be accountable for learning improvement, even beyond the scope of the school, where they are concerned with socio-scientific issues affecting the wider community and have a voice through governmental and non-

governmental bodies (Jenkins, 1999; Levinson, 2006; O'Neill, 2002; Osborne et al., 2002).

In spite of the variety of accountability systems that have been implemented in a considerable number of countries, fears persist regarding a separation between real life and what is studied in schools, because of the continued practice of teaching to the test. There is concern, for instance, about the linking of science education to contemporary societal issues and what should be covered in the future by science education. Some examples of these socio-scientific issues are the ethical concerns associated with DNA analysis, GM food and the application of science to technology and manufacturing industry (Jenkins, 1999; Levinson, 2006). The danger is that the isolation of schoolwork from outside life will make the knowledge acquired in school inapplicable to the service of the community. This is in line with the argument of De Vos et al. (2002), Gilbert (2006), Holbrook (2005), Levinson (2006), OECD (2006) and Osborne and Collins (2001) that a restricted model of school science, where students are taught ‘pure’ facts, isolated from their roots, will not deliver knowledge that can be applied usefully in the service of the community. Consequently, some researchers have suggested various new models of accountability that seek to improve student learning; for example, Darling-Hammond et al. (2014) have proposed a new approach to AFL. Their new model of accountability, illustrated in Figure 2.2, has three main pillars: a focus on meaningful learning supported by qualified players and adequate resources.

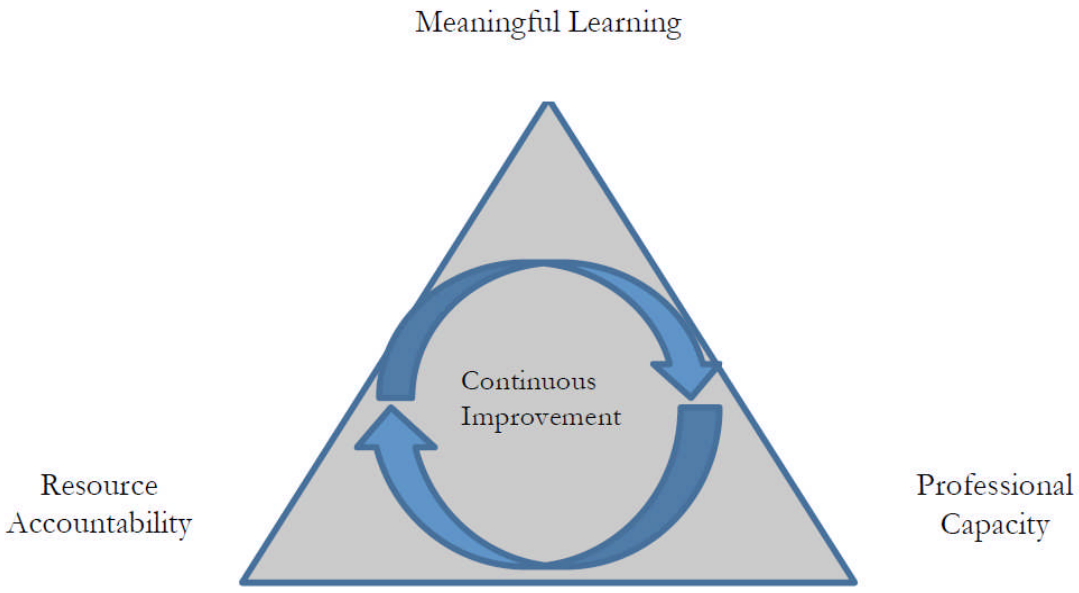


Figure 2.2*:* Key elements of an educational accountability system (Darling-Hammond et al., 2014, p.5)

However, in spite of the availability of various procedures, tools and mechanisms of accountability, such as high-stakes tests, national tests, international studies (e.g. TIMSS) and end-of-term examinations, whose results typically serve the aims of accountability, some education systems have no accountability framework as yet (Black et al., 2003a; Gill & Lerner, 2017; MOE & WB, 2012). The absence of such a framework in places such as Oman may be due to the impact on their education systems of contextual factors, on which little data is available in the literature. To address this this gap, the present study examines accountability for the enactment of a new assessment initiative in Oman and investigates related topics, such as participation in TIMSS and the moderation system.

2.10 Assessment moderation

Moderation in education is defined as the quality assurance process which seeks to ensure that assessment outcomes are consistent, valid, reliable, transparent, accurate and fair (Bloxham, 2009; Maxwell, 2002; Miller, 2000), in order to facilitate students' learning (Ramsden, 2003). In other words, Maxwell (2002, p.1) describes assessment moderation as "a process for developing consistency or comparability of assessment judgments across

different assessors, programs and schools". The official definition given in Oman by the MOE (2014a; 2015a) is: "A range of procedures and processes of tracking and auditing which takes place to ensure the correct and accurate implementation of assessment tools by teachers and the credibility of awarding scores".

Moderation systems were established in developed countries such as the United Kingdom and Australia approximately 50 years ago (Gipps, 1996b; Gipps & Stobart, 2003; Harlen, 2005; Shavelson et al., 2007; Strachan, 2001), while it has been in operation in the Omani education system only since the academic year 2004/2005, i.e. five years after the introduction of the Basic Education system (MOE, 2018b; MOE, 2015a). Moderation has two main purposes, accountability and improvement, involving official reporting and professional development respectively (Adie, 2013; Gipps, 1994; Hutchinson and Hayward, 2005; Lim, 1993; Maxwell, 2002; Maxwell, 2007; Orr 2007; Ministry of Education New Zealand, 2019; Wilson, 2004). Typically, moderation for accountability is external and formal (Beutel et al., 2017), while moderation for improvement, also known as 'social moderation' or 'consensus moderation', is internal and informal (Gipps, 1994; Lim, 1993).

The use of moderation during the assessment process is associated with practices such as working through assessment criteria, double marking and allocating grades (Miller, 2000; Sadler, 2005; Yorke et al., 2000). On the other hand, there is a call for moderation to be applied to practices beyond the assessment process, such as "planning and operationalization of assessment design, and marking through to the post-hoc review of judgements made about students' results or grades" (Sanderson & Mahmud, 2011, p.9). Rust et al. (2005) assert that performing moderation both during assessment and outside of assessment processes (the whole-course approach) allows the linking of objectives, assessment and teaching methods to improve student learning.

Moreover, Adie (2013), (Gipps, 1994), Klenowski and Wyatt-Smith (2013) and Maxwell (2002) argue that addressing the concern for coherence and consistency in the professional judgement of teachers forces them to review their practices so that others can confirm their validity and effectiveness. The

use of moderation is also seen as an attempt to give parents and civil society institutions confidence in the results of assessment tools and the education system in general (Klenowski & Wyatt-Smith, 2013; The Ministry of Education- New Zealand, 2019). Furthermore, the international literature asserts that the key to ensuring that moderation will improve teachers' practices and the capacity of their assessment to support learning is for them to hold conversations in which they discuss their assessment practices with one another (OECD et al., 2005; Gardner, 2006; Maxwell, 2007; Wilson, 2004).

This is consistent with the arguments of several academics (Heritage, 2015; Maxwell, 2002; The Ministry of Education- New Zealand, 2019) regarding the effects of contextual factors on the enactment of moderation. Therefore, a shift is required in the assessment culture of practitioners, as well as those responsible for following up the implementation of moderation, towards employing it to serve accountability and improve practices. This needs time, effort and encouragement (Beutel et al., 2017). The impact of contextual factors on moderation systems is another topic relatively scantily covered by the existing literature, representing a gap that this study seeks to fill in relation to assessment moderation in the Omani education system.

2.11 Trends in International Mathematics and Science Study

The Trends in International Mathematics and Science Study was initiated by the International Association for the Evaluation of Educational Achievement in 1995, since when it has been conducted every four years in approximately 60 countries around the world, varying in geographic location, population size and economic development. In spite of this variety, these countries share the goal of improving maths and science education and the belief that through TIMSS, they can compare components of their education systems such as the curriculum, teaching methods and assessment practices with those of other countries, which they consider an effective tool for policy analysis (Mullis et al., 2009).

The present study concerns the assessment of fourth and eighth-grade students. The TIMSS science assessment framework focuses on two main dimensions, namely content (for example, Grade Four: life science, earth

science and physical science; and Grade Eight: physics, chemistry, biology and earth science) and the cognitive dimension: knowing, applying and reasoning (Jones et al., 2015). Furthermore, TIMSS works through a curriculum model, which focuses on the way that educational opportunities are provided and the factors that influence students' use of these opportunities. As Figure 2.3 shows, the model covers three aspects: the intended curriculum, the implemented curriculum, and the achieved curriculum (Mullis et al., 2009, p.10). Together, these represent the societal needs to be met by students' science learning and how the education system supports this learning; the actual practices in classrooms, the teachers' characteristics and how they teach; and ultimately, what the students have gained.

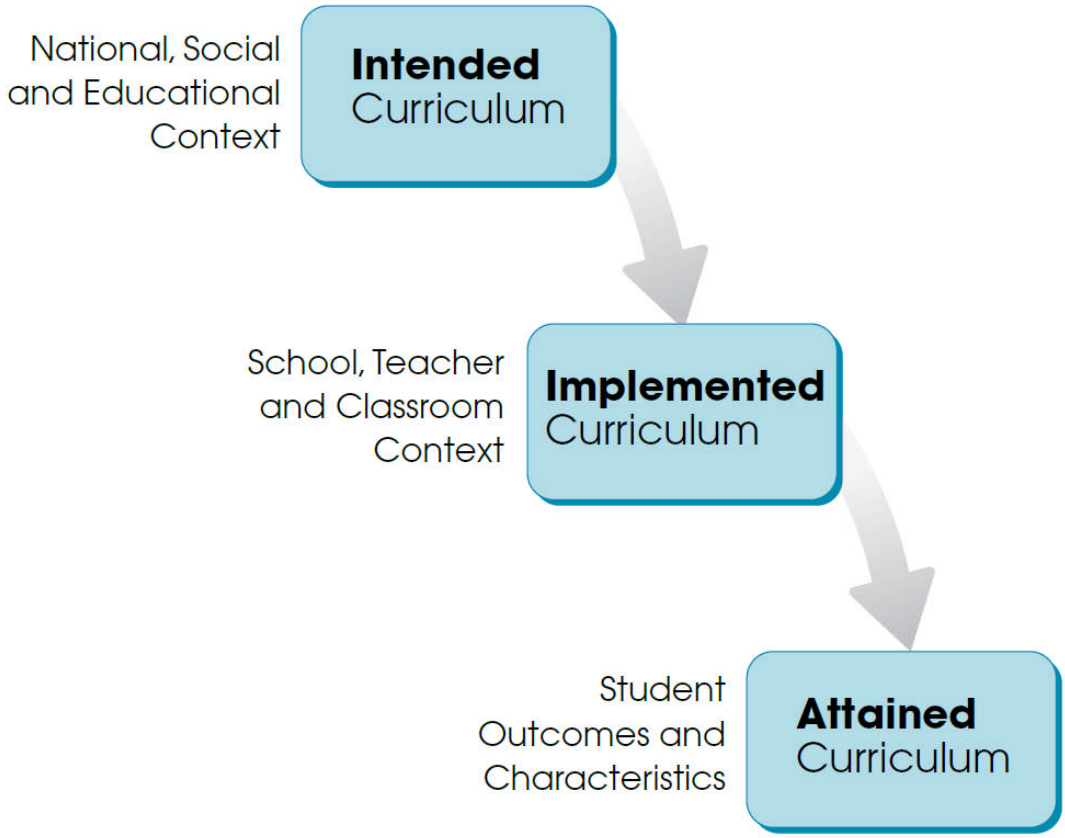


Figure 2.3: TIMSS curriculum model (Mullis et al., 2009, p.10)

Mullis et al. (2009) emphasize that TIMSS has potential for the development of both teachers' performance and students' achievement. In other words, it provides participating countries with a body of significant data which could benefit them all in developing various components of the education system,

as well as accountability for this development, such as curriculum content, pedagogy, assessment, resources and the professional development of teachers. The outputs of TIMSS include comprehensive international data about what students have learned in science, their progress, growth internationally in learning over time, an indication of the effectiveness of teaching and learning, the effect of context on learning and its relationship with policy intentions. Moreover, Dale (2000) and Rutkowski and Rutkowski (2009) argue that participation in global processes such as TIMSS encourages and promotes curriculum development in pursuit of international educational outcomes. It appears that global forces have an influence on national education systems, contributing mainly to curriculum policy development (Monkman & Stromquist, 2000; Stromquist & Monkman, 2001).

In Oman, the MOE (2018) reports planning to assess students' performance accurately and objectively by comparing it with that of students in other countries. To that end, Oman has participated in TIMSS since the fourth session was held in 2007, in the expectation that this would provide a variety of data that could serve several aims, such as to develop and improve educational policy and plans, especially regarding curriculum objectives and content, and assessment and teaching methods (MOE, 2018).

Finally, as aforementioned, participation in TIMSS provides an opportunity to compare national education systems and their components, such as assessment systems, providing rich data to assist in the accountability process, as well as being considered as a tool of policy analysis. However, little data on this issue is available in the literature and to fill this gap, the present study examines the conducting of TIMSS in the Omani context and its role in the enactment of the NAS initiative.

2.12 Benefits and pitfalls of cross-cultural policy borrowing

In order to reform their education systems, many national authorities have borrowed policies from Western countries such as the UK, the USA, Canada, New Zealand and Australia. They see such policies as successful in their countries of origin, which motivates them to use them in their own context (Alderman, 2015; Forestier & Crossley, 2015; Li & Grieshaber, 2018; Phillips

& Ochs, 2003; Sayed et al., 2015; Tan, 2015; Tan, 2016; Tan & Chua, 2015; Wei, 2017). This may involve the borrowing of practices alone, or it may extend to associated political discourses (Silova, 2004). The perceived success of policy borrowing has led to its becoming an increasingly accepted route to reform (Rutkowski and Rutkowski, 2009). There are alternative terms for 'borrowing', such as 'importation', 'transfer', 'copying' and 'assimilation' (Phillips & Ochs, 2003); however, this study will use the term 'borrowing' throughout.

Phillips and Ochs (2003) describe the process of policy borrowing as a sequence of four main stages, as illustrated in Figure 2.4.

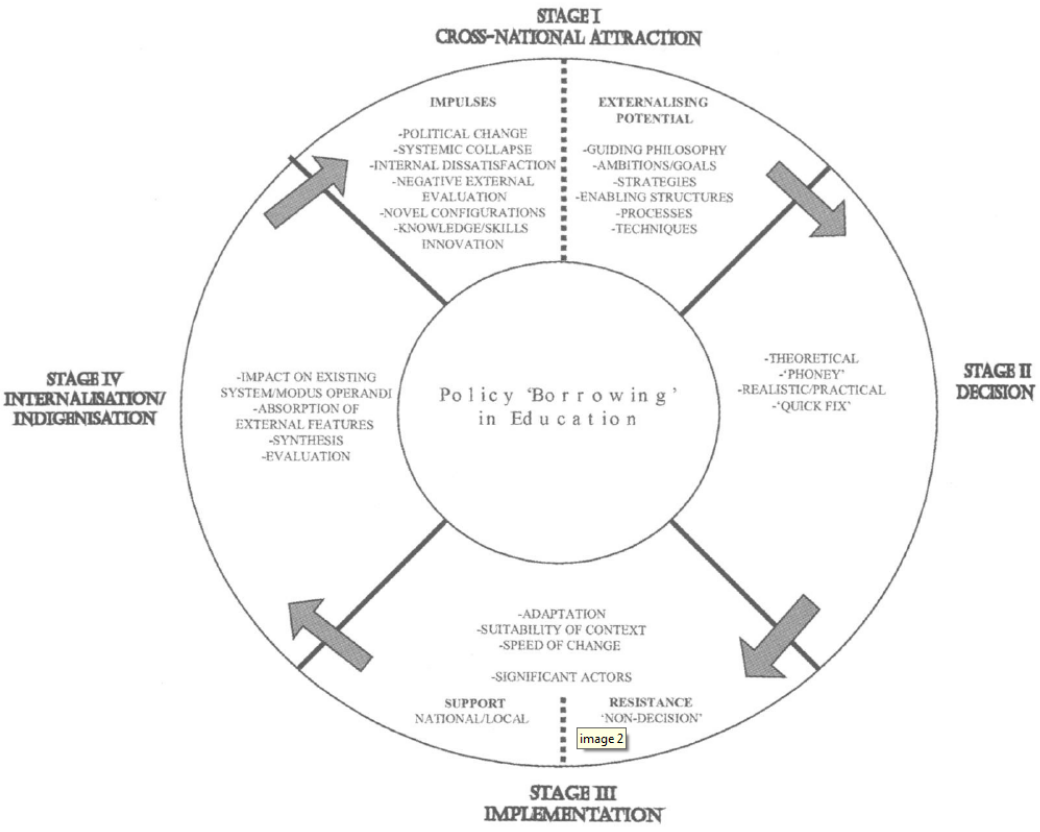


Figure 2.4: Policy borrowing in education (Phillips & Ochs, 2003, p.452)

The process begins at the stage of cross-national attraction, where Phillips and Ochs (2003) list the various impulses behind policy borrowing as including dissatisfaction with some parts of the education system among teachers, parents, students and specialists in assessment, curriculum and supervision, as well as external inspectors. Some aspects of the system (e.g. assessment) may be perceived as ineffective, while the results of international studies such

as TIMSS are negative indicators, as is economic competition. Various other impulses relate to policymakers, such as their perception that the real academic achievements of other countries prove the superiority of foreign education systems, generating a strong political desire to introduce reform. These motivations for change can direct policymakers towards foreign models in the belief that they can solve the existing shortcomings in their own education systems (Ochs & Phillips, 2002).

Then comes the decision stage of policy borrowing, which includes a variety of plans and procedures designed by the government in order to start the change process, such as theoretical decisions for new policy (Tomlinson, 2005), fast, unexamined decisions in favour of attractive education systems (Phillips, 1989), realistic/practical decisions (Last, 1999; Ofsted, 1993) and quick-fix decisions. However, Phillips and Ochs (2003) caution against making quick decisions based on sudden enthusiasm for an educational idea that was born, raised and matured in a foreign context.

The third stage is implementation, which occurs when a strong belief that there are unacceptable shortcomings in the education system coincides with agreement among stakeholders on suggested solutions (Phillips & Ochs, 2003; Simkins et al., 1992). However, since key actors such as local authorities, heads of education offices, advisers and schools principals will influence implementation (Corcoran, 1974), Sarason (1982) argues that policymakers must adapt borrowed policies rather than adopting them wholesale, to allow more space for practitioners to develop their own experience during enactment. The extent of the ability to adapt the new policy will also determine whether the change will be short-lived or long-term. This adaption should be based on contextual factors and take the form of various actions, such as editing new textbooks and guidance to cover educational innovations, and training both novice and experienced teachers. In England, for example, the adoption of any new policy is reinforced by setting it on a statutory foundation, holding public debate and discussion, incorporating the Ofsted inspection framework, allocating budgets for schools and putting plans in place for them to follow up the policy’s enactment (Braun et al., 2011; Braun et al., 2010; Higham et al., 2002; Sin, 2014).

The last stage of the policy borrowing process is internalization/indigenization, where the stakeholders become more familiar with the borrowed policy and it becomes part of the education system. This stage consists of a series of steps, beginning with the investigation of the objectives and motives of the policymakers (Phillips & Ochs, 2003). Ball (1994) suggests examining existing systems by studying the organization, curriculum, pedagogy and assessment. The remaining three steps are absorption, synthesis and evaluation. The absorption of the features of the foreign policy involves examining the context to help specify the appropriate mechanism for this absorption. Synthesis occurs when the borrowed policy and practice become integrated into the existing education strategy (Kissane, 2001). This also leads to reconceptualization, as it influences the enactment of borrowed policies (Carnoy & Rhoten, 2002). Finally, there is a need for evaluation in order to determine whether the borrowed policy has achieved the expectations of policymakers (Steiner-Khamsi, 2002).

Given that culture is a broad concept incorporating “symbols, language, values and meanings, beliefs, norms, rituals and material objects” (Boyd et al., 2007, p.6), consideration of the cultural dimension is fundamental in shaping educational policy and the structure of change, since the local culture could support or counteract the intended change (Deng, 2011; Peluso & Hafler, 2011; Stacey et al., 2018). There is therefore a need to pay attention to diversity in the cultural context, which challenges the concept of globally appropriate routes to education system reform (Tan, 2016). Moreover, cultural differences between the country in which the borrowed policy originates and the one borrowing it represent a real challenge to policy implementation (Tan & Chua, 2015). By the same token, Schulte (2012) and Tan (2015) note that in certain countries such as China, policymakers do not usually copy foreign policies and practices, but take into account the local context by recontextualizing and translating them (Wei, 2017). In other words, the contextual factors have an effect on the aforementioned four stages of borrowing policy. For instance, they affect the impulses behind the attraction of borrowing, while their interaction influences the development of policy and possibly its implementation (Ochs & Phillips, 2002). Finally, Ball (2012) argues that education policy is connected with social and economic policies; in other

words, educational institutions reflect social culture. Therefore, policymakers pass their agenda through such institutions, such as strengthening loyalty to the government, promoting social mobility or instilling skills and knowledge (Green, 1999; Leithwood, 2018; Lingard, 2010; Phillips, 2012; Steiner-Khamsi & Waldow, 2012; Takayama & Apple, 2008).

Oman, like many other countries, has sought to introduce reform of its education system by borrowing policies such as NAS and TIMSS from reference countries including the UK, the USA, Canada and New Zealand. My hope is that this work will therefore help to broaden the range of examples of policy borrowing by investigating it in the Omani context.

2.13 Preparing to introduce policy (policy reinforcement)

Introducing a new policy requires accurate planning and wide reinforcement of its enactment, such as providing necessary training programmes and other resources (Fullan, 2001; Wedell, 2009). In other words, as mentioned earlier, the implementation of any new policy is reinforced by carrying out various actions and providing the necessary resources, such establishing a statutory foundation, promoting public debate, providing professional development for practitioners, installing design and inspection frameworks, allocating budgets for schools and making plans for them to follow up the policy's enactment (Braun et al., 2011; Braun et al., 2010; Higham et al., 2002; Sin, 2014). Therefore, this section addresses two central aspects of policy enactment: reinforcing the professional development of science teachers and equipping schools with adequate science laboratories. I have chosen these two topics because other issues may be seen as common to all academic subjects, whereas professional development depends on specialization (in this case, for science teachers) and science labs are of course dedicated solely to science teaching.

2.13.1 Professional development of science teachers

The Teaching and Learning International Survey defines professional development for teachers as "activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher" (Kemp & Productions, 2009, p.49). Professional development is described as crucial for

any education reform process, especially for those who are involved in its enactment (Hargreaves & Fullan, 1992; Malderez & Wedell, 2007; Richardson, 1994; Sparks & Hirsh, 1997; Wedell, 2009). Its importance in reform lies in its role in developing teachers' skills to enable them to reflect on their practice (Tarrant & Newton, 1992). As to its definition, Kennedy (2007) argues that the term 'professional development' is broad and comprehensive in scope, covering diverse types such as formal, linear and informal training, and continuing professional development (CPD). Moreover, there are several training models, such as the cascade model and the competency-based training model, each of which has a number of positive and negative features.

For instance, the cascade model is viewed as causing a distortion to the training message, which in turn can cause the main aims to be missed. As Chisholm (2005) and Suzuki (2008) point out, the trickle-down nature of cascaded training messages results in their watering down, distortion or misinterpretation, because they pass through many different layers of implementers. Bett (2016), De Swardt et al. (2007) and Fiske et al. (2004) report that the use of this model in teacher training about curriculum change in South Africa caused a considerable number of change information messages to be misinterpreted, so that the change failed to meet stakeholders' needs. Moreover, Dichaba and Mokhele (2012) argue that the cascade model seems to have failed to improve practitioners' performance significantly, because it is seen as unable to distinguish between teachers according to their experience (Bantwini, 2009). Conversely, Suzuki (2008, p.1) asserts that cascade training can "deliver many trained teachers quickly and economically", meaning that it has advantages for planners, especially if the change is wide-reaching and needs to happen rapidly, because its appropriate use will save money, time, effort and human resources (Hayes, 2000; Hardman et al., 2011; Dichaba and Mokhele, 2012). In spite of some disadvantages, then, the cascade training model appears to be considered an acceptable undertaking, especially when used in the initial dissemination of information on curriculum change and if the trainers at all levels are selected carefully (Bett, 2016). As to its shortcomings, these can be avoided by involving experienced teachers in the preparation and delivery of training

materials (Hayes, 2000) and by encouraging school staff to adopt collaborative school-based strategies (Ushie, 2009).

Equally importantly, Duffee and Aikenhead (1992) identify teachers as the most effective factor in educational change. Accordingly, the success of many change projects is attributed to the success of teachers in implementing the innovation in harmony with the intentions of the policymakers. Their personal practical knowledge influences the way they respond to educational change (Van Driel et al., 2001). They should, therefore, be enabled to learn new skills and adapt their existing beliefs and practices to their own teaching contexts. In other words, the adequacy and quality of the professional development courses that they are offered can enable them to perform their duties without relying on the trial-and-error method (Micari et al., 2005; Peluso & Hafler, 2011). This means that effective professional development should engage and collaborate with teachers in practical training and in observing, assessing and reflecting on new knowledge and practices. It is also important for professional development to be sustained, continued, intensive and connected directly to teachers' and students' performance, as well as to all aspects of change in schools (Darling-Hammond & McLaughlin, 1995).

By the same token, CPD is described by Villegas Reimers (2003, p.12) as "a long-term process that includes regular opportunities and experiences planned systematically to promote the growth and development of the profession". It is also defined as the process by which teachers, either alone or with others, develop their thinking, planning, knowledge, skills, practices and effectiveness through a variety of activities, experiences and training courses (Day, 1999; Goodall et al., 2005). In other words, CPD aims to promote reflection and to improve the performance of teachers, who have responsibility for their own development (Leaton Gray, 2005). Other scholars describe CDP as a continuous process (Friedman & Phillips, 2004) which focuses on a certain area of professional development through formal and informal training programmes and activities (Asmari, 2016; Ono & Ferreira, 2010).

Significantly, CPD goes beyond formal training courses offered by official bodies such as education ministries, to include informal courses and activities

such as workshops, seminars and exchange visits, personal readings and research, collaboration with colleagues (peer learning) and the pursuit of higher educational qualifications (Coolahan, 2002; Riding, 2001). Indeed, Fraser et al. (2007) argue that collaboration is crucial for effective CPD. Typically, most collaborative activities involving either experienced or novice teachers, or both, are shaped by subject and course partnerships (Gagen & Bowie, 2005; Hustler et al., 2003; Monk, 2007). Accordingly, CPD encourages practitioners in self-development, which may relate to the feature of CPD that it is personalized; that is, adapted to match the needs and interests of participants, in contrast to the one-size-fits-all approach (Bailey et al., 1998; Hustler, 2003). Personalization can be monitored by documenting training activities and events for each employee as part of their career history record, in line with the advice given to the UK government by a member of the General Teaching Council policy team, stressing “the importance of documentation of CPD activities to shape the basis of career-long records” (Berkeley (2001).

CPD is not limited by its location, but can take place in the school setting, in local or central training centres or private institutions, or at home. On a larger scale, one of the key factors affecting professional development is the national, political or cultural context in which it takes place (Villegas-Reimers, 2003). Thus, Leibowitz et al. (2015), Smith (2012), Stes et al. (2008), Thoonen et al. (2011) and Trowler and Cooper (2002) argue that contextual factors affect professional development in general. Oman, like many other countries, has introduced numerous reforms to its education system, including NAS implementation, requiring decisions and actions in advance regarding the professional development of teachers. Therefore, this study examines teachers’ professional development during the enactment of policy in the Omani context, in the hope of extending the current literature with further examples of the influence of contextual factors on the professional development process.

2.13.2 School science laboratories

This subsection focuses on laboratories because they are a prerequisite of the practical work of science teaching. Abrahams et al. (2011), Bybee (2000), Cerini et al. (2003), Lunetta (1998), National Research Council (1996) and

Roberts (2002) agree that practical work is both useful and enjoyable for students—arguably more so than other science activities—and is helpful in developing their skills and attitudes towards science, which can have a positive effect on preparing them to study at higher education institutions, as well as helping them in their later lives to meet community and labour market needs. This is in line with the assertion of Hofstein and Lunetta (1982), Ramsey and Howe (1969) and Tobin (1990) that practical work is a significant issue in science education, because it encourages students' engagement in building concepts. Conversely, a shortage of properly equipped school laboratories is likely to impair students' participation in practical work, thus denying them the full advantages of the student-centred or student-directed approach in making their learning significant, meaningful and purposeful (Baird, 1990; Barron et al., 1998; Gunstone & Champagne, 1990; O'Neill & McMahon, 2005). Hickman (2017) cites a recent report in which the Gatsby Foundation outlines various benchmarks which can be used to improve science education in England, including an evaluation of laboratory facilities and equipment by comparison with global standards.

A potentially significant point, based on the research of Sharpe (2012), is that students' attitudes towards practical work are age-related, in that their enthusiasm for it is considerable in years 7 to 10 (equivalent to Grades Six to Nine in Oman), but then gradually decreases year by year (Abrahams, 2007). Notwithstanding this possible variation, the MOE in Oman believes that the availability of well-equipped school laboratories is significant for developing teachers' practices, as well as students' learning, by growing their practical skills. Therefore, the participation of students in practical experiments and note taking is considered one of the main science assessment tools, as introduced by NAS (MOE, 2015a). In other words, laboratory work can strengthen students' attitudes towards science, develop their various skills, such as problem solving, inductive and deductive reasoning, and reinforce their grasp of scientific concepts, while promoting the principle of collaboration.

To close this section, the value of resources such as laboratories in encouraging students' learning is amply summarized in the words of the Omani Ministry of Education and the New Zealand Education Consortium:

> A science course without laboratory facilities to conduct experiments to demonstrate scientific facts and phenomena will not have the same outcomes for students as one where imparted knowledge can be tested, confirmed and expanded upon in a suitably equipped laboratory. (MOE & NZEC, 2017b, p.401)

2.14 Challenges to AFL enactment

This final section reviews accounts in the literature of challenges to the implementation of AFL reforms in various parts of the world which have been found to have practical effects and to have resulted from a variety of factors. Table 2.1 outlines various studies that have examined AFL enactment and have identified these challenges, showing clearly that teachers have faced many obstacles arising from a variety of factors affected by the process of AFL enactment. It can be observed that certain contextual factors frequently recur across the different countries in which the studies are set, falling into two main categories: factors affecting preparation for enactment and classroom-related factors. Those which have an effect on preparations for the enactment stage include sudden changes to the assessment system, lack of awareness among teachers of the rationale for AFL, teachers' attitudes towards AFL, poor preparation of teachers, their uncertainty regarding the purposes of the assessment system, their existing beliefs, fixed mind-sets, resistance to change among those with long experience, lack of knowledge, experience and training, and insufficient resources and funding. On the other hand, the classroom-related factors affecting AFL enactment include large class sizes, class management, students' learning behaviour and poor motivation, the environment, time constraints, time-consuming remedial activities, increased burdens on teachers, teacher-centred rather than student-centred learning, low ability among students and confusion between formative and summative assessment.

Table 2.1: Studies of AFL enactment

Source	Context & Aim	Methods	Factors
Said Pace, 2018	Malta: To examine the relationship between beliefs and practices concerning AFL in primary schools	Qualitative: Open-ended questionnaire Documentary analysis Semi-structured interviews	·Lack of teacher's knowledge, experience and pedagogical awareness ·Teachers' negative perspectives about AFL ·Weakness of student ability ·Extent of AFL worthiness ·Teachers' attitudes towards AFL ·Teachers' perspectives of the learners' disposition ·Class size, class management, organization, students' learning behaviour, energizing of students' interest in learning, attention, environment, student laziness and carelessness
Pace, 2018	Malta: To explore the challenges that faced by teachers and their understanding and attitudes in AFL enactment as well as how professional development courses contribute to overcoming these challenges.	Qualitative: Interviews with seven teachers	·Lack of close relation of professional development programmes to the to the teachers' actual AFL practices.
Albert Jonglai, 2017	Malaysia: To investigate contextual factors affecting teachers' beliefs and assessment practices	Qualitative: Observations Interviews	·Existing beliefs ·Lack of knowledge and training ·Interference of other reform initiatives ·Lack of assessment monitoring

Source	Context & Aim	Methods	Factors
Jahan, 2017	Australia: To explore teachers' use of assessment criteria in practical science activities in order to improve learning (AFL)	Mixed methods: Questionnaire (310 teachers) Observations Interviews (6 teachers) Documentary analysis	·Unclearness of purpose ·Lack of professional development ·Poor communicating ·Time constraints ·Lack of teaching experience ·Lack of collaboration and feedback between colleagues ·Gap between teachers and school leaders in understanding the role and use of assessment criteria and tools ·Teachers' fixed mind-sets ·Poor time management skills ·Low socioeconomic environment ·Lack of resources ·Teachers' beliefs and negative attitudes towards monitoring classroom activities ·Lack of online resources ·Language level of assessment documents and criteria ·Lack of effort ·Changes in science syllabus
Al Sawafi, 2014	To examine the relationship between English teachers' beliefs and their practices with regard to the assessment system reform.	Mixed methods: Questionnaire (237 English teachers) Semi-structured interviews with 6 English teachers	·Teachers' lengthy experience ·Large class sizes ·Lack of training and difficulty in using some assessment procedures and tools in practice ·Mismatches between teachers' stated beliefs and their actual practices
Kapambwe, 2010	Zambia: To investigate challenges in enacting assessment activities for improving teaching and learning processes.	Qualitative: Observation	·Unexpected change to assessment system ·Lack of teaching and learning resources ·High average class sizes ·More burden for teachers ·Lack of teachers' collaboration ·Time-consuming remedial activities ·Inadequate monitoring by officials

Source	Context & Aim	Methods	Factors
Al-Kindy, 2009	Oman: To examine teachers' attitudes towards assessment and its effect on their classroom practice	Mixed methods: Structured questionnaires Semi-structured observation	·Sudden shift to new assessment system ·Lack of training programmes ·Teacher-centred learning rather than student-centred ·Absence of peer assessment and self-assessment ·Uncertainty that assessment system contributes to achievement of learners
Uiseb, 2009	Namibia: To explore teachers' roles in assessment enactment in primary schools.	Quantitative: Open-ended questionnaire with 120 teachers from 10 primary schools	·Teachers' lack of awareness of rationale for AFL ·Misapplication of AFL activities by teacher ·Lack of distinction between types of assessment, such as formative and summative ·Lack of constant follow-up training ·Lack of supervision visits ·More records ·High class sizes
Chan, 2008	Taiwan: To examine teachers' beliefs and assessment practices and factors affecting their practices	Quantitative: Questionnaire (520 teachers)	·Insufficient training ·More workload for teachers ·High average class sizes ·More time-consuming assessment activities
Dowrich, 2008	Trinidad and Tobago: To explore teachers' concerns about the implementation of the national assessment programme	Quantitative: Semi-structured interviews with 7 teachers	·Inadequate training ·Lack of collaboration between teachers on assessment issues ·Resistance to change ·Lack of mentoring and supervision services ·Poor parental support ·Lack of resources

Source	Context & Aim	Methods	Factors
Qassim, 2008	Qatar: To examine the influencing factors on teachers' assessment practices	Mixed methods: Questionnaire (490 teachers) Interviews (focus group of 17 teachers)	·Different assessment forms and score distribution standards affected teachers' ability to introduce new procedures in assessment ·Difficulty in complying with assessment requirements ·Curriculum workload ·High average class sizes ·Limitation of teaching time ·Lack of teacher training, particularly new teachers in assessment methods
Al Kharusi, 2007	Oman: To investigate the impact of science teachers' assessment practices on students' perceptions of classroom assessment	Quantitative: Questionnaire: 1,636 students from 24 male schools and 20 female schools Questionnaire: 37 male and 46 female teachers	·Students' negative shared perceptions of the assessment environment influencing their adoption of achievement goals. ·Lack of student ability ·Lack of teacher experience
Guthrie, 2005	The UK: To determine whether assessment techniques such as sharing learning intentions with children, questioning and plenary sessions can be considered AFL and whether these techniques change teachers' ideas about teaching	Mixed methods: Non-participant observation Questionnaire Semi-structured interviews Documentary analysis 1 School principal and 15 teachers	·Confusion between formative and summative assessment ·Teachers' view of formative assessment resulting in its misuse ·Inflexibility in using assessment tools ·Ineffective training for teachers
Susuwele-Banda, 2005	Malawi: To investigate the extent to which teachers use different classroom assessment methods and tools to support learning and teaching	Mixed methods: Questionnaire Observations Interviews	·Teachers' poor experience ·Poor preparation of teachers and lack of support ·Large class sizes ·Inadequate resources and their inequitable distribution

In the first chapter, based on my experience at the Omani Ministry of Education, I explained that there are some indications of similar challenges in the Omani context. This is consistent with the studies of Al-Kindy (2009), Al Kharusi (2007) and Al Sawafi (2014) summarized in Table 2.1, which also shows that such factors indicate the extent to which the context affects teachers' enactment of a new assessment initiative within any education system, as well as the introduction of any change in assessment that has a significant impact on teachers' perceptions of their new role in its enactment. In addition, teachers seem to enact change based on their experience, beliefs and other contextual factors associated with their workplace.

While the studies listed in Table 2.1 offer valuable insights into AFL enactment and some factors that affect it, further investigation is needed to redress imbalance in terms of subject and context. Most of the studies have examined AFL enactment in general and although some have focused on a particular subject, only two (Al Kharusi, 2007; Jahan, 2017) were concerned specifically with science teaching and these two did not cover all of the issues related to AFL enactment, such as practical lab work, accountability, teacher agency and moderation. Therefore, more critical consideration is needed of other factors and their impact on AFL enactment in science. With regard to context, more studies are needed to represent the large majority of science teaching settings across the world.

This section has demonstrated that there is an increasing number of studies providing evidence of a wide range of factors affecting the development and enactment of AFL policy. This is in parallel with the growing body of research related to science teaching, as this is crucial for the future of nations.

2.15 Summary

This literature review has focused on two main areas: the role of AFL in improving teaching and learning; and the development and enactment of policy in general, and of AFL policy in particular. The introduction of AFL can be considered to mark a paradigm shift in the assessment system in Oman, bringing to the fore principles and practices that teachers there have never used before. It requires them, therefore, to modify their practice, develop their

roles and change some of their convictions by accepting new assumptions regarding assessment. This is, of course, worth researching through this study. Moreover, by expecting in some instances that policy intentions will be readily assimilated by practitioners, thus enabling smooth and easy implementation, policymakers manifestly fail to take into account contextual factors, relevant circumstances and features of the environment. This study therefore seeks to examine the actual enactment of political intentions and the factors that impact on it. Another concern is that little attention has been given to various systemic issues related to enacting a new assessment policy, such as accountability, moderation, teacher agency and the Islamic perspective on policy development. I believe that the topics, claims, arguments, issues and factors that have been examined in this literature review, as well as the recognized limitations of some studies in their coverage of AFL-related issues, support the rationale for this study and help to provide ideas about its methodology, which will be discussed in the next chapter.

Chapter 3
Research Design

3.1 Introduction

The previous chapter reviewed the available international literature regarding the development and enactment of policy on assessment for learning (AFL) in schools, largely in Western contexts. This review indicates that there is a real need for research in the Omani context in order to provide empirical evidence of the extent to which the practices of science teachers at Grades 5 to 10 align with the AFL policy intentions at the heart of the NAS project, as well as investigating the factors that influence these practices; in other words, examining the translation of policy into practice through the enactment of NAS in science teaching at Cycle 2 of Basic Education (BE). This chapter details the research design adopted. It begins by presenting the study's aim and the research questions, then explains the choice of research paradigm and data collection methods, the selection of participants and the consideration of ethical issues. Next, it reports on the pilot study and the challenges faced in the field, sets out the approach to data analysis, including the need to ensure the trustworthiness and accuracy of the findings, and concludes with a summary.

3.2 Aim and research questions

I have become aware of a gap between the policy intentions of the MOE about NAS as AFL on one hand and teachers' actual practices on the other, that is, in the translation of policy into practice. This awareness is based on my reading of national and international literature in the field of education in general and assessment for learning in particular, as well as Omani governmental documents, reports of official visits to schools and moderation reports, combined with my experience in the Assessment Department of the MOE. Accordingly, the main aim of this study is to understand how science teachers enact a national initiative that focuses AFL. In other words, I seek to:

- understand the MOE's policy intentions regarding the purposes of NAS, its enactment as AFL and accountability for this;

- discover how science teachers enact NAS as AFL through their practices in the classroom; and
- explore the contextual factors that influence the classroom practices of science teachers while they enact NAS as AFL.

In pursuit of these aims, the study is directed by the following research questions:

1. What are the policy intentions regarding the purposes of the New Assessment System in Basic Education in Oman, its enactment in science teaching and accountability for this?

   This question relates to curriculum change (the policy perspective) and specifically to the policy intentions behind a new initiative in the assessment system based on AFL. It is designed to generate information about these intentions relating to the purposes, enactment and accountability for NAS by conducting interviews with ten policymakers and by analysing official documents and related material. The data discussed in Chapter 4 of this study address this question most directly.

2. How do science teachers enact the New Assessment System in Basic Education classrooms?

   This question explores how science teachers understand and interpret NAS policy intentions, translating them into classroom practices. I gathered the data related to this question and to questions 3 and 4 by conducting observations and post-observation interviews with practitioners including schools principals, heads of science departments and science teachers. All three questions are addressed specifically in Chapter 5.

3. What are the factors that influence the New Assessment System practices and thus its functioning as Assessment For Learning?

   Answering this question allowed the study to identify contextual factors affecting science teachers' practices in enacting NAS as AFL and to explore the relationships between these factors.

4. To what extent do the Ministry of Education's policy intentions regarding the New Assessment System align with science teachers' practices in respect of the Assessment for Learning approach?

I have used the analysis of the first and second research questions as the basis of the analysis related to this fourth question, as it concerns the extent of the alignment between the MOE's policy intentions regarding NAS, which emerged from the answers to the first question, and the actual practices of science teachers, which were the subject of the second question.

3.3 Research paradigm

Capra (1996, p.6) defines a paradigm as "a constellation of concepts, values, perceptions and practices shared by a community, which forms a particular vision of reality that is the basis of the way a community organizes itself", while for Huitt (2010, p.1) it is a "pattern or model of how something is structured (the parts and their interrelationships) and how the parts function (behaviour within a specific context or time dimension)". Alternatively, a paradigm is "a way of ordering and simplifying the perceptual world's stunning complexity by making certain fundamental assumptions about the nature of the individual and society. Thus, all theories, as well as the methods generated by them are, ultimately, paradigm based" (Ratcliffe, 1983, p.165). This section justifies the decision to adopt the interpretative paradigm in this qualitative study.

According to Stake (1995) and Yin (2017), qualitative research investigates human lives in their real context and relies on their understanding, focusing on personal experience in certain situations. Merriam (2002) agrees that researchers who take a qualitative approach are interested in what people have done based on their experiences, so they look for a rich product that leads them to understand the phenomenon being investigated from the perspective of the participants themselves (Auerbach & Silverstein, 2003). Similarly, the interpretative paradigm treats the researcher as an essential internal research tool in qualitative research, where a real-world phenomenon is difficult to investigate using external instruments (Yin, 2011). Therefore, interpretive researchers employ their personal experience to draw conclusions by interviewing people, observing practices and analysing data,

then making their own interpretations (Stake, 1995). However, the participants are the experts, rather than the researcher (Merriam, 2002; Stake, 1995). Moreover, when the researcher is the main research instrument, there may be a concern of researcher bias, which represents a real challenge for interpretive researchers to prove that they remain neutral (Marshall & Rossman, 2014). In addition, the experience and interests of the researcher are expected to affect the conduct of the study, so they should stay clear of anything that could introduce personal bias into the research process (Merriam, 2002; Saldana, 2009). Accordingly, Saldana (2009) suggests that the researcher should monitor and record what they personally think and feel in all research processes, to help them to distinguish their biases (Ary et al., 2006; Auerbach & Silverstein, 2003).

Equally importantly, Richards (2014) argues that the researcher's understanding of their own research paradigm is very important in helping them to minimize the risk of failure in the subsequent stages of the research with respect to methodology. Accordingly, as this study investigates how science teachers enact a national initiative (NAS) that focuses on AFL in science education, seeking to shed light on the influence of contextual factors on their classroom practices, I believe that interpretivism is the most appropriate paradigm. In other words, certain features of this approach make it the best choice as the underlying research paradigm for this study.

First, according to the theoretical principles of interpretivism, theories are driven from the site of study where opinions, views and judgments can be gained. In other words, the theory follows the research, as the researcher responds to research questions by observing participants and collecting data, following which theories are induced from that data (Cohen et al., 2013). Thus, the emphasis is on "induction, discovery, exploration, theory/hypothesis generation, the researcher as the primary instrument of data collection and qualitative analysis" (Johnson & Onwuegbuzie, 2004, p.18). Interpretive research describes and interprets actions and behaviours, which is an ideal approach to investigating the extent of compatibility and differences between teachers' understanding of NAS policy intentions and their practices (Bassey, 1999). It is also suitable for dealing with situations subject to change and

behaviours affected by circumstances, such as when practitioners' beliefs and practices vary in response to developing trends in educational reform. Another significant point is that this approach helps to examine conditions from the perspective of the participants, rather than of the researcher, which can be more objective. Moreover, interpretive research cannot be separated by the researcher from the context, as well as the respondents being the only source of information. Thus, many reliable results can be obtained as a result of the cooperation and interaction between researcher and respondents (Al-Lamki, 2009; Bryman, 2012). Overall, this model provided me with a strong opportunity to work with people in their natural situations in order to build and develop relationships with the participants by using various data collection methods to explore the phenomenon of interest. This in turn enhanced my understanding of the reasons for their practices and enhanced my research skills.

Having established the philosophical grounding of the study, the next section turns to the practical methodology employed.

3.4 Data collection methods

In order to achieve the aims set out in Section 3.2, this study employs a suite of methods, namely document analysis, classroom observations and semi-structured interviews. The use of three different methods and data sources reinforce the robustness of the findings (Yin, 2014). Indeed, it is characteristic of interpretive research to adopt a variety of data collection methods to improve accuracy, in-depth realization and understanding (Denzin & Lincoln, 2011).

A further benefit of using several different data collection methods in this study was that this suited its policy-related nature. For example, analysing documents in order to discover the policy intentions behind NAS would reveal the extent of conformity or inconsistency with the results of observations and interviews, both with decision makers themselves and with practitioners (Briggs et al., 2012). Thus, this variety of methods has provided multiple perspectives on the research questions. Furthermore, the participants were chosen from seven different key stakeholder classes, with somewhat similar

questions being asked, thus providing a range of different views on the same themes and so enriching the narrative (Briggs et al., 2012).

An equally important consideration was that if the data collection methods were imprecise and uncontrolled, the study would not be satisfactory or adequate. Therefore, I did my best to develop them and conduct them in a controlled manner (Cohen et al., 2013). Eventually, I decided to interview each policymaker, school principal and departmental head once only, while the observations and post-observation interviews were conducted twice for each science teacher, which enabled the observations to cover more than one classroom situation, with different topics. The fieldwork took place in Oman over a period of six months, from November 2016 to May 2017. The Arabic language was used in interviews and in taking notes of observations, as this was the first language of all of the participants and is the language of science teaching in Omani public schools.

The following subsections detail successively the use of document analysis, observation and interviews.

3.4.1 Document analysis

Merriam (1988) describes documents as providing raw data which are not in any particular form and are not collected through observations or interviews. Documentary data support the research in terms of analysis, interpretation and the drawing of conclusions. There are many types of documents, such as syllabuses, schemes of work, lesson plans and worksheets, whose analysis can answer some questions which cannot be answered using other techniques (Hammersley & Atkinson, 2007). I have used document analysis in parallel with the data gained from the observations and interviews in order to address research questions 1 and 4 (Section 3.2).

In addition to official government documents, the written material examined includes related documents such as ministerial decrees, general documents on students' learning assessment, assessment documents for science, syllabuses, schemes of work, lesson plans and recommendation reports. Together, these have furnished evidence of the intentions underlying the NAS

policy, preparations for its implementation and resources allocated for enactment, as well as furthering my understanding of the context.

3.4.2 Observation

Merriam (2002, p.13) describes observation as “a first-hand encounter with the phenomenon”. In other words, it involves viewing a phenomenon in its context and carefully capturing its important aspects, to provide a body of authentic data (Cohen et al., 2018). In the context of education, Borg (2015) states that observation has the great advantage of providing detailed evidence of teachers’ practices in the classroom. More generally, Patton (1990) asserts that the data which are obtained from observation are useful for researchers to understand a particular situation; as a tool for collecting data directly by watching and listening to participants, it is better than other tools and techniques at avoiding false results. Gebhard and Oprandy (1999) cite the depiction of classroom observation as the “non-judgmental description of classroom events that can be analysed and given interpretation” (Williams & Burden, 1997, p.35). However, observation has two major disadvantages. The first is the reactivity effect, whereby participants are affected by the presence of the observer, and the second is that this tool is rather time consuming, although this can be avoided by implementing a highly controlled schedule (Zeedyk & Kelly, 2003).

Two common types of observation can be distinguished: participant observation, which allows for the flexible design of qualitative research, and structured observation, which is particularly suited to quantitative research (Robson, 2011). I sought a degree of flexibility in the design of the observational aspect of this study, so that I could gather copious data without limiting myself to a narrow domain, but I also adopted an observation schedule in order to make the process well organized (Appendix A).

An important contribution of observations to this study was their value in improving the quality of the interviews when teachers talked about their practice. In detail, I used observations to discover how science teachers enact NAS as AFL through their practices in the classroom. Therefore, the purpose of the observations was not to evaluate the teaching, but rather to examine

teachers' practices in real classroom situations regarding the use of NAS as AFL in science at Grades 5 to 10.

As recommended by authors including Creswell (2013) and Miles et al. (1994), I took notes during the observations, which enabled me to describe teachers' practices in real situations with a focus on the use of NAS as AFL. Finally, the observations were conducted twice for each of the nine participating science teachers, which allowed observations in more than one classroom situation, with different themes. This also helped the teachers to become familiar with the researcher and more trusting of him, which provided more of an opportunity to explore the enactment of NAS during the lessons in further detail. Finally, I was able to conduct all 18 observations, although many of them were postponed several times because they coincided with examination days, because a teacher was absent or because the teacher preferred a different date.

3.4.3 Semi-structured interviews

Cannell and Kahn (1968, p.527) define an interview as "a two-person conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information". This is seen as a way for participants to express their views and discuss their own interpretations of the situation or context (Cohen et al., 2018). The interview method is described by Gill et al. (2008) as a way of gathering accurate data to derive a deep understanding of educational phenomena. Thus, interviews are valuable for obtaining the detailed story of a participant's experience by exploring a certain theme in depth, revealing the beliefs of individuals on an issue, such as teachers' beliefs about the role of NAS in improving learning.

Interviews can be categorized structurally as either "fully structured, semi-structured or unstructured" (Robson, 2011, p.270). In semi-structured interviews, which are commonly used in interpretive research, the researcher follows a guide in the form of an agenda of the themes to be covered, but does not necessarily do so rigidly, in order to allow the interview to flow more naturally, asking unplanned questions in order to maintain the broad direction of the interview (Thomas, 2013). Such an interview can be seen as "a

participative activity between the interviewer and the interviewee to generate knowledge" (Shah, 2004, p.552).

Based on the features of interviews in general and semi-structured interviews in particular, I was motivated to use them to address the research questions, especially since my aim was to investigate how participants understood the NAS policy intentions and enacted them. To this end, I developed separate interview schedules, reproduced in Appendices B and C respectively, for the policymakers, and for the school staff members (practitioners).

All of the interviews were conducted face to face, but the settings and conditions differed considerably. Some were held in a quiet place, some in a room with a telephone, where a phone call sometimes caused an interruption, and some in places with no privacy, as many people would enter the room without warning. It can be deduced that while these were all face-to-face semi-structured interviews, the widely differing conditions may have affected their accuracy, quality and flow. Finally, the interview data contributed to several functions of this study, such as identifying and understanding the MOE's NAS policy intentions, obtaining science teachers' perceptions of these intentions and the enactment of NAS, and exploring the factors influencing their practices during NAS enactment.

3.5 Sampling

The targeted population represents the group of people from whom a researcher is concerned with gathering data in order to draw conclusions and answer the study questions. This population comprises all cases in a general sense; for example, all science teachers in Omani schools (Cohen et al., 2013). On the other hand, most research procedures make it difficult to deal with the whole population, for reasons including time, cost, official permission and the logistics of accessing all members of the population. In this case it is more appropriate to employ sampling, choosing a sample which can be taken to represent the population if it is codified in a systematic way (Cohen et al., 2018; Robson, 2011).

Accordingly, this study used purposive sampling, where cases are selected to participate in the study based on their typicality (Cohen et al., 2018). This

strategy is a suitable option in qualitative research due to the low number of participants. Moreover, it allows in-depth exploration of the topic of the study (Teddlie & Yu, 2007). In the present study, rich data were obtained from policymakers on the MOE's intentions regarding NAS and from practitioners on the enactment of the policy in schools, despite the small numbers of participants.

The sample consisted of two distinct groups, the first being policymakers from MOE headquarters, representing each department concerned with developing NAS policy and following up its enactment. The second group consisted of practitioners from three public Basic Education schools in the Muscat Governorate. As this was not case study research, I decided that the sample would include a set of practitioners working in different contexts, in terms of geography, setting and gender. The schools were therefore selected to include urban and rural settings, mountains, plains and coastal areas, differing availability of facilities and resources, and a range of class sizes. Because of the possibility that the gender of staff and students might affect the results, one of the three schools was all male, one all female and the other a mixed-gender school. By choosing the three schools carefully I was able to cover all of these variables, which provided a better and more comprehensive view and diverse interpretations of participants' practices and experiences.

Having identified the MOE departments and the three schools whose staff would be invited to participate in the study, I contacted the director of each MOE department and sent them the project information sheet in order to discuss which of the specialists might have the desire and interest to participate, and thus consent to do so. I then contacted the principals of the three schools with a similar request. Once the potential participants had been identified, I contacted them individually by telephone in order to discuss the project in more detail and to set a timetable for the fieldwork. Each one was sent an information sheet and consent form by email and if they did not reply within three days, a second attempt was made. If they still had not replied after a further week, I looked for an alternative participant to take their place (Appendices D and E). In spite of some unanswered calls and emails, and apologies from many MOE specialists and school staff members, declining to

participate, I was eventually able to recruit the intended number of participants. The following subsections give details of the participants selected.

3.5.1 Participants from MOE headquarters (policymakers)

Policymakers are individuals who are responsible for, or involved in, creating ideas, plans and policies (Cambridge Dictionary, 2019). The educational policymakers participating in this study were at four levels: an assessment consultant and three specialists from each of the science assessment, science curriculum and science supervision departments. I conducted interviews with members of these four different classes of policymakers concerned with NAS on the assumption that different people in different contexts would have different perspectives on the same thing. As to the number of respondents, this was determined by the purposive sampling principle, which is to follow "the researcher's judgment as to typicality or interest" (Robson, 2011, p.275). The composition of the sample of policymakers interviewed for the study (Table 3.1) was based on the organizational structure of the Ministry of Education (Figure 3.1).

Table 3.1: Participants from MOE headquarters (policymakers)

Data collection method	**Participants**	**Notes**
Interviews	1 assessment consultant	One interview each, with audio recording and written notes
	3 science curriculum specialists (qualified experts)	
	3 science assessment specialists (qualified experts)	
	3 science supervision specialists (qualified experts)	
Totals	10 participants, 10 interviews	

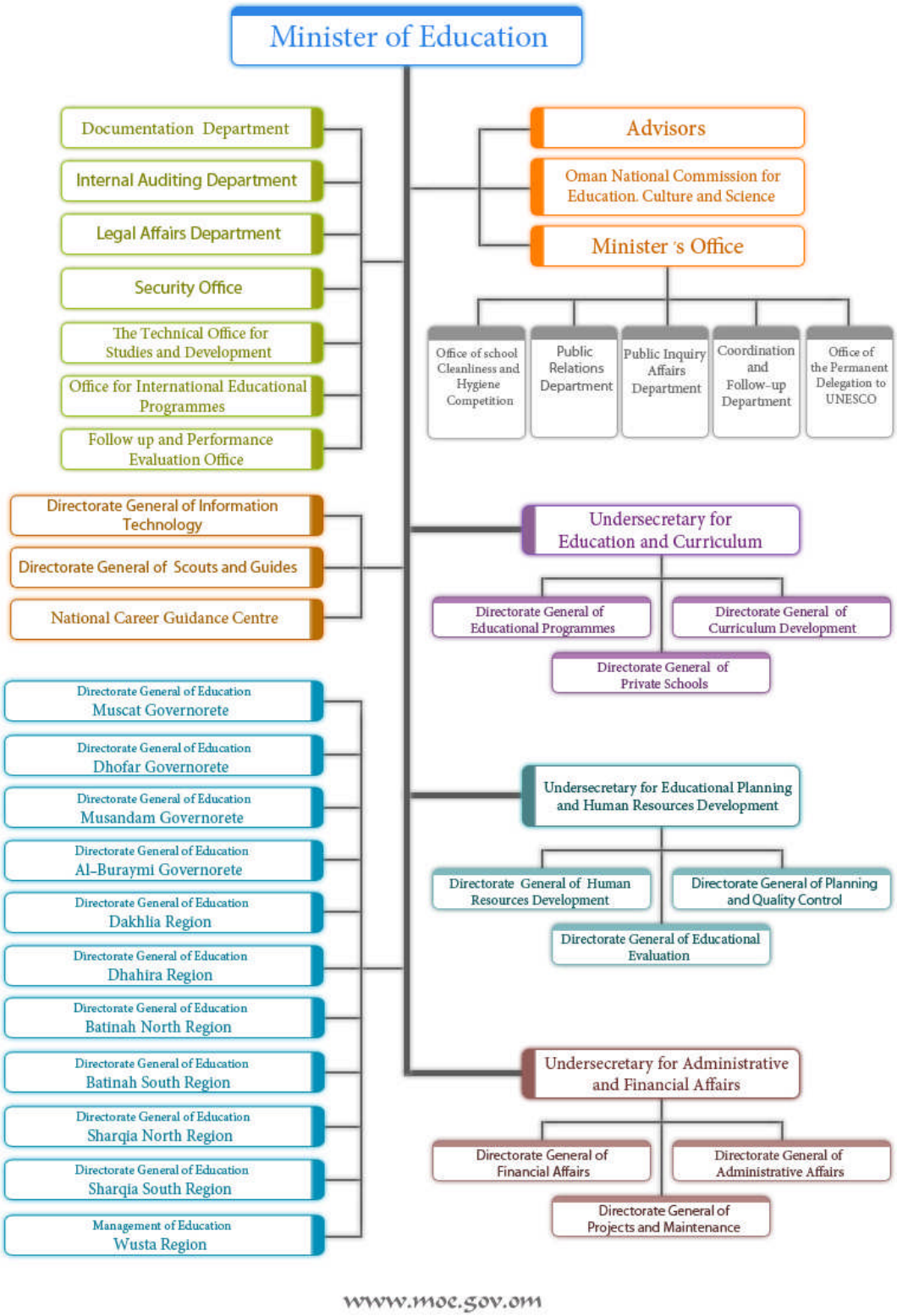


Figure 3.1: Organizational structure of the Omani Ministry of Education

3.5.2 Participants from schools (practitioners)

The sample of practitioners consisted of science teachers, heads of science departments and school principals, all working in public schools in the Muscat Governorate. The principal reasons for choosing this governorate were that it is where I live and that it is close to the headquarters of the MOE, where the policymakers were to be interviewed. Familiarity with the schools' locations helped me to select the sample of schools, as well as enabling me to simplify procedures for completing arrangements for data collection, which saved considerable effort, time and money.

Additional benefits of Muscat as the setting of the study include its mix of towns, villages, mountains, coastal areas and plains. Similarly, its population is drawn widely from the other governorates of Oman, as it is the political and commercial capital of the country, where a considerable number of families from elsewhere have settled. It can be taken as broadly representative of the whole country in that its schools have the same facilities as those in other governorates in terms of laboratories and equipment, while its teachers have undergone more or less the same training programmes and are subject to the same curriculum content and assessment system.

Accordingly, I collected data in each of the three schools from the principal, the head of the science department and three in-service science teachers of Grades 5 to 10. These participants were selected for their diversity of teaching experience, ranging from novices who had been assessed through NAS when at school themselves, to those with two to eight years of service, having started teaching after the graduation of the first BE cohort, and some with more than 19 years' experience, who had started teaching before the introduction of NAS (Table 3.2). This diversity of experience helped to ensure that a wide variety of views were expressed, making exploration of the study topic more comprehensive. Finally, while the purposive method of determining the sample may be seen as failing to ensure that it was scientifically representative or typical, compared with the random selection of nine teachers, three heads of department and three principals, I feel confident about this choice, as the participants belonged to the various contexts.

Table 3.2: Participants from schools (Practitioners)

Data collection methods	**Participants**	**Notes**
Interviews	3 school principals	One interview each, with audio recording and written notes
	3 heads of science departments	
Observations	9 science teachers	Twice each, with written notes
Post-observation interviews		Twice each, with audio recording and written notes
Totals	15 participants, 18 observations and 24 interviews	

3.6 Ethical considerations

Ethics in the context of research means respecting others and their privacy while conducting the research (Thomas, 2013a). Although ethical considerations need to be taken into account in all research, this varies from one piece of research to another and depends on the purpose of the research and the types of participants. Universities, including the University of Leeds, require their students to consider these factors in order to minimize as much as possible any risks arising from participation in the research (Creswell, 2013). Accordingly, before I started to collect data, I obtained the ethical approval of the University of Leeds Ethical Committee to conduct this research (AREA 16-025, Appendix F).

The next step was gaining access to the locations where the data were to be collected. This meant complying with the regulations of the Ministry of Education in Oman, which required me to obtain approval from the MOE's Technical Office for Development and Studies (TOSD). Therefore, in order to obtain authorization to conduct my study, before starting the fieldwork, I arranged for a brief account of the research topic to be sent to the TOSD with a cover letter (Appendix G).

In order for potential participants to understand the purpose and conduct of the research before deciding whether or not to participate and to grant me access, I designed a participant information sheet which gave details of the project including the study's aim, the methods of data collection and

management, the expected risks of participation and my contact details. This sheet also mentioned that the interviews would be audio-recorded and included information about the right of participants to withdraw from the research without prejudice. I sent a copy at least a week before my visit to each participant, which motivated some to ask questions before informing me whether or not they wished to participate. Then, before conducting each observation or interview, I provided participants with the project information sheet and consent form to review and sign in the case that they agreed to my presence. Similarly, a letter was sent through the school secretary to the parents of the students involved, including information about the project and a consent form, although my intention was not to monitor their children but to observe the teachers' practices when teaching them (Appendices H and I). I also explained to the students what would happen during the observation. In conclusion, all participants took part in this study voluntarily, of their own free will.

Two methods were used to protect the privacy and confidentiality of the participants: their identities were disguised by the use of pseudonyms and any confidential information shared with them was fully protected (Cohen et al., 2018; Denscombe, 2002). In detail, the schools are identified only by the gender of their students, while the pseudonyms assigned to the participants are shown in Table 3.3.

Finally, in respect to data protection, the procedures set out by the University of Leeds were followed with regard to the storage and encryption of data using encrypted files and passwords. I then moved these files to the encrypted folder on the database on the University of Leeds servers (known as the M: drive). Finally, I stored related files, printed materials and documents in my locked drawers, located in the research student study room.

Table 3.3: Participants' pseudonyms

Place of data collection	Participants	Pseudonyms
MOE Headquarters	Assessment consultant	Leader
	Assessment specialists	A.Moussa
		A.Shahab
		A.Shiny
	Curriculum specialists	C.Baker
		C.Sabah
		C.Hassan
	Supervision specialists	S.Sinan
		S.Waleed
		S.Moshrifa
School (Male)	Principal	PA
	Head of department	HA
	Teachers	T1Hussain
		T1Tarik
		T1Hilal
School (Female)	Principal	PB
	Head of department	HB
	Teachers	T2Lama
		T2Seama
		T2Pearl
School (Mixed)	Principal	PC
	Head of department	HC
	Teacher	T3Maryam
	Teacher	T3Aisha
	Teacher	T3Mohamed

3.7 Pilot study

A pilot study was conducted from the 14th to 25th August 2016 at the headquarters of the Omani MOE and at a Grade 5 to 10 public school in the Muscat Governorate. In detail, responding to the official letter provided by the University of Leeds and addressed to the TOSD, I received authorization from the latter to conduct this study. A message was sent to the Directorate General of Educational Evaluation, the Department of Educational Supervision and the

Directorate General of Muscat Governorate, where the pilot study was to be conducted, to inform them about my visit.

I first visited the MOE's headquarters, specifically to see the Directorate General of Educational Evaluation and the Department of Educational Supervision. I explained to the directors of these departments the details of my research and the purpose of my visit. In response, they identified two members of their staff for me to interview: a science assessment specialist and a specialist in the supervision of science teachers. I had a meeting with these experts to explain the details of my visit, to obtain their consent to participate and to agree a time for my actual pilot visit. Once they had agreed to participate and signed the consent form, the two interviews were scheduled, then conducted.

At the same time, I contacted the Head Office of the Directorate General of Education in the Muscat Governorate to seek permission to carry out the pilot study and to coordinate with them on this issue, with the result that a school was identified for the study to take place. A message was sent to the school administration to inform them about my visit and I then had a meeting with the principal to explain the aim of my visit, after which I agreed dates with two science teachers to conduct observations and post-observation interviews, after they had signed the consent form. The first participant had eight years of teaching experience and the second twenty-two. Following communication via the school administration, the parents concerned gave their consent to the pilot study. All individuals who participated did so voluntarily and of their own free will.

I drew several lessons and obtained a number of benefits from the pilot study. First, I learned that a clear knowledge of a study's aims motivates participants to welcome the researcher and cooperate with him. Therefore, the first step in fieldwork is to explain the study in detail. I also gained information and experience about the administrative procedures needed to apply the data collection methods, such as the necessity to contact the school administration early to prepare a quiet place to conduct interviews. I learned to be patient and flexible during the fieldwork, because it will sometimes happen that despite having agreed to appointments, a participant is absent, decides no

longer to participate or asks to postpone an observation or interview, requiring the repeated modification of the fieldwork schedule. In addition, I became aware of the need to familiarize myself with the digital audio recorder and to test it before using it in an interview. At the same time, I found that using this device during interviews was convenient, so that after a very short period of time it felt normal and the interviewee no longer paid particular attention to it. The pilot also gave me an initial estimate of how long each observation and interview would take, which was approximately 30 to 35 minutes and 35 to 40 minutes respectively, and I discovered that transcribing each interview required approximately three to four hours of typing.

Finally, with particular relevance to the content of the main study, the pilot study made me aware of some points and themes which needed to be observed and discussed during the interviews, resulting in a few adjustments to the observation schedules and interview guides. These additions included details regarding TIMSS, the Global Chains of Science Curriculum and assessment tool standards.

3.8 Fieldwork challenges

Fieldwork is usually associated with several variables, including those related to the circumstances of the participants, the period during which data are collected and the environment of the data collection site, which may sometimes be outside the scope of the researcher's expectations (Dearnley, 2005; Nicholl, 2010; Rimando et al., 2015). This section summarizes the challenges that I encountered during the fieldwork.

I arrived in Oman from the United Kingdom on Saturday 12th November 2016 and on the following day I visited the TOSD offices at MOE headquarters to seek permission to begin data collection. I was asked to provide copies of my transfer report, interview and observation schedule, and a supporting letter from the university, despite having previously sent all of this information from the UK two weeks earlier. Three weeks later, on 4th December 2016, I received permission to begin the fieldwork. TOSD staff sent a message to the departments and schools that I was visiting, to implement my fieldwork tools. It is possible that it would have taken more time to receive these permissions

if the staff there were not known to me and did not already trust me, as an employee of the MOE for over 20 years. Apparently, the administrative procedures are dominated by a heavy bureaucracy which causes delays in processing applications, despite the availability of an electronic message system that connects MOE headquarters with governorates and schools. A further potential reason for delay is the allocation to each employee of a quota of work, none of which is assigned to another person to cover leave, for example. This may explain why it took five weeks for my application to be granted from the time of the initial despatch of documents. This rather long period of time affected the progress of the fieldwork plan.

However, I was able to make use of the time from 13th November to 4th December 2016 to visit the Statistics Department of the MOE to obtain the information I needed to select the three schools to be involved in the study, as well as the participants from MOE headquarters. Thus, I prepared the first draft of participant selection and drove to the selected schools to familiarize myself with their locations. During this period I also printed out copies of the observation schedule, interviews, information sheets and consents as needed. Finally, I visited the Sultan Qaboos University Library and became a member, giving me access to its facilities so that I could work and organize the study data.

Among the challenges that I faced during the actual collection of data were delays to my schedule. For instance, I started fieldwork in the first school on 5th December 2016 and planned to finish on 5th January 2017, but I had to stop early because students took unofficial absence from school as of 28th December to prepare for the end-of-term one examinations beginning on 9th January. This delayed resumption of the fieldwork in schools until the beginning of the second term on 12th February 2017 and obliged me to modify the fieldwork plan. Meanwhile, on 6th January 2017, I visited the departments of supervision, curriculum and assessment in order to make the necessary arrangements to interview MOE personnel and found that the curriculum specialists were busy with the Global Chains of Science Curriculum project (aiming to adapt international science curriculum chains for Omani schools), while the supervision and assessment specialists were engaged in following

up the implementation of the end-of-term exams and carrying out moderation for the Grade 12 results. The outcome was that I was able to complete only one interview with one of the supervision specialists.

Additional challenges included the unplanned absence of some adult participants, requiring me to reschedule the observation and interview times, while others unexpectedly withdrew their consent to participate in the study, so I had to recruit new participants from my reserve list, which again delayed the original plan. A further difficulty that I often faced was the lack of a quiet and appropriate space for conducting interviews, although I had arranged in advance with the three school administrations that they would provide a room that met this purpose. As a result, I moved from time to time between different school facilities to find a suitable place, which caused some delays. There were also two factors external to the education system itself: the fieldwork plan was delayed by another week due to heavy rains that caused the early departure of staff from the MOE headquarters and schools, as well as by the formal visit of two Arab rulers to Oman, when staff were asked to leave work early in order to clear the main roads in preparation for the passing of the procession.

In conclusion, despite my familiarity with the research context, I faced a number of challenges requiring me to make many decisions during the actual conduct of the research.

3.9 Data analysis

Based on the decision to use the interpretative approach in this study, it was up to the researcher's consideration to identify the appropriate data analysis method, according to the research purposes and the nature and amount of data (Cohen et al., 2018; Creswell, 2013; Richards, 2014; Tesch, 1990; Thomas, 2013a). Holliday (2016) and Lichtman (2012) explain that the progression of research is not linear, but each stage influences the other, so I chose the circular model of data analysis. Accordingly, there was no need to wait to finish a certain process to move to the next, such as there being no need to complete all of the data collection before starting the analysis; instead, I initiated analysis of the data while continuing the collection stage, so that

participants' input could be used as feedback on which to base the development of subsequent rounds of data collection. In other words, I took an iterative approach to the analysis (Creswell & Poth, 2016; Knight, 2001; Schutt, 2018). Moreover, I kept the research aim in mind during the data analysis stage in order to avoid any ready-made judgments or preconceptions that could have influenced my interpretation of the data; in other words, I took an inductive approach, allowing the data to lead the analytical process (Patton, 1990).

There are several thematic analysis models, such as those proposed by Braun and Clarke (2006), Creswell (2013), Lichtman (2012) and Vaismoradi et al. (2013), which are very similar. Therefore, I decided to adapt them to create a model consisting of five steps, illustrated in Figure 3.2. I did this by examining the description of each step or phase in each model, then merging some steps and splitting others. These steps, explained in successive subsections, are: preparing and organizing the data, exploring and coding, forming and reviewing themes, interpreting and reporting the findings, and ensuring the trustworthiness and accuracy of the findings.

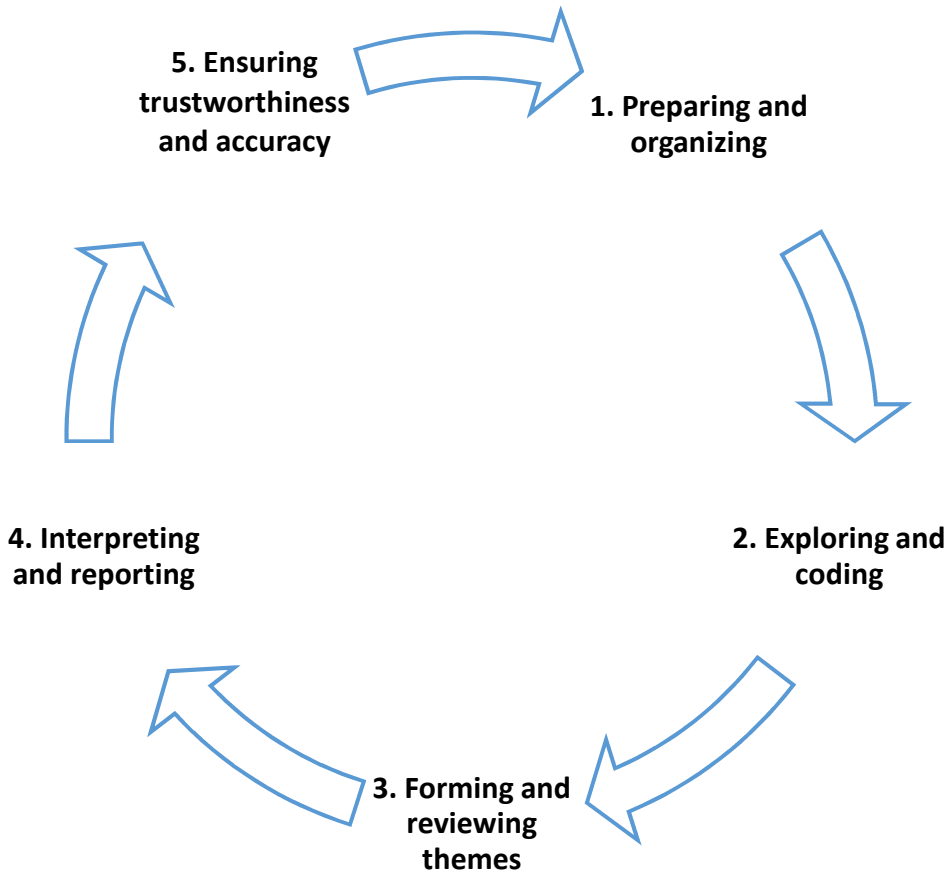


Figure 3.2: Process of data analysis

Adapted from Braun and Clarke (2006); Creswell (2013); Lichtman (2012); Vaismoradi et al. (2013).

3.9.1 Preparing and organizing

I commenced analysis by uploading the interview data from audio recordings to the NVivo software, as well as the written notes and reflections on both interviews and observations, in order that when data collection was complete, they would be organized in one place. These data were organized in separate folders for each type of participant. All of the audio recordings were then transcribed. This process allowed me to obtain general knowledge and a keen sense of the data, as well as becoming familiar with them, which in turn supported me later at the coding stage.

Following the recommendation of Wolcott (1994, p.10) to let the data “speak for themselves”, the interviews were recorded with a small digital voice recorder, then later uploaded onto my university account (M: drive) in order to

import them into the NVivo program. This allowed me to control the listening speed and playback easily, as well as providing time spans for each part of the interview to facilitate the return to each clip separately. I listened to all interviews and transcribed them through NVivo, which took three to four hours per interview. In detail, 34 interviews were transcribed in Arabic, word by word, and the analysis was taken from the participants' original words, without modification. Figure 3.3 illustrates an example of transcription in NVivo.

Figure 3.3: An example of transcription in NVivo

3.9.2 Exploring and coding

The coding of data is considered one of the significant steps in facilitating their smooth handling and straightforward access (Kvale & Brinkmann, 2009; Plas & Kvale, 1996; Richards, 2014). In other words, data coding is a process that mediates between data collection and analysis (Saldaña, 2015), helping the researcher to reflect on the data and to develop insights regarding the research questions, related ideas and themes (Thomas, 2013b). This also works to direct the researcher's attention towards identifying all of the relevant details of the participants' responses, deepening the understanding of the study topic (Rubin & Rubin, 2011). Therefore, it is crucial to consider the context of the participants. Accordingly, in this study a thematic analysis was performed on documents and interview transcripts, using the NVivo11

software (Bazeley & Jackson, 2013). I followed Lichtman's (2012) three Cs coding model, whose successive steps are labelled codes, categories and concepts (Figure 3.4).

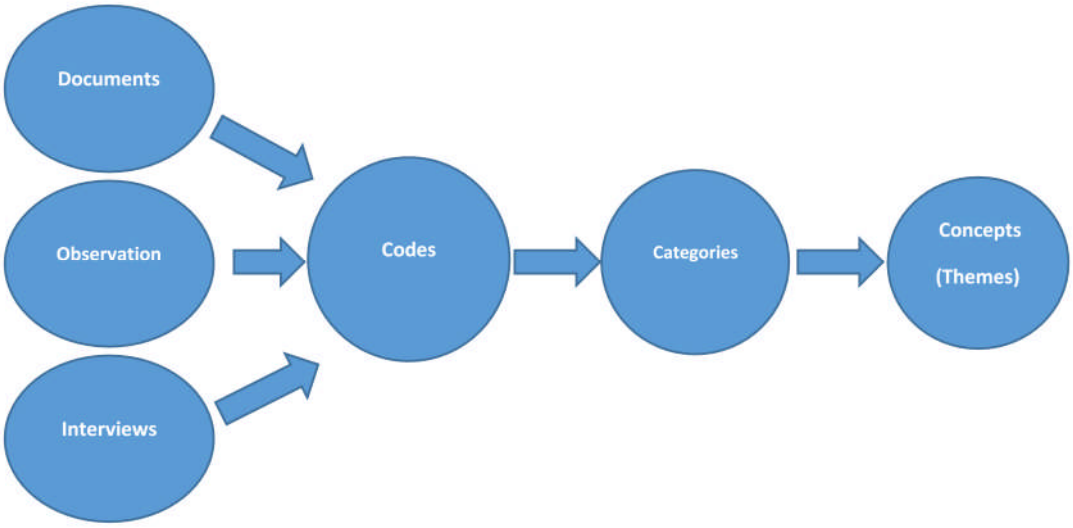


Figure 3.4: Lichtman's (2012) 3 Cs Coding Model

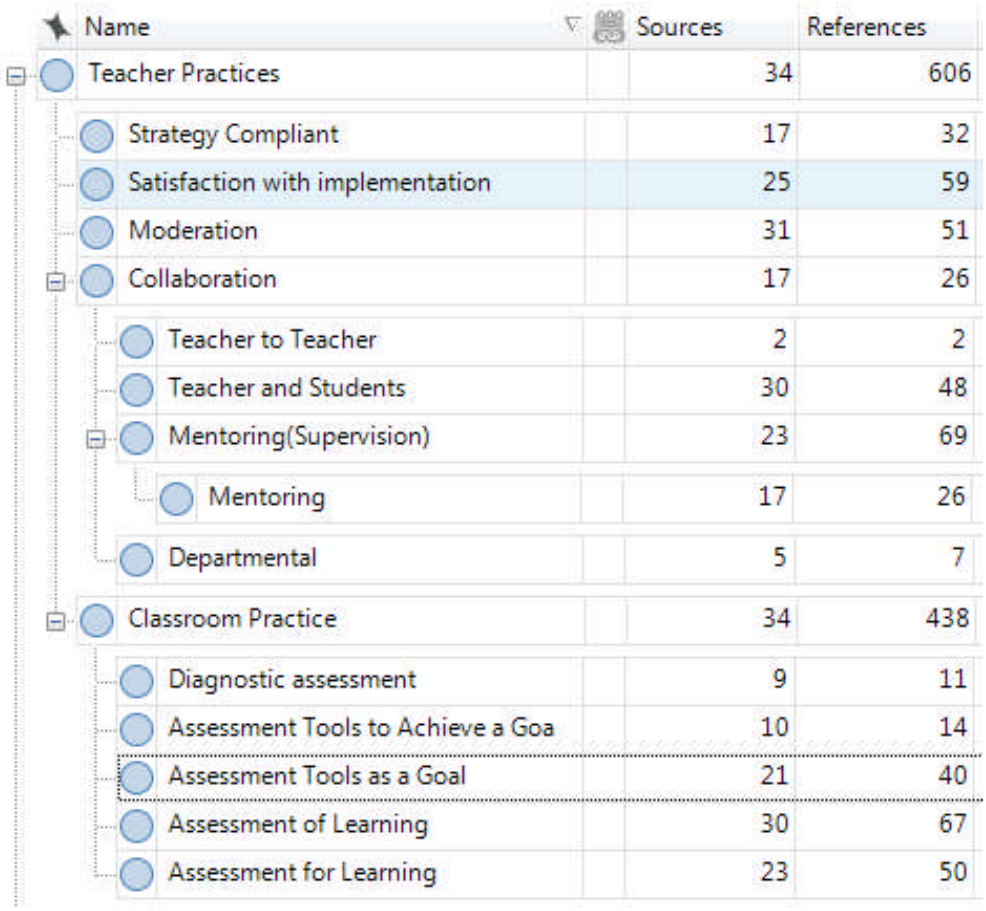
First, I decided that the basic unit of analysis would be the sentence, as the teachers typically spoke naturally in the interviews without restriction. Thus, they sometimes expressed more than one idea in a sentence, while at others times they used several sentences to express a single idea. Based on this unit of analysis, the data were divided into codes, which later evolved into categories, then into wider concepts or themes. Before undertaking the full analysis, I conducted several trials with the first set of data, which gave me more knowledge about the data, strengthened my confidence and improved my practice in this regard (Braun & Clarke, 2006; Mason, 2002).

Based on the four research questions, I carried out the analysis in four stages. In other words, I addressed all of the issues related to each question individually, which included reviewing and coding the data, then refining the codes into categories and subsequently into themes, and so on. This iterative coding approach naturally took a considerable time, but it ensured that the data were well organized at the level of each question. It also gave me valuable experience in coding, making me more familiar with the data, which

in turn improved my reflections about them over time and thus enhanced the quality of the codes.

3.9.3 Forming and reviewing themes

Once I had completed the initial coding step for all of the data, I started reviewing these initial codes, noticing some repeats and overlaps that led me to classify similar ones under the same category. For example, the codes ‘Diagnostic assessment’, ‘Assessment for learning’, ‘Assessment of learning’, ‘Continuous assessment’, ‘Formative assessment’ and ‘Summative assessment’ were put under a new category named ‘Assessment purposes’. Later, I grouped the merged categories under broader themes, such as ‘Policy development (intentions)’. Finally, three broader themes were identified for this study data, named ‘NAS policy intentions’, ‘Perspectives on NAS policy intentions’ and ‘Perspectives on NAS policy enactment’. Keeping in mind that codes, categories and themes were not assigned according to how often they appeared in the data, but rather to their relation to the research questions (Braun & Clarke, 2006), some were based on ideas expressed by relatively few participants, but were nevertheless listed under study themes as crucial points. Figure 3.5 shows a sample of the theme-formation stage in NVivo. It is also important to note that the data analysis procedure did not follow an existing framework, but did take into account the specificity of the context. Therefore, the framework emerged from the data themselves, which drove the process of analysis.



Name	Sources	References
Teacher Practices	34	606
Strategy Compliant	17	32
Satisfaction with implementation	25	59
Moderation	31	51
Collaboration	17	26
Teacher to Teacher	2	2
Teacher and Students	30	48
Mentoring(Supervision)	23	69
Mentoring	17	26
Departmental	5	7
Classroom Practice	34	438
Diagnostic assessment	9	11
Assessment Tools to Achieve a Goa	10	14
Assessment Tools as a Goal	21	40
Assessment of Learning	30	67
Assessment for Learning	23	50

Figure 3.5: Example of the theme-forming stage in NVivo

In the case of the second and third research questions, all of the post-observation interviews were analysed and divided into codes, categories and themes, while in the case of the first research question, document analysis was conducted in addition to interview analysis by the same mechanism as for the second and third questions. The approach to dealing with the data related to the first question was based on using the policymakers' perspectives to define the themes, as well as considering to what extent they aligned or contrasted with what was stated in the documents. The analysis of the first and second research questions was then used as the basis of the analysis related to the fourth question, as it concerned the extent of the alignment between the MOE's policy intentions regarding NAS, which emerged from the answers to the first question, and the actual practices of science teachers, which were the subject of the second question.

Later, I used NVivo to organize the data by aggregating everything relating to each of the three themes individually. I then imported the data into an Excel

worksheet, where each theme was placed horizontally and the data were placed in front of it, which helped with the ease and flexibility of handling. This enabled me to reread the data more clearly and in an organized form, thus determining the overlaps between issues and prevailing ideas. Consequently, I renamed some themes and made other improvements, modifications and refinements.

3.9.4 Interpreting and reporting findings

The fourth stage involved interpreting the data and writing up the analysis. The first draft of the findings report presented the points identified in the data in narrative form (Clandinin & Connelly, 2000; Riessman, 2008). Before and during the writing process, I sought to make sense of the data and interpret them for the purpose of organizing them within chapters. Throughout this stage, earlier drafts of the findings were revisited several times and quotations were added, modified or cut, in order to incorporate the crucial elements that supported the broader themes. This led to the restructuring of the findings chapters and the process of revision and modification continued up to the writing of the discussion (Chapter 6).

The reporting of the study findings mirrors the aim of the study, which is to understand how science teachers enact a national initiative (NAS) that focuses on AFL in science education. The data are presented in two separate chapters: Chapter 4 concerns NAS policy intentions regarding purpose, enactment and accountability, which were identified by analysing documents and interviews with policymakers, while Chapter 5 presents the findings derived from post-observation interviews with practitioners, concerning their perspectives on NAS policy intentions and enactment, their actual enactment of NAS policy and the factors influencing these practices. All of these key issues are analysed with evidence from the data.

Translation was an important consideration in this study, as most of the documents analysed were written in Arabic, which was also the language of the interviews. I therefore translated the quotations selected for inclusion in the report into English. I did my best to provide accurate translations which would clearly convey the meaning to the reader, despite that fact that a translator is often unable to find exactly equivalent words, relying on

experience to produce an acceptable rendering (Xian, 2008). It is also crucial to take into account the transparency of translation as a factor affecting the quality of research (Wong & Poon, 2010).

I encountered many challenges, as literal translation is often inappropriate, conveying an unintended meaning. Seemingly, not all literally identical concepts have the same meaning, which made me move away from assuming similarity in meaning in order to avoid misleading the reader (Pena, 2007; Shah, 2004). Accordingly, I strove to find functional translations of the main concepts and quotations, and discussed them with four colleagues from Arab countries, one of whom was a PhD student in translation, two were PhD students in education and the other an MA student in TESOL. I thereby followed the advice of Douglas and Craig (2007) that in order to have an effective translation, there must be collaboration between language specialists and cultural insiders.

On the other hand, I did not rely on translators, because I believed that this might have led to some degree of interference in my freedom of interpretation, so instead I commissioned professionals to review and validate my own translations. In detail, I identified two native speakers of Arabic with good reputations as translators in Oman, especially in the field of education. I took a sample of around 25 per cent of the quotes to each translator for revising. Although they both confirmed that my translations conveyed well the original meaning, they suggested some improvements in style and grammar, such as in the use of the terms ‘implementation’ and ‘enactment’. In response, I made the suggested adjustments to the sample of quotations and considered their comments in the remaining translations. Finally, I retranslated some of the quotations that I had doubts about, then submitted them for rechecking. Finally, I am confident that the process of review contributed to the improvement of this thesis.

3.9.5 Ensuring trustworthiness and accuracy of findings

The final stage of analysis was to determine the credibility and accuracy of the study findings. As Golafshani (2003) argues, researches who follow a qualitative approach cannot assess the quality of their findings by using the concept of reliability, which relates to the replicability of the research results,

nor that of validity, which concerns suitability and accuracy of measurement. On the other hand, there are some authors, such as Lincoln and Guba (1985), who discuss criteria by which qualitative researchers can validate their research findings. In other words, they pay more attention to the concept of the trustworthiness of the study's findings, assessed by four criteria: credibility, transferability, dependability and confirmability. In this regard, trustworthiness relates to the extent to which the results of the research correspond to reality (Merriam, 2009). However, Maxwell (2012, p.105) argues that "one can never really capture reality".

I addressed the criteria of Lincoln and Guba (1985) as follows. Regarding the issue of credibility or dependability, related to the recognition that contexts are constantly changing and therefore unstable, I indicated the timescale of the data collection and contextual changes throughout the duration of the research. Concerning matters of transferability and generalization, I have presented a detailed analysis of the context in which the NAS policy was enacted and the factors affecting its enactment, so as to allow others to determine whether or not they can transfer the findings to their own contexts (Bryman, 2003). Moreover, as explained earlier in this study, science teachers in the Muscat governorate have similar training backgrounds and use the same assessment system and curriculum as those in other governorates in Oman. Therefore, these findings can be taken as relevant to science teachers in Oman in general.

Furthermore, with regard to the dependability and credibility of the research from the participants' perspective, I cross-checked the data sources; for example, I identified NAS policy intentions from the relevant documents, then checked these against the interview responses of policymakers. It is also relevant here that third parties were engaged to review the translation of extracts of documents and interviews. Equally importantly, the confirmation of data by others can be seen to strengthen the trustworthiness of the research data. Therefore, my claim is supported in each theme of this research by the quotes and precise answers of the participants. The fact that the study sample included seven types of key stakeholder can also be considered useful for providing a range of different views on the same themes, constituting a form

of data confirmation. Moreover, in spite of the argument of McDonough and McDonough (1997, p.110) that “any form of observation will tend to introduce a distortion of normality”, I sought to minimize the impact of the researcher’s presence by visiting the MOE’s headquarters and the three schools that participated in the study at least twice before the actual data collection began and meeting with the participants. Conducting the interviews in Arabic, the first language of all of the participants, also ensured that they would be able to express themselves comfortably, thus maximizing the accuracy of the data, which was further enhanced by the use of a digital audio recorder. Finally, I took great care not to intervene in the interviews to express my own opinions and experience of NAS, which might have influenced the participants and their responses.

Ultimately, the response to data inevitably differs from one researcher to another, as there is no unique perspective (Holliday, 2016). Therefore, I was not convinced of the need to appoint a third party to review my thematic analysis, because this would take time and would be of little use. Instead, I followed the suggestion of Bazeley (2013) in this regard, preferring to check the accuracy of my analysis myself by reviewing each chapter of the findings and its themes, and the number and type of participants’ responses on each theme. I then checked for consistency between each section, as well as the summary of each chapter.

3.10 Summary

This chapter has detailed the research design of the study, stating the aim and research questions, explaining the choice of research paradigm, addressing ethical considerations and discussing the lessons learned from the pilot study. It has explained the approach to sampling and described the methods of data collection, which consisted of document analysis, observation and interviews. It has also discussed the fieldwork challenges and the thematic analysis, including how I have ensured the trustworthiness and accuracy of the findings. The next two chapters present an analysis of the study data.

Chapter 4
Curriculum Change: The Policy Perspective

4.1 Introduction

This chapter is dedicated to presenting the findings that relate to the first research question:

RQ1: What are the policy intentions regarding the purposes of the New Assessment System in Basic Education in Oman, its enactment in science teaching and accountability for this?

As mentioned in Chapter 3, I analysed data derived from interviews with ten policymakers, as well as the revision of official government documents and other related texts, such as ministerial decrees, general documents on students' learning assessment, assessment documents for science, syllabuses, schemes of work, lesson plans and recommendation reports. Three categories emerged from the analysis: the purposes of NAS, enactment of NAS and accountability for NAS enactment, which I grouped into a broader theme, namely NAS policy intentions.

First of all, there appears to be a strong relationship between the economic and education systems; therefore, the call for curriculum change initially emerged as part of the policymakers' intentions under the common Vision for Oman's Economic Future 2020, in which the MOE participated. Furthermore, although the Minister of Education, as a member of the Council of Ministers, is among the higher level of policymakers in Oman, it is possible that the call for curriculum change was purely externally driven or equally that it was internal, resulting from a partnership between the MOE's decision makers and stakeholders. In other words, there was basically an internal willingness to change. In a similar manner, irrespective of differences among research participants in job positions and work stations between MOE headquarters and schools, as well as in areas of specialization, the majority of them believed that the MOE had implemented the New Assessment System (NAS) as a response to pressure from higher-level policymakers, which in turn resulted from the demands of various international organizations, such as the World

Bank and UNESCO. Participants affirmed that the main goal of these international bodies was to promote the development of an education system in Oman—as a developing country—which would improve the standard of living of its citizens. On the other hand, the MOE argued that NAS implementation stemmed from a real national desire for educational development, which aligned with global trends in the development of the education system and therefore did not belong to a specific organization (MOE, 2015a). In any case, whether the motivation for change was internal or external, the key point here seems to have been the integration of roles and sharing of responsibility between all three sectors of society (the corporate or private business sector, the public or governmental sector and the public, non-governmental, not-for-profit sector) in pursuit of the goals of Vision 2020 (Ministry of National Economy, 2006).

Accordingly, as Leader3 and S.Sinan3 stated, the MOE began to conduct various studies and organize conferences, such as a study entitled *The Reform and Development of Education in Oman* (1995), which it conducted in cooperation with a Canadian educational company, a study of educational assessment in Oman, which was conducted by the Scottish Examination Board (1996), and a continuous process of discussion and discourse between policymakers and specialists in curriculum, supervision and assessment, running from 1995 to 1998, which adopted a brainstorming technique in order to develop the final draft of the policy proposal for the project and its implementation. As a result, a decision was taken in 1998/1999 to begin the implementation of so-called Basic Education (BE), with the NAS serving as the core of this change.

In line with this, three of the research participants pointed out that there were international experience protocols on which NAS implementation was based. In detail, C.Sabah4 claimed that the protocol in question was Canadian, but C.Hassan4 noted that it was Scottish, while A.Moussa4 affirmed that it was a New Zealand experience. None of the available documents issued by the MOE appears to resolve this issue, which suggests that this information may have been limited to policymakers. However, various other documents do mention all of these experiences separately, which may explain participants'

differing understandings of the basis of NAS implementation. Furthermore, the participants may have been more interested in the system's components than in international experiences, and communication between groups of stakeholders may have been imperfect, resulting in them not having a complete understanding of international protocol experiences (A.Moussa4).

Moreover, two participants, an assessment specialist (Mouss9) and a supervision specialist (S.Sinan6), stated that regardless of the experience protocols, the competencies of the 21st century from the core components of the NAS policy stressed that the implementation of this system works to provide students with these competencies, in order to be qualified for their future life.

> The learning competencies (skills, abilities and knowledge) of the 21st century are the competencies that students must possess. They are a core component in all the Ministry's projects. (A.Moussa9)
>
> This assessment system focuses not only on knowledge, but on skills such as problem-solving, collaboration and critical thinking. (S.Sinan6)

This falls in line with what the P21 organization has identified as the competencies and skills of 21st-century learning, the so-called four Cs, namely communication, collaboration, critical thinking and creativity (P21 Partnership for 21st Century Learning, 2007). In the same manner, Rotherham and Willingham (2010) emphasize that during the learning process, schools should consider these competencies. Finally, it is fair to say that there is high demand for an assessment system that can precisely measure learning competencies (Rotherham and Willingham, 2010).

In relation to the first research question of the study that relates to the policy intentions of NAS, the term 'policy intentions' in this study includes the aspects of curriculum change advocated by the MOE, enabling the education system to provide students with the skills necessary to meet the requirements of living in the 21st century (MOE, 2003).

Although no particular documents have been identified as directly specifying the MOE's policy intentions regarding NAS, elements of that policy are indirectly represented in some other documents, such as ministerial decrees, the MOE's official texts and guidance notes for practitioners about NAS, student assessment handbooks and student assessment documents.

Therefore, the other essential source of data for this study are interviews with a select group of participants engaged in policy development as key actors close to the policymaking site, as well as observations supporting those interviews (see Chapter 3). Based on this data, I will set out and discuss the MOE's policy intentions regarding NAS by presenting the findings under three categories, which are policy intentions regarding the purposes of NAS, policy intentions regarding NAS enactment and policy intentions regarding accountability for NAS, as shown in Figure 4.1.

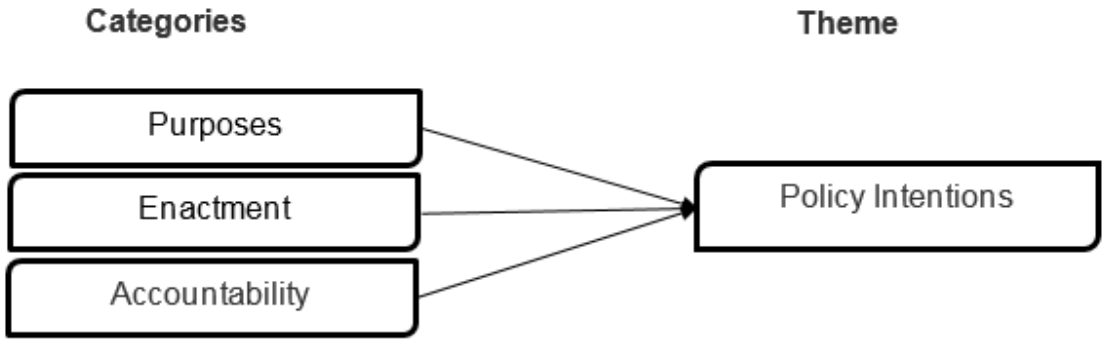


Figure 4.1: Policy intentions and its categories

4.2 Purposes of NAS

One highly experienced stakeholder started the interview as follows:

> NAS was designed to participate in providing appropriate methods and techniques of teaching in order to achieve the knowledge and skills goals of the curriculum contents, which are at the heart of this system. In this way NAS seeks to improve teachers' practice in the classroom. (Leader2)

Leader2 here makes three crucial points comprising a coherent whole, starting with an improved assessment system, intended to introduce *"appropriate methods and techniques of teaching"*, representing pedagogy, and *"knowledge and skills"*, representing curriculum content. This is consistent with the General Document for Students' Learning Assessment (2015a). Therefore, NAS is considered to be a fundamental part of education system reform in respect of the development of assessment tools and curriculum content, as well as teachers' behaviour and practice to improve students' thinking and learning skills and experiences: *"I consider that NAS is a fundamental part of the education system reform that enables the MOE to*

improve the curriculum content continuously, as well as teaching methods and strategies" (A.Moussa3). Moreover, the MOE did not create developed curriculum content for the sole purpose of preparing students for exams, but rather to develop their personalities and to provide them with essential skills for their future (A.Shiny3). Therefore, this curriculum needed an assessment system containing tools other than examinations, which NAS provides (C.Baker3; C.Hassan16; C.Sabah3). In other words, NAS offers a variety of assessment tools through which the MOE presumes that teachers can shift from a total focus on voice learning which relies uniquely on examinations to experiential learning and coursework, thus to experiential assessment (MOE, 2014a). As a result, NAS would narrow the gap between basic and higher education. *"NAS introduced a variety of assessment tools which can give students a chance to gain essential competencies that may decrease the gap between basic education and higher education"* (C.Baker4). An additional purpose of NAS was to systematize what to assess, why and how, in order to improve students' learning (MOE, 2003). The crucial point here is the relationship between assessment, pedagogy and curriculum content under the umbrella of curriculum change, known as NAS. Therefore, this section provides more detail of the policy intentions underlying the purposes of NAS.

The research data indicate that the assessment system preceding NAS focused on assessment of learning (AOL). *"There was more interest in the summative assessment in order to take a final decision whether students go up to the next grade or not"* (C.Baker2). Thus, students were directed to *"memorize information, then recall it during examinations"* (C.Sabah7). In contrast, NAS focuses on AFL as well as AOL. Furthermore, the assessment specialist (A.Shahab3) stated that her beliefs about NAS had changed after she moved from teaching to the assessment department. She was sorry that she had previously believed that NAS was only an examination system. In other words, she had seen it as merely a group of assessment tools used to assess students and register their marks in order to classify them into two groups: pass and fail. This suggests that there may have been poor communication between MOE headquarters and schools, low awareness of the system and a gap between policymakers and practitioners.

> Unfortunately, like a lot of teachers, my beliefs about NAS when I was a teacher were completely different from my current situation. Since I moved to the assessment department, the policy of NAS has become clearer to me. … NAS's purposes exceed the concept of assessment for scoring to focus on assessment for learning, which follows up and assesses students' acquisition of knowledge and skills from the beginning of learning, step by step. (A.Shahab3)

A.Shahab3 did not explain the meaning of 'assessment for scoring', but she seems to have been referring to the idea, mentioned above by C.Baker2, of assessment based on test scores.

It seems that NAS was introduced with two main purposes, namely AFL and AOL. The Assessment Reform Group in the UK (2002, p.2) defines AFL by its purpose as "the process of seeking and interpreting evidence for use by learners and their teachers to decide where the learners are in their learning, where they need to go and how best to get there". In the same manner, it can be recognized that AFL demands ongoing assessment of the curriculum learning objectives. In contrast, AOL focuses entirely on final product or outcome, rather than process.

4.2.1 Assessment for learning

"NAS seeks to improve teachers' practices in the classroom, where it provides them with a variety of assessment tools" (Leader2). Accordingly, a considerable number of MOE documents, such as Ministry of Education (2014a), Ministry of Education and The World Bank (2012), Ministry of Education (2006) and Ministry of Education and the New Zealand Education Consortium (2017b), identify the basic units of the system as assessment tools, whose development and diversification are essential for it to function as an AFL system. Therefore, the variety of NAS tools is expected to help teachers to build and shape students' learning skills, as well as measuring their progress continuously. Furthermore, according to C.Baker13, the system assumes *"that the teacher has an essential role in teaching and learning, more than before. In other words, he will have a kind of authority which is assumed to enable him to improve the teaching and learning process"*. Two assessment specialists (A.Moussa3 and A.Shahab2), a curriculum specialist (C.Sabah5) and a supervision specialist (S.Waleed2) argued that NAS gives teachers a voice and often a choice in how they teach. More specifically, they can choose

the appropriate strategies, activities, teaching methods and assessment tools. This falls in line with the specifications of the General Document for Students' Learning Assessment (2015a, p.4) and marks a development giving greater weight and authority to teachers, which may be interpreted as encouraging so-called teacher agency, defined as “the teacher’s capacity to act purposefully and constructively” (Priestley et al., 2012, p.194). In other words, in case of policy change, it can be defined as teachers’ capacity to act as the main agents of policy enforcement. The following extract from the General Document for Students' Learning Assessment illustrates evidence of giving greater weight and authority to teachers (2015a, p.4)

يتيح النظام للمعلم الفرصة في إختيار أدوات التقويم المناسبة لكل مخرج من مخرجات التعلم الخاصة بمادته
"NAS gives teachers an opportunity to choose appropriate assessment tools for each learning objective in the subject."

Indeed, NAS urges teachers to encourage students to participate, express their views and assess their work themselves, processes which can instil confidence in their character (MOE, 2014b; A.Shiny4; S.Sinan3; S.Moshrifa3). NAS also seeks to develop students’ capacity to make judgements about their work in the light of the learning objectives (A.Shahab3).

Additionally, the diversity of NAS tools will encourage teachers “to continually carry out the assessment process during daily learning and direct students’ learning, then adjust it on the basis of their weaknesses and strengths” (MOE, 2015a, p.11). This reveals three relevant AFL features of NAS. The first idea behind the diversity of tools is that of an ongoing process with no specified end point. Thus, it seeks to provide students with various important concepts and skills such as communicating, critical thinking and problem solving, i.e., to connect the assessment process with learning and teaching processes, which in turn are linked with learning outcomes (MOE, 2014a). It focuses on all aspects of learning, not only on the cognitive dimension, through the integration of knowledge, information and skills (MOE, 2014a). Furthermore, a supervision specialist (S.Waleed12) stated that this continuous process can

encourage students to search through diverse sources such as books, periodicals and websites. In a like manner, this continuous process could provide useful information about students' learning that can be used to improve it. Typically, this involves adapting lessons/teaching in order either to solve a problem or to build on success (MOE, 2015a). Thus, students need to reflect on their own work and recognize what is good and poor in it. Likewise, the following extract (MOE, 2013a: p.13) shows that NAS focuses on how teachers teach as well as how students learn, i.e. what happens in the classroom (activities, tasks and teaching materials) as well as its impact on students' role in the classroom:

> - what students say
> - what students write
> - what students do
> - which strategies students use to carry out tasks
> - how students react to new input
> - how students interact with each other
> - what is revealed by their facial expressions and body language
> - what is revealed by their self-assessments
>
> None of these 'indicators' is perfectly reliable. However, combined together, they provide a very rich source of (diagnostic) information about student learning.

Another purpose of the continuous processes within NAS is to enable teachers to provide students with continuous feedback and descriptive reports of their progress. *"The system has a variety of tools which have made it a continuous assessment system. This feature of continuity benefits students by providing them with continuous feedback about their performance"* (S.Moshrifa2). This leads on to the second idea that demonstrates the purpose of NAS, which is related to guiding students. In other words, NAS was designed to assist teachers in monitoring and discussing the performance of their students continuously, in order to offer immediate guidance on their learning, rather than postpone it to the end of the term or year (A.Shahab3; A.Shiny14). It appears that NAS works through student-centred learning, whereby the role of the teacher is to direct students' learning, rather than to indoctrinate them with knowledge. Furthermore, parents can collaborate with teachers in this process of guidance and follow-up in order to enact any proposed remedial plans (S.Waleed3; S.Sinan13), even if they complain from

time to time about the multiplicity of assignments that students are required to submit in all subjects, not only in science (C.Hassan12).

On the other hand, while recognizing the crucial role of student-centred learning, some policymakers considered this model to be of limited usefulness in some sessions. For instance, specialists in assessment and supervision respectively argued that *"the interaction between students and teachers may not absolutely follow a student-centred learning model"* (A.Moussa17) and that *"sometimes, students need to focus on listening and memorizing information with little interaction between them and the teacher"* (S.Moshrifa13). Other participants (C.Hassan13; C.Sabah13; A.Shahab9: S.Sinan17; Leadership12) strongly asserted that student-centred learning seeks to achieve a discernible improvement in interaction between students and teachers as well as students' role in the classroom. It seems that it is not easy to shift from one method of learning to another and this may relate to the nature of the relationship between teacher and students, the topic and the teacher's experience.

This leads to the third idea: that NAS is intended to help teachers to understand the individual features of the learners. Thus, A.Moussa3 argued that the variety of assessment tools would help teachers to minutely assess students' knowledge and practical skills and so determine their individual differences. *"Also, the variety of tools will help teachers to assess their students in detail in several skills [knowledge and practical skills], which in turn helps to highlight their individual differences"* (A.Moussa3). A.Shahab3 agreed that NAS *"is an accurate system that distinguishes between the individual differences of students"*. These contributions are consistent with the Student Assessment Document in Science for Grades 5-10, which directs teachers to take individual differences into consideration:

> Teachers have to take into account the individual differences between students with a focus on the distinguished and talented students for developing their abilities and skills by providing them with activities that enhance their creativity, as well as providing assistance to those students who have not reached the required achievement and those with difficulties in learning. (MOE, 2014a, p.5)

As a result, the MOE expects that teachers will remedy their students' weak points and any difficulties that they may face in learning by building and then

implementing individual remedial plans. On the other hand, teachers must enhance their students' strong points and develop their abilities and skills by providing them with activities that work to enhance their creativity (MOE, 2015a).

Leader3 gave a negative answer to his own rhetorical question: *"Does the reality of NAS implementation reflect its intended purposes?"* However, he did not specify any indications of this gap between the purposes of NAS as expressed in MOE documents and its actual enactment, nor did he explain the reason behind this mismatch.

In summary, this section has outlined the main purposes of NAS as assessment for learning, under three sub-themes: of NAS as an ongoing/ continuous process which works through student-centred learning and recognizes students' individual differences. Each of these purposes may or may not be realized.

4.2.2 NAS as assessment of learning

Leader2, who had long experience in leadership, stated that NAS was considered to be a significant tool of educational development that facilitated the achievement of educational goals. Moreover, NAS was expected to provide an evaluation of MOE policy by generating feedback about the education system on which the Ministry could base remedial measures. NAS was also designed to modify teachers' and students' practices continuously as part of the educational development process. *"NAS is an important tool of educational development that seeks to achieve the desired educational goals. It was hoped that this system would provide remedial actions for the education system"* (Leader2). Others made statements in accordance with this aim: *"NAS served to evaluate teachers' performance. It is an evaluation of their practices"* (S.Waleed2). *"I can recognize teacher performance through the lens of evaluation" (S.Moshrifa2)*. This focus on final product rather than process, i.e., assessment of learning, is one of the main purposes of NAS. It is "less interested in the specifics of 'how' and 'why' learning is achieved than in the actual end-product" (MOE, 2013a, p.43). Thus, NAS functions as a measure of the extent of students' progress in terms of marks (S.Moshrifa2;

S.Waleed2). In other words, one of its main purposes is giving students an opportunity to gain more marks by more than one assessment tool:

> NAS having plenty of tools is in students' interest. In other words, for example, in Grade 9 a student could get around 60 marks out of 60 in assessment tools that are designed in school. So, this helps him to have a big chance of going up to the next grade regardless of his performance in official examinations. (C.Hassan3)

A crucial characteristic of NAS is conveyed by the phrase "*regardless of… performance in official examinations"*, since the use of examinations as the only assessment tool can generate 'exam pressure'. Conversely, C.Hassan3 and S.Sinan13 argued that the use of a variety of assessment tools make increase students' creativity by allowing them to relax, free of 'exam phobia'. Another significant purpose of NAS is to facilitate reporting to the MOE, parents and other concerned parties. This reporting feature allows both practitioners and policymakers to monitor and evaluate the progress of enactment and the achievement of learning objectives (A.Shiny3; Sbah3; C.Baker4; S.Sinan2; S.Waleed2). *"NAS helps to ascertain the extent to which pre-existing learning objectives are achieved in order to take some action to improve student learning"* (A.Shiny4). NAS also helps policymakers to evaluate curriculum objectives and contents in general, as well as in respect of their suitability for students' age, their sequencing according to school grades and their integration between the themes of science and those of other subjects (Sbah3; C.Baker4; S.Waleed3). Similarly, given that NAS seeks to develop students' personalities and provide them with essential skills for their future, the reporting function helps teachers *"to follow their students' performance, even in terms of acquiring some personal skills such as a strong sense of responsibility and practical skills such as in laboratory work"* (S.Moshrifa2).

Additionally, in contrast with the previous assessment system, NAS takes into consideration two fundamental points illustrated in the following quote: *"After NAS was enacted the parents' relationships with the school improved. Also, the gap between basic education and higher education decreased"* (C.Baker4). First, NAS seeks to build a good communication channel between school and parents to share responsibility for students' learning among them. Second, it aims to develop all aspects of students' character, not only through

the acquisition of knowledge, but also by providing them with skills in areas such as laboratory work, problem solving and critical thinking which will contribute to preparing them for higher education, i.e. narrowing the gap between basic education and higher education, as well as helping them later to meet community and labour market needs (C.Sabah3). Finally, S.Waleed2 opined that students' results through NAS can help to determine the availability of resources associated with the policy, as well as identifying teachers' needs, such as for professional development and training.

In summary, this section has outlined the main purposes of NAS in assessment of learning, under three sub-themes: seeking to achieve education system goals (outcomes); evaluating MOE policy on assessment systems, curriculum objectives/contents, teachers' performance and the availability of resources associated with the policy; and reporting.

4.3 Enactment of NAS

Advanced preparation is a keystone of any initiative in order to create the right conditions for its enactment (Amoo, 2016). A number of MOE documents state its intentions regarding preparation for NAS implementation, while a considerable number of research participants spoke in detail about this topic. For instance, MOE (2015a) and MOE (2014a) both emphasize the significance of guides and other documents in helping teachers during implementation. Therefore, the MOE has issued several documents, such as the General Document for Students' Learning Assessment and Students' Assessment Documents in Science. In accordance with MOE (2015a) and MOE (2014a), specialists in supervision (S.Waleed3), curriculum (C.Hassan9) and assessment (A.Moussa11; A.Shiny11; A.Shahab7) described these documents as useful for practitioners because they reflected the MOE's intentions regarding NAS implementation. Moreover, A.Shiny10 cited MOE (2015b) as indicating that the MOE intended to improve teachers' skills by providing a variety of training courses in order to prepare them to deal with any change in the education system, either presently or in the future. In addition to the Ministry's plans to provide associated resources for NAS enactment, A.Moussa6 noted that the MOE had introduced other related

initiatives, such as participation in TIMSS. As presented in Chapter 3 and based on a review of the literature on policy enactment and of the MOE documents, as well as the comments of policymakers, this section examines NAS enactment under the six categories headings listed in Figure 4.2:

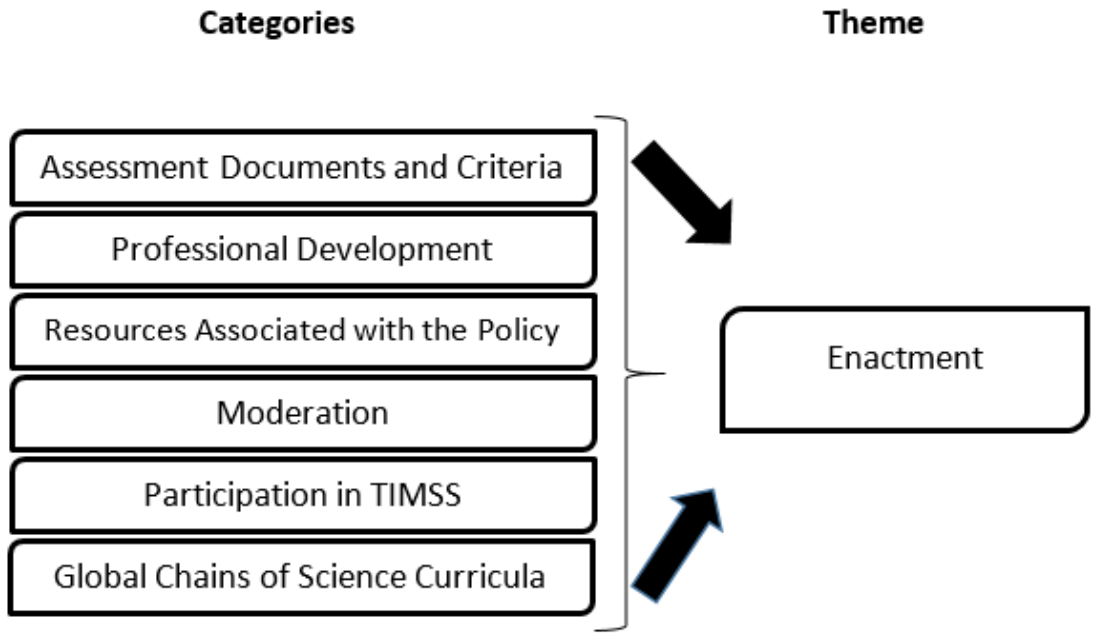


Figure 4.2: **Enactment and its constituent categories**

4.3.1 Assessment documents and criteria

Assessment documents: The MOE indicated that the Students' Assessment Document for Science was created to support teachers in implementing NAS. In other words, this document covers science assessment tools as well as student assessment tips and instructions (MOE, 2014a). The following views of a supervision specialist (S.Waleed3) were shared by a curriculum specialist (C.Hassan9) and three assessment specialists (A.Moussa11; A.Shiny11; A.Shahab7):

> It is a very important document that reflects the MOE's intentions regarding the assessment system. It was edited in the form of procedures/instructions in a very clear and simple style that is easy to read and understand, which should help teachers to enact this system smoothly. (S.Waleed3)

Two central points can be drawn from this remark. First, the document is very important because it represents a policy intention related to the guiding of teachers to improve learning and teaching (A.Shahab7; A.Shiny11). *"It is a*

translation of NAS policy intentions with useful information and examples to help teachers during the enactment of NAS, so they need to read it carefully to take full advantage" (A.Shahab7). Second, the document seeks to simplify enactment procedures in order to assist teachers, for instance by acting as a guide on how to enact NAS tools during teaching practice (C.Hassan9; A.Moussa11). *"The document is assumed to be clear for teachers, so if they give it attention and read it carefully, it can help them in teaching, because it provides all the details that they may need"* (A.Moussa11). However, the curriculum specialist (C.Baker10) expressed the view that teachers reading the document were not sure to understand its details and the ideas behind the system, with potential consequences for their practice. *"Teachers may read this document, but that does not mean that they understand the policy intentions, which may have an effect on their practice"* (C.Baker10). From these words it can be inferred that practitioners must read the text in depth in order to fully grasp the underlying policy intentions and should seek the help and support of specialists such as supervisors to clarify any difficult passages, as only a complete understanding can properly support their practice (Ball et al., 2012).

Equally importantly, C.Hassan9 argued that regardless of the total number of pages in the assessment document (over 70), it appears that its writing style reflects its purpose as a guide to support NAS enactment. Similarly, the MOE claims that the science assessment document is based on NAS principles, granting teachers the freedom to search and select appropriate assessment tools for each topic, as well as their own enactment strategies (MOE, 2003). In addition, as the MOE intended, the assessment document was found to enhance teachers' confidence because its implementation was subject to their own interpretations (MOE, 2003).

However, regarding teachers' freedom in implementing NAS, C.Sabah15 suggested that the MOE should update the document regularly and make it more flexible to avoid any restriction on teachers' practice: *"This assessment document can be useful for teachers and I have recommended them to use it, as long as it does not restricting their practice, so the MOE needs to revise this document continuously"*. It seems that C.Sabah15 took into account the

feedback that could be received from teachers, as well as the variable of teachers' cumulative experience, which could be a positive factor affecting their understanding of the assessment document's contents. Consistent with this view, a supervision specialist stated that *"the updating of the assessment document, which is based on teachers' feedback, can be a good way to improve the enactment of NAS by teachers"* (S.Moshrifa10).

Finally, the views examined above were expressed by participants who appeared to consider themselves to represent policymakers or at least to be very closely linked to them. Therefore, they saw the assessment document as fully appropriate and did not criticize its contents or the circumstances of its design in any way.

Assessment criteria: This subsection discusses the criteria for assessment that are a main part of the assessment document. In line with the above comments by C.Sabah15 and S.Moshrifa10 about the importance of revising and updating assessment documents from time to time, A.Shahab6 reported that when NAS was first implemented, the assessment criteria were absent from all assessment tools except for the examination and that the authors later added the criteria for some tools, such as projects and presentations. Among the critical points to be drawn from this is the existence of a kind of continuous revision and development of the components of NAS, such as the assessment documents, although A.Shahab6 did not explain the motivations behind this revision or the sources that it was based on, such as teachers' feedback or the reports of officials who were tracking the enactment of NAS. Second, it seems that there was a lack of preparation for implementing the system in respect of the explanation of assessment criteria, or at least a mention of some examples, especially in the first stage of enactment.

On the other hand, the amended version of the assessment document repeatedly uses the phrase: "this is only a suggested assessment criterion for this assessment tool". It seems that the MOE authors intended to leave space for teachers to decide what was appropriate for their students, rather than relying on a ministerial prescription of a particular tool for a given topic. Moreover, this phrase appears to assume that teachers have sufficient experience in the assessment field and can take advantage of assessment

specialists and supervisors, who may also encourage them to select appropriate assessment tools. Therefore, they can easily determine the appropriateness of these criteria in their own way (A.Moussa19). Figure 4.3 reproduces the proposed criteria for the assessment of presentation (MOE, 2014a, p.29):

- إعداد معايير بكيفية منح الدرجة بصورة عادلة بين الطلبة. ويمكنك أخي المعلم /أختي المعلمة الاستعانة بهذه المعايير في تقويم أداء الطلبة .

الدرجة	معيار الدرجة
٣	– عرض الأفكار بطريقة سلسة و متسلسلة – توظيف وسائل العرض – الرد على الاستفسارات بدقة – الإلتزام بالزمن المحدد له – وضوح لغة العرض والصوت
٢	يحقق أربعة أو ثلاثة من المعايير المذكورة أعلاه
١	يحقق اثنين أو واحد من المعايير المذكورة أعلاه

29

Figure 4.3: Proposed project assessment criteria form

Its translation is as follows:

- The teacher should prepare criteria for assessing this tool. He/she may also use the proposed criteria below to assess student performance.

Mark	Criteria
3 out of 3	Coherence Creativity Question responsiveness Timeliness Speaking skills
2 out of 3	Achieves three or four of the above criteria
1 out of 3	Achieves one or two of the above criteria

Regardless of the level of these proposed criteria and their relevance to this assessment tool, teachers are thus invited to decide what is appropriate for their students and therefore have no need to wait for the MOE's instructions.

This freedom of selection represents one of the main intentions of the NAS policy (S.Sinan16). Finally, teachers may need to improve their skills to enable them to design assessment tools and criteria, while assessment specialists and supervisors may need to develop their respective skills in order to support and mentor the teachers. This need for professional development is discussed in the next section.

4.3.2 Professional development

The assessment specialist A.Moussa6 offered the following opinion regarding professional development:

> Yes, I am aligned with the MOE in the need to develop educational assessment tools and their criteria along with giving more space for teachers to participate in creating and choosing the appropriate assessment tools for topics, but I believe that its intentions regarding professional development must be at the forefront of its interest before the previous point, so that teachers are able to easily handle the system and its related components such as tools, teaching methods and curriculum content. (A.Moussa6)

This response reflects the importance of professional development, which seems to be an underlying process for practitioners preparing to enact NAS. In addition, it may come under the intentions of the MOE in order to improve teachers' skills and prepare them to deal with updating of the education system, either presently or in the future (A.Shiny10). In other words, *"The MOE has presumed that its plan for professional development will increase teachers' awareness and experience of the enactment of NAS"* (S.Moshrifa5).

At the same time, despite the importance of professional development for those who enact NAS, more than half of the policymakers who participated in this research appeared to restrict the concept to formal and linear training, ignoring broader meanings (Kennedy, 2007). On the other hand, four of the ten participants (the assessment specialist A.Shiny25, the supervision specialist S.Moshrifa5, the curriculum specialist C.Hassan9 and Leader13) used language implying that they were referring to continuing professional development, which has a deeper and more comprehensive meaning.

Continuing professional development: The MOE argues that the continuing professional development of teachers is fundamental for improving their skills in order to be ready to carry out changes such as NAS enactment

(MOE&NEC, 2017b). In the interviews, A.Shiny25 asserted that the MOE's keenness on CPD would empower teachers to carry out their duties, in conformity with the remarks in Section 4.3.1 about giving teachers more freedom to select appropriate assessment tools and criteria: "*Continuous self-development addresses the limitations of teachers' knowledge and skills, which is in parallel with the Ministry's directions towards empowering teachers and giving them more power"* (A.Shiny25). Furthermore, S.Moshrifa18 supported the view that the establishment by the MOE in 2013 of the Specialized Institute for Professional Training of Teachers (SIPTT) might be an explicit step towards achieving its policy intentions regarding CPD for teachers. On other hand, S.Moshrifa18 gave no details of the SIPTT, such as its plans, programmes, working mechanisms, or its specific role in teachers' CPD.

Other research participants made no direct mention of this concept, but indirect references to it can be identified. For instance, Leader 13 stated that *"the MOE is interested in encouraging teachers to start self-development, side by side with the formal training that it may provide from time to time"*. This appears to suggest that he considered the MOE to be aware of the importance of self-development as an essential element of CPD and that the Ministry believed that formal training alone was not sufficient for improving teachers' skills. The words *"may provide"* indicate a degree of uncertainty as to whether professional development plans for teachers would be enacted as intended, perhaps because of challenges that were not identified by the participants. Moreover, regarding the various forms of CPD, participants detailed only two activities: informal learning *("urging teachers to read relevant documents and articles to develop their skills" [C.Hassan9])* and obtaining qualifications *("Postgraduate study, such as MA and PhD degrees, is very helpful and enriching. So the MOE intended to raise the number of annual scholarships as well as encouraging teachers to seek distance learning and part-time study" [S.Moshrifa5]).*

Eventually, in spite of the confirmation of two assessment specialists (A.Moussa7 and A.Shahab8), who worked in the training team for teachers during the commencement of NAS enactment, the MOE was seeking to create

a specific and structured CPD plan for school staff. However, they did not specify that there was a written plan for teachers' CPD, referring instead to an annual plan for formal training programmes at the levels of schools, governorates and MOE headquarters. It seems that the Ministry was making scattered efforts without a systematic plan for the delivery of CPD for teachers. Furthermore, there was an absence of documentation on CPD activities.

Formal training: Not only did more than half of the policymakers who participated in this research restrict the concept of professional development to formal and linear training; they also focused on two main types of formal training, i.e. pre-service and in-service training, each of which is now examined in turn.

Pre-service training: Regarding the change in Oman over the last two decades in the mission of teaching, the MOE expects that newly qualified teachers will be able to

> …guide their students in developing critical skills in analysis, judgement and problem solving; work with a broader range of students with a greater mix of skills and backgrounds than before and ensure that students show improvement in their behaviours and perform well on the measures of learning, such as school continuous assessment tools and national-level tests. (MOE & WB, 2012, p.127)

It appears that the MOE based its expectations on the demands of recent developments in the schooling system. Thus, one of the main requirements of NAS is for qualified teachers whose specific skills empower them to teach their students as the MOE planned.

> The MOE hopes that the institutions of higher education will deal with their students as a specialized project, so that they have the necessary skills to enable them to start teaching successfully, as well as keeping up to date with any new educational reforms, such as NAS implementation. (Leader6)

Two points may be drawn from this, the first being that the MOE's ambition is to have well-qualified graduates who are ready to start teaching from the first day in school. We know that the employment system in the MOE operates simply through permanent job contracts, rather than teachers being subjected to a period of training, testing and assessment of fitness to teach, for instance, which is known as employment under training and probation. The second point is that the MOE intends student teachers to have some level of skill in

dealing with new trends in education, which would make them more capable of carrying out the change. Therefore, the supervision specialist S.Waleed9 asserted that *"the MOE believes that first step of teachers' skills development should start with teacher preparation institutions, then after that comes the role of the MOE and professional self-development"*. S.Sinan12, a highly experienced supervision specialist, confirmed that the MOE seeks to have continuous and permanent contacts with the internal teacher preparation institutions through joint committees, in order to ensure that study plans include topics related to its policy intentions regarding the education system in general and NAS in particular. For instance, S.Sinan12 reported that in the last two years, a textbook used by the School of Education at Sultan Qaboos University, the main teacher preparation establishment in Oman, had contained a chapter on continuous assessment. Furthermore, A.Shahab7 asserted that in order to ensure that graduates meet the MOE's requirements, there should be good coordination between the MOE and the teacher preparation institutions regarding change in the education system. The MOE presumes that such coordination can align the curricula of the institutions with the objectives of the education system, including on assessment (A.Shahab7; C.Baker6). In accordance with this, an assessment specialist pointed out that *"collaboration between the MOE and teacher preparation institutions put at the forefront of its agenda the issue of training students about the reality of NAS enactment and how to deal with it"* (A.Shiny11).

However, A.Shiny11 added that these institutions typically focused on theory rather than practical topics and training teachers for real-life settings. This comment suggests that he was unsure about the results of collaboration on this issue. Indeed, the curriculum specialist C.Sabah5 and the supervision specialist S.Moshrifa10 argued that this imbalance between the teaching of theoretical and practical topics might have a negative effect on novice teachers' skills, an argument supporting the creation and development of NAS tools which would in turn promote classroom practices consistent with assessment for learning. Two other participants, A.Shiny7 and S.Waleed9, warned that the aforesaid imbalance between teaching theory and real-life training might favour teacher-centred rather than student-centred learning. In other words, they appeared to suggest that appropriate training can provide

teachers with the experience and skills needed to practise student-centred learning, promoting their function as guides for their students.

Based on the fact that the majority of teachers, who are appointed annually by the MOE, are graduates of local institutions, it appears that there is a need to continuously revise the mechanisms of connection and collaboration between those institutions and the MOE regarding the translation of education policy, thus identifying the skills necessary for teachers to perform their roles as planned. Nine of the ten participating policymakers argued that teachers' preparation and development must comprise two complementary stages: pre-service and in-service.

In-service training: According to Leader6, in addition to the building of teachers' skills in the teacher preparation institutions, the MOE has a major role to play in the in-service training required to prepare them to teach effectively. It follows that such training is essential for those directly involved with teaching, such as teachers and supervisors, in order for them to carry out their roles as intended by the MOE (C.Sabah9). These comments are in line with a report by the Ministry of Education and The World Bank (2012) calling for the continuous provision of appropriate in-house training courses and professional development for both experienced and newly qualified teachers, as important prerequisites for the high quality enactment of NAS policy. S.Waleed10 and A.Shiny10 argued that in order to achieve the policy objectives, there must be integration and synchronization between the change and training. In other words, the policy intentions should be accompanied by a detailed plan for the training of all groups involved in enactment. This plan must be flexible, continuous and renewable in order to cover the continuing annual expansion in the number of schools, which means there is a continuous need for training (A.Shiny10).

Accordingly, the majority of research participants clearly stressed that the formal training programmes must have a particular focus on NAS, rather than on education more generally, while A.Shiny8 and C.Sabah7, specialists in assessment and the curriculum respectively, argued that specialized training is essential for teachers at both Grades 1-4 and Grades 5-10. Moreover, nine of the ten participating policymakers (namely A.Shahab15, A.Shiny22,

S.Moshrifa18, S.Waleed21, A.Moussa23, C.Hassan19, C.Sabah18, C.Baker10 and Leader13) claimed that comprehensive formal training would made teachers fully aware of the main purposes of NAS. One of these policymakers, C.Baker10, believed that teachers' practices are usually affected by the extent of their awareness and knowledge. In other words, the participants saw specialized formal training as essential for practitioners to be well aware of NAS policy and to understand it. This would provide them with a high level of motivation and the ability to interpret and translate the NAS policy into practice, as per the MOE's requirements (A.Shiny25). Reflecting the importance of formal training programmes for teachers in the area of NAS, A.Moussa8 stated that the MOE conducted annual in-depth 'quality training courses' in assessment, covering NAS.

However, two participants (namely S.Moshrifa18 and A.Shahab21) concluded their contributions to this part of the interview by questioning whether all novice teachers received formal training in any aspect of NAS. The answer will be presented in the next chapter of this study, which relates to perspectives on the NAS policy. Finally, S.Moshrifa18 suggested that the SIPTT should design an annual training programme for all novice teachers, which would raise awareness of the MOE's policy on NAS and train them in creating and implementing NAS tools. Furthermore, the Institute should conduct short courses for all teachers in need of such training, which should be inventoried and determined by heads of department (one of the tasks listed in the job description), thus improving teachers' ability to translate the policy into practice (Brent et al., 1996).

The distinction that participants appeared to make between experienced and novice teachers motivated the inclusion of the following subsection on novices.

Novice teachers: While teachers are typically classified as experienced or novice according to length of experience, none of the research participants was able to offer specific definitions of these two categories and MOE documents do not often use the term 'novice teachers' (Al-Shukaili, 2007). However, the research participants, in accord with many such documents (MOE, 2015a; MOE, 2015b; MOE, 2013b; MOE & WB, 2012), tended to use

the terms ‘new teachers’ or ‘newly appointed teachers’ in reference to those in their first year of appointment, i.e., having less than one year of experience. Therefore, ‘experienced teachers’ are those with one or more years of experience.

On the other hand, S.Waleed11 and C.Sabah10 surprisingly asserted that a new teacher would need three years to begin dealing adequately with NAS: *“Three years later, I began to realize its purposes and thus dealt with it”* (S.Waleed11). *“They need three years to understand the system”* (C.Sabah10). Two main points emerge from these assertions. Firstly, they imply a specific definition of novice teachers and thus indirectly of experienced teachers, as having respectively less and more than three years of experience. I therefore find it surprising that the MOE does not yet have precise definitions of these terms, which could be derived by studying the reality of teachers’ experience in schools. Additionally, if such a study were conducted, it could lead to an effective collaboration between the MOE and schools, which might be considered valuable in respect of schools’ participation in making decisions, even at the lowest level of deciding on terminology. Secondly, novice teachers are likely to suffer more than experienced teachers in the enactment of NAS due to lack of experience. Moreover, as stated earlier, undergraduate study usually focuses more on theoretical issues than on practical training. Therefore, novices may need more training than experienced teachers in assessment. The MOE certainly has its own processes and procedures for delivering these training programmes; it seems that its formal training tends to employ the cascade model (S.Sinan10).

Cascade training model: Responses of participants including S.Sinan10 and S.Waleed4 indicate that MOE headquarters provides training programmes for science teachers indirectly, working through the cascade training model, which is “a mechanism for delivering training messages from trainers at central level to trainees at local level through several layers” (Suzuki, 2008, p.1). A highly experienced supervision specialist (S.Sinan10) argued that it was a good idea for the MOE to use this method to train teachers in assessment. He supported the contention that this model saved time and

effort by reference to the high number of teachers compared to the small number of trainers, as well as the governorates being quite far apart, adding a comment about selection:

> The MOE selects trainers carefully at all levels, except the heads of department, because only one is available in each school. Usually, they are highly qualified and have a positive attitude towards this system. Moreover, they must be directly linked to schools for the tracking of system enactment, which in turn will help to deliver the targeted training message. (S.Sinan10)

However, neither S.Sinan10 nor S.Waleed4 said anything about the length of the process of delivering training messages through this model, passing from trainers to assessment specialists, then supervisors, heads of department and finally teachers. In particular, these participants neither stated whether any distortion of training messages could be expected nor discussed the effect of the varied quality of multiple kinds of trainers on the efficiency of this long process.

It can be concluded that the cascade model appears to have been used in the formal training of teachers in NAS enactment and that it has both advantages and disadvantages. However, regardless of the mechanism employed, the central point is that in order to achieve its objectives it must be able to deliver messages to trainees clearly and completely.

4.3.3 Resources associated with the policy

When asked about any other requirements for NAS beside teachers' professional development, the majority of participants responded that they were certain that these existed. *"To achieve the significant aims and purposes of NAS, there is a need to develop the school environment by providing basic resources for NAS enactment"* (C.Baker7). In general, interview responses and MOE documents alike tended to specify requirements in three main areas: school funding, class size and school laboratories.

School funding: School funding is essential for the conduct of day-to-day schoolwork, teaching and the provision of things such as stationery, learning aids and laboratory materials, which are used in daily teaching activities (MOE & WB, 2012). Assessment specialist A.Shiny10 stated that since the first year of NAS implementation the MOE had created an annual plan for the necessary provision of stationery, learning aids, instructional materials, equipment and

printers. Similarly, A.Shahab6, C.Baker7 and C.Hassan10 reported that the MOE had identified many requirements of NAS enactment crucial to its success in schools which had not applied to the previous assessment system, including stationery, learning aids, instructional materials, photocopying equipment, printers and a petty cash allowance for internal professional development workshops. The Ministry of Education and the New Zealand Education Consortium (2017b) state that the MOE allows each school direct access to up to 30 per cent of the profits from its tuck shops towards these requirements. C.Hassan10 added that since 2012, the MOE had allocated to each school an annual petty cash allowance for direct purchases in the range of 2000-6000 OMR (≈ £3,850 to £11,550), depending on the school's size and number of students. In detail, the MOE intends that this allocation to cover continuous requirements, such as minor maintenance, stationery, learning aids, instructional materials and internal professional development workshops. Other major requirements including the periodic maintenance of school equipment fall within the competence of the Governorate General Directorate of Education (Leader13).

It seems that during the first years of NAS implementation, the MOE supplied schools with basic requirements such as stationery, learning aids and instructional materials. Several years later, in addition to these materials, which are distributed annually to schools, the Ministry has allocated annual funding for each school to cover other needs not met by the original provisions.

Class size: As noted in Section 4.2.1, one of the main tasks of the teacher is to distinguish between students in respect of their performance in order to provide them and their parents with detailed individual feedback (MOE&NEC, 2017b). The assessment specialists S.Sinan9 and A.Moussa3 stated that these distinctions can be determined through the enactment of ongoing NAS activities designed to achieve the purposes of assessment for learning. Accordingly, the MOE believes that class size has a significant impact on teaching practice, especially as lessons are limited to 35 minutes in duration (S.Sinan9; A.Moussa3; A.Shiny19). The Ministry has therefore set a target of eventually reducing the average class size to a maximum of 20 students. However, at worst in urban schools, it requires class size not to exceed 30 in

Cycle one (Grades 1-4) and 35 in Cycle two (Grades 5-10) (MOE, 2003; MOE, 2015a).

Correspondingly, Leader8 argued that reducing class sizes could play a key role in enabling NAS to translate education policy as intended by the MOE; teachers would be able to carry out proper practices because they would have more time with each student. A.Moussa12 explained that a smaller number of students would make it easier for the teacher to observe, discuss and provide feedback.

To summarize the participants' views and the MOE documents, it seems that NAS is based on ongoing assessment tools and activities which require teachers to expend much effort and time to allow for individual differences between students. Moreover, teachers' ability to meet NAS requirements may be affected by the number of students in the classroom, although one might question whether any empirical studies have demonstrated a relationship (either positive or negative) between achievement and class size. It seems fair to say that the conditions of NAS enactment are no less important than its components.

Laboratories: The relevance of class size to the conduct of laboratory work is illustrated by this extract from the interview with an assessment specialist:

> The MOE took into account that the total number of students in the classroom is an essential factor for teachers when planning laboratory work, regarding the type of experiment and the number of teamwork groups that are distributed for each experiment, as this should align with the capacity of the school laboratory and the availability of materials and equipment. (C.Sabah9)

Two key points arise from this. First, NAS resources are somewhat interrelated and complement each other in order to create appropriate conditions for its enactment. Second, the availability of a well-equipped school laboratory will help teachers to carry out laboratory work as intended by the MOE, whereas if laboratory provision is inadequate, the teacher may be obliged to take actions such as designing a restricted plan for laboratory work, carrying out a limited number of experiments, or relying on teamwork assessment rather than individual assessment. Accordingly, the MOE believes that the availability of adequately equipped school laboratories is significant in developing teachers' practice, as well as students' learning, by

growing their practical skills, while students' participation in practical experiments and note taking is one of the main science assessment tools introduced by NAS (MOE, 2015a). On this topic, the curriculum specialist C.Hassan10 reported the MOE's belief that NAS should play a considerable role in shaping students' practical skills, such as conducting laboratory experiments, which are highly valuable to them. In other words, the NAS policy intentions listed in the science assessment document include a strong call to involve students in laboratory work by providing an adequate number of suitably equipped laboratories (MOE, 2014a). In detail, this document explains the MOE's motivations regarding laboratory work, which can be summarized in four points: developing students' attitudes towards science; developing their skills in areas such as problem solving, inductive and deductive reasoning; reinforcing scientific concepts among students; and promoting the principles of collaboration and teamwork action while providing opportunities for self-learning. The following extract illustrates these motivations regarding laboratory work (MOE, 2014a, p.41).

المختبر المدرسي والبيئة المادية المحيطة بالطالب انسب البيئات لتحقيق ذلك. ويؤدى الأداء العملي بشكل فردي أو جماعي وتسعى أنشطة الخبرة المباشرة إلى تحقيق مجموعة من الأهداف والمخرجات منها:

- تشجيع وتعزيز طرق التفكير العلمي.
- تطوير مهارات العلم الأساسية والمتكاملة.
- تدرب على مهارات حل المشكلات والاستقصاء والاستكشاف العلمي.
- جعل الظواهر الفيزيائية والكيميائية والبيولوجية أكثر من واقعية من خلال الخبرات الحية.
- تحقق من الحقائق والمبادئ المدروسة.
- تشجيع الملاحظة الدقيقة وتسجيل الملاحظات بحرص.
- تطوير المهارات اليدوية.
- زيادة التحصيل العلمي والاحتفاظ بالمادة العلمية لمدة أطول.
- تنمية الاتجاهات والميول العلمية وتأثير الإيجابي في اتجاهات الطلبة نحو العلوم.
- تعزيز العلاقات الاجتماعية والعمل التعاوني كما تتيح فرص التعلم الذاتي.
- الإيفاء بمتطلبات الاختبارات العملية.

In light of these assertions, it seems rather surprising that official documents refer to the allocation of only one laboratory for each school in Cycle 2,

regardless of its population (MOE, 2003). In addition, it was not clear from participants' responses what lay behind this single laboratory policy. On the other hand, supervision specialist S.Waleed10, who had a wide understanding of assessment systems and the resources needed to enact them, pointed to the MOE's support for a culture of teamwork and collaboration between schools in matters including the exchange of laboratory materials and equipment to help meet some of their needs. He added that the MOE also directs schools to benefit from their environment. While these guidelines may be seen in a positive light, they may also be taken as an indirect admission by the MOE that materials and equipment are in short supply or that one laboratory is inadequate for some schools.

Last but not least, the Ministry of Education and the New Zealand Education Consortium (2017b) correctly affirm that the availability and use of resources such as laboratories encourages students' learning. Therefore, "a science course without laboratory facilities to conduct experiments to demonstrate scientific facts and phenomena will not have the same outcomes for students as one where imparted knowledge can be tested, confirmed and expanded upon in a suitably equipped laboratory" (MOE & NZEC, 2017b, p.401).

4.3.4 Moderation

The concept of moderation is quite new in the Omani education system, having been espoused by the MOE in parallel with the implementation of NAS in 1998/1999. Moderation is defined by the Ministry of Education (2014a) as "a range of procedures and processes of tracking and auditing, which takes place to ensure the correct and accurate enactment of NAS tools by teachers and the credibility of awarding marks". This definition indicates that moderation has three main aims: of assessment, evaluation and verification. The first aim is to assess the extent to which teachers accurately enact the NAS tools. Thus, A.Shiny21 saw moderation reports as facilitating the performance by assessment specialists, supervisor specialists and curriculum specialists of their duties in following up NAS enactment. The second aim is to evaluate teachers' performance and their ability to implement NAS tools as intended by the MOE. On this point, the curriculum specialist C.Baker6 stated that the MOE planned to *"take advantage of moderation reports in terms of*

measuring teachers' understanding, interpretation and application of NAS tools, then provide teachers and supervisors with detailed feedback to take into consideration in the future". The third aim of moderation is to ensure a high level of credibility in awarding marks, thus verifying the accuracy of students' results and the absence of manipulation.

The observation by S.Moshrifa5 that moderation *"can help to minimize the usual mismatch between students' results in continuous assessment tools and final examinations"* suggests the existence of a fourth aim linked to those of assessment and evaluation above. One possible explanation for this argument is that moderation may function as a judgment tool which obliges teachers to follow fixed criteria in student assessment, without the risk of grade inflation, particularly in the case that these assessment tools, which are designed and assessed by teachers, represent, for instance in Grades 5-9, up to 60 per cent of the total weight of the assessment (S.Waleed11). Additionally, the curriculum specialist C.Baker6 argued that *"moderation can provide useful feedback to revise curriculum contents and teaching methods"*. At first glance, there appears to be a conflict, especially in Grade 12, between two aims of moderation: that of auditing the extent of teachers' credibility in awarding students' scores and that of mentoring teachers and supporting them by providing feedback on their performance. However, A.Shahab13 strongly argued that there was no such conflict, because the purpose of feedback is not only to modify students' scores or change teachers' annual appraisal reports, but also to improve teachers' understanding and so to develop their practice in the future, as well as aiding curriculum development. She added that these moderation reports are useful in planning teachers' professional development programmes.

In addition to the aforementioned definitions, further details can be discerned regarding the types of moderation and the next steps or scenarios after issuing moderation reports. In detail, A.Moussa22 distinguished between formal and informal moderation, stating that the MOE designed informal moderation to be carried out at all grades from 1 to 12 by school-level staff including principals, heads of the science departments and teachers. Typically, this informal moderation takes place continuously throughout the year in the form of

ongoing discussion among staff regarding all aspects of assessment including the criteria in use (MOE, 2014a). In other words, it may help teachers to decide which activities suit their students' levels and reflect most closely the learning objectives.

As to formal moderation, the MOE specifies its use solely for Grade 12 and at the end of each term. It is conducted through a collaboration between a central team from MOE headquarters and the governorate. The supervision specialist S.Sinan19 explained that formal moderation happens in two linked steps, the first of which is an analysis of statistical indicators at the level of each governorate, each school, each year, each subject and each teacher. This generates broad information on which to base the next step, a visit by the formal moderation team to all Grade 12 schools to ensure that the marks awarded by teachers are honest, objective, fair, consistent and in accordance with the criteria listed in the science assessment document and other associated documents (MOE, 2014b). It appears that the focus on Grade 12 may be to correspond with the general certificate awarded to students at the completion of their schooling, after which they move on to higher education without any other admission tests. This indicates that the NAS results are treated as standards for entry to higher education opportunities. The following is an extract from the Moderation Guide for Grade 12 for Science, which illustrates some follow-up criteria of the moderation team at the MOE (2018b, p.15). The excerpt does not give full details of the mechanism of work of the moderation team, but it does outline the main points which team members must take into account during the moderation process (for more detail, see the Chapter 2, Section 2.10).

الأداة	معايير المتابعة	ملاحظات في متابعة الأداة
الاختبار العملي (الفيزياء - الكيمياء- الأحياء) (٥ درجات)	• ارتباط الاختبار بمخرجات التعلم . • توزيع درجة الاختبار على قدرات الاستقصاء العلمي وحل المشكلات . • لا يتضمن الاختبار أي أسئلة نظرية مطلقا، عدا تلك المرتبطة بشكل مباشر بالجانب العملي في التجربة. • يتم تقويمها مرة واحدة فقط . • لا تكون أسئلة الاختبار العملي نصا لأسئلة الاستكشافات أو التجارب الواردة في كراس العملي . • ينبغي على المعلم إعداد معيار محدد لتصحيح الاختبار العملي يشمل المعايير والدرجات الموزعة عليها . • تراعي الفروق الفردية.	• أن تتوفر ورقة الاختبار ومعيار الإجابة للأسئلة . • في حالة عدم توفر الأدلة للدرجة المرصودة لا تعتمد الدرجة .

Tool	Follow-up criteria	Comments
Practical Science Exam (5 marks)	• Link the exam to learning outcomes • Distribute exam marks between the skills of problem solving and empirical investigation • The exam should not include any theoretical questions at all, except those directly related to the practical aspect of the experiment • Assessment should not be repeated, i.e. only assess a student once • Practical exam questions should not include any question/item or experiments that are listed in the practical booklet • Teachers should prepare a marking scheme that includes criteria and mark distribution •Take into account individual differences	• Practical exam paper and answers should be available to the moderation team. • In case of absence of evidence to support the marks awarded, these will not be approved.

4.3.5 Participation in TIMSS

The Omani Minister of Education, Dr Madiha bint Ahmed Al-Shibaniyah, is cited in MOE (2018) as declaring that keeping pace with rapid technological change requires the development of mental and practical knowledge and skills among students, to enable them to meet learning needs and labour market requirements for the 21st century. Moreover, based on national statistical indicators which recommend support for students' achievement levels in core subjects such as science, the MOE planned to assess students' performance accurately and objectively by comparing it with that of students in other countries. Therefore, the MOE participated in the IEA's Trends in International

Mathematics and Science Study, whose standards have a high credibility since the fourth session was held in 2007. The Ministry expected this participation to provide a variety of data that could be useful in pursuit of several aims, such as to develop and improve education policy and planning, especially regarding curriculum objectives and content, and assessment and teaching methods (MOE, 2018).

According to the Omani national science report for TIMSS 2015 (MOE, 2018a), the MOE's decision to participate in the study is a significant step associated with indirectly evaluating the main components of the education system, of which it considers NAS to be at the forefront. Therefore, the MOE expects participation in TIMSS to promote and improve the education system, while being useful in delivering indirect feedback about NAS through the measurement of students' knowledge and skills and the views of students, teachers, principals and parents about science learning and teaching in Oman (MOE, 2018). Similarly, C.Baker17 described the MOE as essentially interested in participating in TIMSS in order to determine how well Basic Education had achieved its desired developmental role with respect to assessment, curriculum and pedagogy, compared with other countries' education systems. Accordingly, it appears that the basic purpose of Omani participation in TIMSS is to gain a broad idea of the extent of fulfilment of the aims of Basic Education, by comparing Oman with other countries. Obviously, this comparison is conducted by means of the same instruments and content for all participating countries (A.Moussa22).

The assessment specialist A.Shahab14 concurred with C.Baker17 and A.Moussa22 by stating that the MOE expected that TIMSS would *"help to diagnose the efficiency of the education system generally and the assessment system in particular compared with systems in other countries"*, while the supervision specialist emphasized its importance for assessment:

> In contrast to the other components, it seems that the assessment system will have more benefits from the participation in TIMSS in terms of developing items of assessments tools as well training teachers to build similar items such as examination items, thus helping them to develop professionally in this area. (S.Waleed20)

He went on aspirationally: *"But our ambition is to see such development remedy the curriculum to include skills, trends and values along with knowledge".* By the same token, a curriculum specialist identified one of the most important expected advantages of participation in TIMSS:

> Yes, the MOE urges us to take advantage of TIMSS results and carry out some of its recommendations through the inclusion of its main points in the plan of developing the curriculum's objectives and content. For example, in Grade 4, the MOE curriculum content plan lists topics on electricity as a response to the recommendations of the study. (C.Baker17)

Actually, C.Baker17 mentioned only one aim of this modification, which was to develop the curriculum objectives and content within the plans to improve the education system to bring it up to the level of developed international education systems. On the other hand, A.Shahab14 argued that this amendment had probably occurred as a response to the MOE's efforts to improve students' results in TIMSS by at least matching the international average: *"The MOE aspires to seeing Omani students' results reach the international average, which is 500 points, and beyond"* (A.Shahab14). In addition, the assessment specialist A.Moussa22 claimed that the Global Chains of Science Curriculum (GCSC; see Section 4.3.6) had also been developed and implemented as a response to the TIMSS results, as well as some other national reports. It seems that notwithstanding their different motives and aims, these amendments and developments are all useful and aligned with the aspirations of the Minster for improving educational policy cited at the start of this section.

In a similar manner, the supervision specialist S.Moshrifa went on to say that one of the MOE's intentions regarding participation in TIMSS was to attempt to introduce a culture of conducting studies and surveys by applying several study tools, such as tests and questionnaires. The implementation of such tools could represent a new trend and help to avoid the prevailing traditional belief of stakeholders that such tools should be used only to assess students' attainment, rather than in surveys. It seems that changing teachers' convictions and beliefs is a central element of the MOE's policy intentions, and this may be supportive of greater political enforcement of new initiatives.

In summary, four main expected aims emerged regarding participation in TIMSS, the first being to diagnose the efficiency of the education system, identifying its weak and strong points in order to create remedial plans for improving all of its components, including the assessment system and curriculum contents. The second aim is to develop teachers professionally in this area, the third to introduce a culture of conducting survey studies and the fourth to improve the results of Omani students to match or exceed the TIMSS international average of 500 points. In other words, the TIMSS result can be considered both an indicator of help in developing the education system and at the same time an indicator of competition. As the utterances of the MOE and policymakers may not show the full picture on this issue, teachers' reflections are also examined, in the next chapter.

4.3.6 Global Chains of Science Curriculum

Exploration of the research data revealed interconnections, overlap and mutual support between the themes which emerged. For example, participation in TIMSS is shown above to have supported the MOE's ambitions to improve the assessment system as a prerequisite to the development of the Omani education system in order to bring it up to the level of successful global systems by comparing it with other systems. Subsequently, this comparison prompted the MOE to create new plans for other related actions, such as the development of curricula (A.Moussa22).

Thus, the MOE's (2017a) document entitled *The Science and Mathematics Curriculum: Everything you need to know* states that the MOE and the University of Cambridge signed an agreement to develop the science and mathematics curricula. Actually, the MOE presumed that these modern curricula would particularly support the development of Basic Education implementation, including that of NAS implementation, which is considered to be the heart of this education system. This integrated project was thus designed to cover three main areas: preparing a modern curriculum content in science and mathematics for Grades 1-12 by using global chains; the training of teachers, supervision specialists, curriculum specialists and assessment specialists to implement and track the implementation of these

curricula within modern pedagogical trends; and developing the associated assessments.

Moreover, a considerable number of the research participants, such as the supervision specialists S.Moshrifa15 and S.Waleed17, the assessment specialist A.Moussa26 and the curriculum specialists C.Baker20, C.Hassan21 and C.Sabah21, supported the MOE's policy intentions regarding the establishment of the GCSC project, as this excerpt illustrates:

> In view of the fact that some of the recommendations of reports have indicated the urgent need to develop science curricula to keep pace with the era of information explosion and technological revolution in the world, the Global Chains of Science Curriculum is expected to be a paradigm shift which can develop the education system with respect to raising its performance relative to global developed education systems. Therefore, the MOE planned to prepare the education system as a global system, especially since science and mathematics are known to be the same all over the world, unlike other subjects. (S.Moshrifa15)

Three themes emerging from S.Moshrifa15's interview may be seen as representative of the MOE's policy intentions on this issue. First, GCSC is a complementary initiative within the main initiative of education system development that aims to improve educational performance according to international standards. C.Baker20 explained that it would function to improve students' attainment, which in turn would support their performance in international studies such as TIMSS. Second, this sub-initiative may remediate the shortcomings of the old curricula. Accordingly, the assessment specialist A.Shiny19 and the supervision specialist S.Waleed17 believed that the GCSC project was introduced by the MOE as a response to the need for a revision of the curricula and the result of curriculum evaluation through reporting, which revealed some shortcomings in content, a failure to keep pace with global developments and incompatibility between the sequence of topics and objectives. Third, this initiative was established in order to deal with two very important subjects: science and mathematics. C.Hassan21 mentioned that these are metaphorically called 'global languages' because they have a major role in the development of nations. Therefore, S.Moshrifa15 agreed with the MOE (2017a) that the GCSC would play a central role in allowing qualified students to compete in the local and international labour markets in future.

However, despite S.Moshrifa15's evident conviction and optimism regarding the MOE's policy intentions for the GCSC project, she stressed the importance of adapting global curricula to take account of the Omani sociocultural dimension, which appears to be the keystone in the structure of change. In the same way, the assessment specialist A.Shahab11 did not hesitate to express her fears as to how well these curricula would fit with customs and traditions and in general with the social-cultural dimension, to the extent that she proposed basing the building of new curriculum standards on an Omani sociocultural dimension, then creating new content in accordance with global trends, rather than starting from global standards and curricula, then attempting to fit them to the local culture.

4.4 Accountability for NAS

It seems important to feel accountable for the concept of science education in Oman. Accountability in this sense is not only for external stakeholders, such as policymakers, specialists in assessment, curriculum and supervision and parents, but primarily for teachers (Anderson and Planning, 2005; Neave, 1987). Therefore, the assessment specialist A.Moussa20 expected teachers to have a sense of professional accountability towards science teaching in Oman, so it is presumed that they will have professional values for developing science teaching through the implementation of Basic Education, with NAS at its heart.

Contrary to expectations, the majority of MOE documents examined, such as MOE (2015a), MOE (2014a), Ministry of Education & The World Bank (2012) and MOE and NZEC (2017b), do not touch directly on accountability, but focus instead on responsibilities. For instance, the *General Document for Students' Learning Assessment* (2015a) emphasizes that the MOE is interested in distributing responsibilities regarding NAS enactment across all stakeholders, with a particular focus on teachers' responsibilities, perhaps because they are very close to the students, mentoring and guiding them through the learning process. In this regard, the supervision specialist S.Waleed9 suggested, as a step towards accountability, that the MOE should create an employment contract between itself and teachers, clarifying the limits of responsibility and

duties under which accountability is made in case of failure. This suggestion raises two significant points. First, there may be no detailed contract between the employer, represented here by the MOE, and the employee, represented by the teacher. Second, S.Waleed9 felt that in the absence of such a contract, the teacher cannot be held accountable for his performance.

On the other hand, on the assumption that the MOE has detailed responsibilities for all departments and staff, A.Moussa20 suggested that the Omani Education Council should develop accountability regulations, which should include accountability based on the responsibilities and duties of the MOE overall and for each department, such as the departments of curriculum, assessment and supervision, as well as for schools. The curriculum specialist C.Baker5 agreed with this suggestion, expecting such detailed regulations to:

> …avoid the overlapping of responsibilities and determine who should be held accountable, whereas what happens now is that each person or each department blames the others. For example, the supervisors say that the reason for this shortcoming is down to the curriculum specialists, and the curriculum specialists say this is a shortcoming of the assessment specialists, and so on. These accusations are a natural consequence in the absence of regulations. (C.Baker5)

The first main point arising here is that there is no clear allocation of responsibility among ministry staff, MOE departments and schools for the enactment of NAS initiatives. The second point, which relates to the first, is the absence of regulations through which employees who fail to perform their duties according to the MOE's initiatives, such as NAS enactment, are held accountable.

In spite of A.Moussa20's and C.Baker5's views, four of the ten research participants implicitly or explicitly expressed views on the accountability of teachers and the MOE regarding NAS enactment. For example:

> Typically, at the beginning of the enactment of new MOE initiatives, firstly, accountability should lie with the Ministry, as it has a responsibility to create an appropriate environment for enactment, either through the formal training of teachers, or providing necessary resources for enactment. Then a greater accountability lies with practitioners, especially teachers, who have responsibility for the enactment of this initiative and its consequences. (A.Shahab10)

This suggests that accountability for NAS enactment is shared between the MOE and teachers. Moreover, A.Shahab10 pointed out that teachers must

bear the greatest share of this accountability, a view that she may have based on the MOE playing its role fully in the first phase of NAS enactment, by providing the necessary resources such as training for teachers, clear documents, guides for teachers and properly equipped laboratories (A.Moussa20). Leader13 offered an opinion compatible with this analysis:

> Teachers should be given more freedom to select appropriate assessment tools and teaching strategies rather having particular tools imposed for them to operate in order to achieve certain learning objectives. This sort of prescription limits their creativity and therefore they must be given the space to make their own choices. They can then be held accountable for the nonfulfillment of the NAS enactment aims. (Leader13)

From this point of view, teachers' empowerment is the first step to accountability. In line with this, C.Sabah14 believed that the MOE seeks to grant teachers a wide space of freedom in NAS enactment to select what they see as suitable for their students, such as assessment tools and teaching strategies. Given this degree of empowerment, schools and especially teachers must be held accountable for NAS enactment. The supervision specialist S.Moshrifa5 presented an analogous argument:

> Accountability for NAS enactment should include all concerned, especially decision makers and teachers. Teachers have the primary role in this operation. However, despite their vital function, sometimes they do not take any care regarding the achievement of NAS objectives and this may be due to their own wants and convictions rather than the Ministry's failure to provide what is required, such as providing necessary support for teachers and training them on how to implement NAS tools. (S.Moshrifa5)

In detail, she argued that the MOE intended all stakeholders, especially the MOE's decision makers and teachers, to be accountable for NAS enactment. She emphasized that teachers must be more accountable than others for NAS enactment. It seems that she based this opinion on the current situation in the education system, where teachers, being very close to students, can act as a 'dynamo', encouraging students to interact effectively. Additionally, she claimed that teachers do not always fully execute their role in the teaching and learning process, which she attributed to their own beliefs. She added that even if those teachers needed particular training as a result of the lack of basic resources and requirements for NAS enactment, this did not excuse them from fulfilling their responsibilities, as they should have their own plans for CPD and should be able to develop their experience day to day by utilizing

their more experienced peers in their school and outside. Furthermore, some teachers, although newly appointed, may be well qualified, having developed themselves, but they do not do well in their practice. S.Moshrifa5 also noted that the MOE's annual supervision plan included visits by supervision specialists with the aim of mentoring and supporting teachers, which she felt could help to avoid some misunderstanding and misinterpretation of curricula objectives by teachers. It should be noted, however, that she did not give any details of how teachers' beliefs could affect their performance. Finally, she felt that teachers should have more accountability for CPD than the MOE.

Somewhat surprisingly, the supervision specialist S.Waleed9 expressed a contrasting view:

> Teachers cannot be held accountable alone for NAS enactment. For instance, school principals sometimes push teachers to raise students' scores by adding more marks, which could be considered as fraud, and a kind of academic dishonesty. Principals usually undertake such actions to avoid accountability, even though it rarely happens, which is at most a note or message that does not follow any other procedure. They also do this in order to gain a good position among schools, even if it is not real. (S.Waleed9)

Three critical themes can be drawn from this contribution. First, all practitioners in schools should be held accountable for NAS enactment. Second, it seems that some practitioners lack the will to improve science education in Oman and consequently fulfil their duties simply in order to demonstrate compliance, which may help them to avoid accountability for any fraudulent practice of which they may be guilty. On the other hand, regardless of accountability, where are teachers' values? Are there any factors that may affect their motivation and hence their practice? The relevant data on these questions will be presented in Chapter 5 of this study. Third, S.Waleed9 appears to have concurred with A.Moussa20 and C.Baker5 in reporting the absence of an accountability system and of any tools able accurately to detect abuse by practitioners and policymakers in NAS enactment. However, it could be that participation in TIMSS (Section 4.3.5), as well as the implementation of national tests (which started in April 2018, after the data for this research were collected), are examples of diagnostic and discovery tools which may help to ensure accountability.

It seems that the majority of the MOE documents examined, as well as the policymakers who participated in the research, restricted the concept of accountability to the sense of holding accountable those who fail to fulfil their responsibilities. Conversely, there was little or no evidence of concern for teachers' self-accountability regarding the improvement of science learning, for their motivation, or for the factors affecting their performance. The MOE would appear to be in need of a new vision of accountability encompassing the broad sweep from the establishment of a policy through to individual practice, involving the participation of all stakeholders.

4.5 Summary

This chapter has offered a perspective on policy intentions in Oman regarding the purposes and enactment of the New Assessment System in science in Basic Education and accountability for its operation.

Regarding purpose, there seem to be two complementary main sub-themes. The first sees NAS as a system of assessment for learning, guided by three apparent concepts: that NAS is an ongoing/continuous process, that it works through the idea of student-centred learning and that it distinguishes between students' individual differences. The second sub-theme is that of NAS as an assessment of learning, illustrated by the fact that NAS seeks to achieve education system goals (outcomes) and that it evaluates the MOE's policy regarding the assessment system, curriculum objectives/contents, teachers' performance and the availability of resources associated with the policy, as well as providing a variety of reports.

Analysis of the MOE documents and participants' points of view also revealed a number of factors affecting NAS enactment or its development and that of other components of the education system. These include the provision of assessment documents and criteria, professional development and resources associated with the policy. Others are the introduction of a system for tracking and auditing NAS enactment for moderation, participation in TIMSS to compare the performance of Omani students with those in developed countries and the development of curriculum content aligned with the global curriculum, known as the Global Chains of Science Curriculum. Finally, it is

evident that the MOE aspires to enact its policy regarding NAS. Therefore, as stated in the MOE documents and supported by the participants' contributions, there should be accountability for the enactment as planned.

Chapter 5
School Staff Perspectives on the NAS Policy

5.1 Introduction

As previously mentioned, the main aim of this study is to understand how Science teachers enact a national initiative (NAS) that focuses on assessment for learning (AFL) in science education. Chapter 4 has examined policy intentions regarding the implementation of NAS by analysing two sources of data. The first comprises MOE documents, such as ministerial decrees, official publications and guidance notes for practitioners, as well as student assessment handbooks and student assessment documents. The second source is the interview responses of a group of participants selected for their engagement in policy development, as they worked closely with the policymaking site; that is, they are considered to be policymakers.

However, these sources are not deemed likely to provide a complete picture of NAS policy intentions and enactment; as the head of a school science department said, *"The system may be beautiful and its objectives are wonderful, but what about the reality of enactment in schools, that is, how it is enacted by the teachers?"* (HC12). The present chapter therefore examines the reflections of the practitioners (teachers and other members of school staff), data which relate to the second, third and fourth research questions:

RQ2: How do science teachers enact the New Assessment System in Basic Education classrooms?

RQ3: What are the factors that influence the New Assessment System practices and thus its functioning as Assessment For Learning?

RQ4: To what extent do the Ministry of Education's policy intentions regarding the New Assessment System align with science teachers' practices in respect of the Assessment for Learning approach?

In detail, as explained in Chapter 3 (Section 3.5.2), the data were extracted by analysing observations and post-observation interviews with practitioners: three school principals, three of heads of department and nine science

teachers. Accordingly, twelve categories emerged from the data, which were grouped in two broader themes: Perspectives on NAS policy intentions and Perspectives on NAS policy enactment. Section 5.2 first explores in detail the views of school staff on the aims and intentions of the policy, then Section 5.3 addresses their perspectives based on their practices during enactment. Figure 5.1 illustrates the broad structure of the analysis.

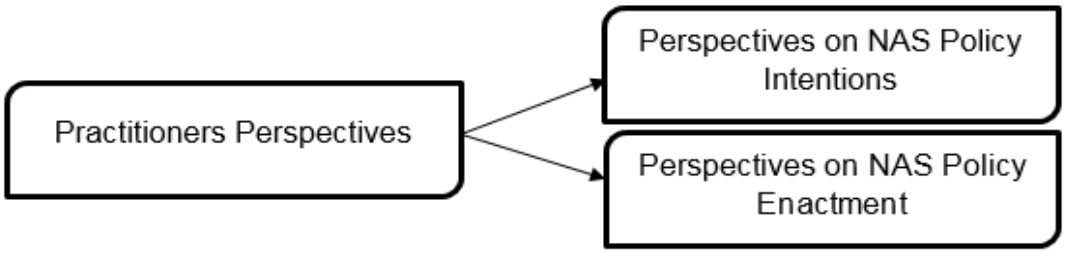


Figure 5.1: Structure of analysis in Chapter 5

5.2 Perspectives on NAS policy intentions

This section presents the views of school staff, according to the structure shown in Figure 5.2, based on observations and post-observation interview data.

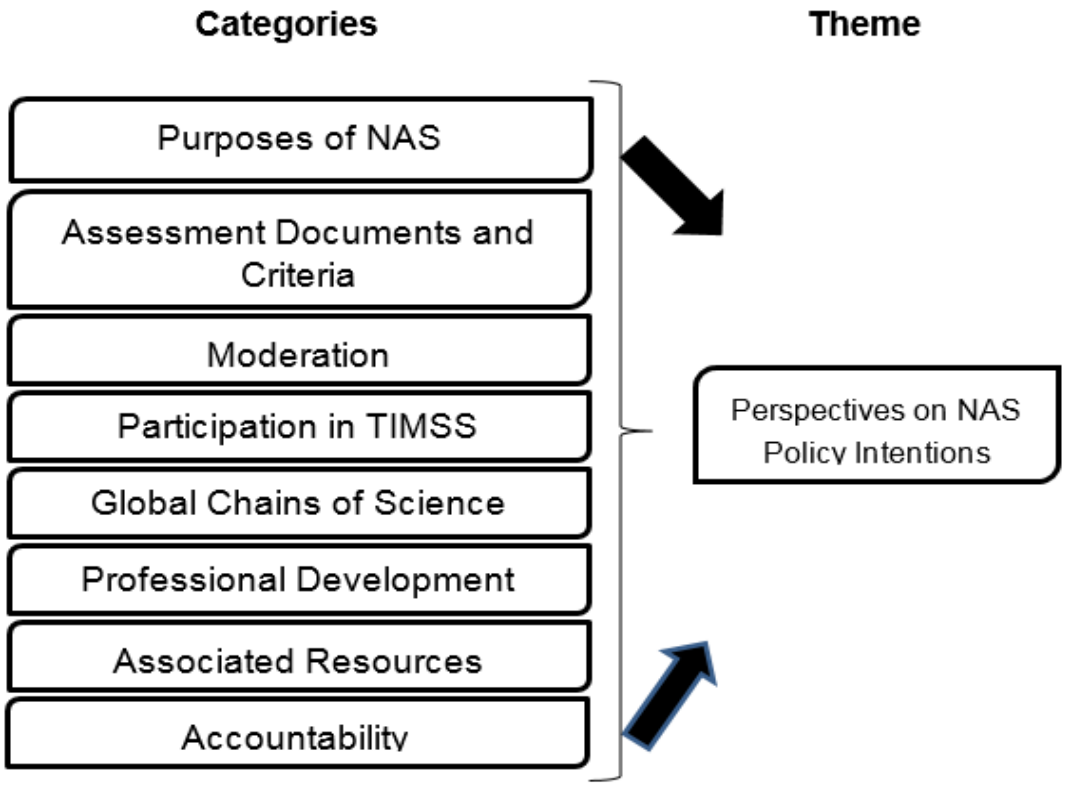


Figure 5.2: Structure of analysis of data on NAS policy intentions.

5.2.1 Purposes of NAS

As mentioned in Chapter 4, asking policymakers the question 'Why do we assess our students?' identified the intended purposes of NAS, which were not necessarily aligned with the views of school staff (practitioners), nor necessarily represented the reality of classroom practice. Therefore, members of staff were asked for their views of these intentions through their actual application of the system. Regardless of what they stated about the types of assessment that they practised, including diagnosis and formative and summative assessment, the aims of using these types of assessment can determine their purpose. The participants' views were consistent with the two main purposes of NAS distinguished in Chapter 4: assessment for learning (AFL) and assessment of learning (AOL), the former being an ongoing process, in contrast to AOL, which focuses on the final product or outcomes of learning.

Moreover, the classification by the UK National Foundation for Educational Research (NFER, 2007) of assessment types by function indicates that there

is an integrative relationship between AFL and AOL. Consistent with this analysis, the school staff interviewees considered the enactment of NAS as AOL to pave the way for it to serve an AFL function.

NAS as assessment for learning: The two following excerpts of interview responses by school principals can be taken as typifying the views of other teachers, heads of science departments and school principals in summing up the main purposes of NAS as AOL. The most experienced school principal in the research population characterized NAS as:

> … a continuous assessment system that has a variety of tools. It works to improve students' skills through their interaction with teachers throughout the school year. NAS also enables teachers to create certain activities, strategies and teaching methods in order to motivate student learning. (PC2)

A second school principal, with more than two decades of experience, offered this account:

> The current assessment system seeks to measure many student skills that could not be measured by the previous assessment system. Furthermore, through NAS the students' achievement level can be assessed continuously and in detail, which can help to identify the individual differences between students, in order to address their weaknesses and to enhance their strengths. (PA2)

Four crucial points emerge from these contributions. The first is that NAS, with its variety of assessment tools, is perceived as an ongoing process that seeks to improve students' learning and teaching. In line with the above remarks, a teacher, T2Seama2, considered that the crux of NAS is that it is a continuous assessment system. Given her length of service as a teacher in MOE schools, it is clear that T2Seama2 had experienced both NAS and the former assessment system, which may have prompted her to identify continuity as the main feature of NAS. Similarly, a departmental head of science, HA11, described NAS as seeking to continuously help teachers to apply assessment tools, strategies and teaching methods as needed, in order to provide effective learning. On the other hand, HA11 offered no details about whether NAS aimed to give teachers the freedom to create, design and select the appropriate use of these tools, strategies and teaching methods, or whether it simply obligated them to apply certain tools for each topic from a series of tools, as specified in advance by the MOE. Regardless of the extent of any such freedom, another teacher, T2Pearl48, believed that the tools in current

use made it easier for them to provide students with various significant skills. However, he did not specify any of these significant skills. Equally importantly, a head of science, HC2, claimed that the diversity of the assessment tools within NAS could boost students' motivation for learning and was thus likely to make them more active in achieving their learning objectives. Likewise, a science teacher, T3Maryam4, argued that the variety of assessment tools could undoubtedly help teachers to instil confidence in students and develop methods of acquiring the relevant skills.

The second crucial point is that NAS was seen as designed to work through the idea of student-centred learning. On this point, a principal emphasized that teachers were expected to guide students for learning and not just indoctrinate them with knowledge. *"Through this system, the MOE seeks to develop the teacher's role as a guide for students rather than a lecturer, which helps to build students' personal independence"* (PB4). This reference to independence may be seen as related to what is known as 'autonomous thinking'. It seems that PB4 realized the intentions of the MOE regarding the development of the student's role in the learning process through NAS. A science teacher made a remark consistent with this: *"The current system is in favour of teachers and students, as the students apply NAS tools and the teachers advise them. In the end, all these actions lead them to achieve the learning objectives"* (T2Pearl3). Another teacher, T2Seama2, emphasized the continuous nature of the mentoring enabled by the system: *"With NAS, it is possible to gain an ongoing idea of student's performance in order to guide them constantly"*. These responses indicate that some of the participants recognized the intentions behind NAS, but it should be borne in mind that this does not necessarily mean that they practised it accordingly in the classroom.

The third crucial point is that NAS was viewed as seeking to help teachers to provide students with various essential skills. In line with both principals cited at the beginning of this subsection, a teacher who was well-educated in the assessment field said this: *"NAS with its various tools can help me during the process of providing students with some specific skills in sciences, such as interpreting, analysing, predicting and observing, as well as acquiring knowledge"* (T2Lama2). It seems that the variety of assessment tools

supported her in building students' skills in order to improve their learning. In the same manner, HA11 believed that NAS was created to play a major role in shaping students' soft and practical skills, which would be valuable for their future careers, examples being practical skills such as laboratory work and soft skills such as teamwork (Pappas, 2016). Furthermore, T2Pearl3 agreed with the assertion of her fellow teacher T2Seama2 that NAS sought to help teachers to assess students in several learning skills: *"NAS can enable teachers to assess the variety of students' skills"* (T2Seama2). In other words, as a departmental head went on to say, NAS aims to help teachers to assess their students in certain skills, including laboratory ones: *"This system can make it easier for teachers to assess students' diverse skills, such as practical laboratory skills. It is seen as a measure by which teachers can make sure of the extent of progress in the skills acquired"* (HB6).

It is worth noting that this third point has been included among the purposes of NAS as AFL rather than AOL, because this point is discussed from the perspective of an ongoing process of assessment and related issues such as the continuous feedback that NAS tools provide for teachers, rather than final outcomes.

The fourth crucial point arising from the above remarks of PA2 is that NAS was perceived as able to support teachers in identifying the individual differences between students. Thus, a teacher, T3Aisha2, identified the constant interaction between students and teachers as among the main features of NAS, apparently focusing on the interactions occurring during the use of several assessment tools, usually associated with the continuous and constructivist assessment that can lead to assessment for learning (OECD, 2008). In detail, another teacher, T1Hussain3, stated that such interactions can help teachers to distinguish the performance of each student and thereby identify the so-called individual differences among students. A fellow teacher, T3Mohamed2, noted that teachers could benefit from these interactions to obtain quick and clear diagnoses of students' performance, allowing them to address their weak points and enhance their strong points. He added that one of the innovations brought about by the enactment of NAS was that this process involved drawing up remedial plans, thus enabling teachers to keep

in constant contact with students according to each individual remedial plan. This is consistent with the observation of PA2 that diagnosing students' performance allows them to be distinguished according to individual differences and provides a determination of strengths and weaknesses which can then be addressed and enhanced respectively.

In summary, despite the variety of school staff members who participated in the research, it can be seen that the majority of them saw NAS as intended to function as an assessment for learning through the implementation of various assessment tools. Moreover, some participants stated that most of the expected benefits of the new assessment system, such as AFL, had arisen only after its enactment in the Omani education system.

NAS as assessment of learning: Alongside the perception of NAS as AFL discussed above, a considerable number of research participants in all three groups, such as T2Lama2, T2Pearl3, T1Tarik2, T1Hussain2, T3Mohamed2, T3Maryam2, HB3, PC2 and PA2, reflected a view of NAS as seeking to achieve the learning objectives intended by the MOE. Thus, T1Tarik2 stated that NAS, with its various tools, aimed to achieve the objectives of the curriculum contents, including acquiring skills and knowledge. Two other teachers, T1Hussain2 and T3Mohamed2, and a school principal, PC2, pointed out that during the fulfilment of learning objectives, NAS measures continuously and in detail the extent of achievement of the curriculum content, whether for subjects in general, or for each skill in the same subject, in order to provide feedback which could eventually help to achieve the learning objectives as planned by the MOE. It seems that the cornerstone here is the necessity for practitioners to have a prior idea of the learning objectives set by the MOE, providing a platform for them to pursue these objectives by using the various tools of NAS.

Regarding the variety of these tools, T1Hussain3 was in line with T2Lama23, T3Maryam4, T2Seama2 and HC23 in arguing that the previous assessment system relied on formal examinations only, giving students only one chance to achieve their grades. Reliance on a single tool left students at risk of apparent underachievement because of any circumstance that might arise during the examination period. By contrast, NAS sought to provide students

with more opportunities to gain marks by using more than one assessment tool.

> The diversity of assessment tools helps students to obtain higher grades by informal assessment tools that are designed by teachers. In addition, there is an allocation of higher marks for these informal tools, for example, in Grade 10, 60 per cent of assessment weight, unlike the previous system, which was entirely based on the official exams. (T1Hussain3)

Regardless of teachers' practices and their credibility—or lack of it—in awarding students' marks, it appears that the high allocation of marks for the formative assessment tools may have led both teachers and students to consider this variety of assessment tools to be an effective way of calculating scores, rather than serving other primary purposes, such as the pursuit of learning objectives.

A number of other issues were raised in the interview with a school principal:

> NAS provides me with the ability to get detailed and ongoing reports on student performance, which in turn helps me to monitor and mentor teachers' performance by determining the extent to which the students have achieved their learning objectives. (PB4)

One central point arising from this excerpt is that NAS pursues the diagnosis of students' performance. T2Seama3 affirmed that this could, in turn, help to provide continuous feedback to teachers and other stakeholders in order to put in place remedial plans to improve students' learning. As mentioned earlier, the assessment of learning can in some cases facilitate the AFL function of NAS, underlining the integrative relationship between AFL and AOL (NFER, 2007).

PB4's words raise another important point: that one of the main purposes of NAS was seen to be reporting, because it allows the school principal and other officials to follow up teachers' performance and students' achievements. Such reports would typically summarize performance and one of the participating teachers saw their purpose as recording teachers' judgments of student performance: *"They are an expression of the result of judging students' achievement levels by using marks"* (T2Lama1). There was a general emphasis among most of the research participants that the judgment of students' performance through the awarding of marks was one of the main purposes of NAS as an assessment of learning. Thus, T3Maryam4 and

T2Seama2 described NAS as a tool for determining students' achievement levels and underpinning a final judgement as to whether they should proceed to the next grade. In addition, T3Mohamed2 and HC23 perceived NAS as intended to assess students continuously in order to prepare them for final examinations. It seems that they considered NAS to be an ongoing assessment acting as a kind of training or preparation for the final examinations, thus enabling students to gain high marks.

By the same token, T3Maryam24 stated that the MOE urged schools to send NAS reports to parents in the form of comments in students' planners or notebooks, in addition to the summative report at the end of each term. She described these reports as representing a communication channel with the potential to improve relationships between parents and schools. Several other teachers (T1Hussain2, T1Hilal3, T1Tarik2, T3Aisha2 and T3Mohamed2) agreed withT3Maryam24 that NAS represented a major departure from the former system, where communication was sparse and of poor quality, whereas NAS basically works through building effective channels of communication between teachers and parents. T2Pearl3 added that this communication could sometimes lead to a collaboration between schools and parents in order to develop students' characters in terms of providing them with knowledge and skills. It appears that its reliance on a variety of assessment tools was seen as allowing NAS to provide continuous assessment of students' knowledge and skills, and that it was perceived to foster continuous communication between schools and parents.

Equally importantly, PA2 agreed with his fellow principal PB4 on the importance of NAS reports, notably the final reports summarizing students' attainment: *"The final reports of students' results are considered to be a criterion of competition for getting an opportunity in higher education institutions"* (PA2). In other words, these final reports are essential and very significant, as the most important criterion for determining students' admission to higher education.

Contrary to my expectations, one teacher strongly linked NAS to classroom management:

> NAS is a beautiful assessment system that aims to encourage students to be more active and interested in gaining marks. Thus, it can affect their behaviour so that they are more obedient to their teacher and more disciplined in the classroom. Therefore, it is intended to promote teachers' status and grant them prestige and power among students, which represents a source of pressure on students to show more interest in learning. (T3Aisha3)

This teacher seems to have believed that classroom management could be enforced by the employment of NAS tools, acting as a source of coercion of students in terms of the marks they would obtain. School principal PB2 concurred that the continuous recording of marks through NAS could play a significant role in the control of students' behaviour, helping lessons to run smoothly. These two participants appeared to see classroom management and control as one of the main purposes of NAS.

Seven participants, representing all three staff groups (Mohammed2, T1Hussain2, PC3, PA2, HC3, HB5 and HA3), perceived NAS as reflecting teachers' performance though their students' results. T1Hussain2, for example, described NAS as *"an evaluation of my performance"*, while a head of science, HB5, noted that students' results could easily be used to monitor teachers' performance in ways that would affect how they were treated. The suggestion appeared to be that teachers' work in implementing a variety of assessment tools could itself be assessed via students' results in these assessments and that the results of this secondary assessment could perhaps be used to guide decisions on matters such as teachers' promotion, mentoring and moderation. Two participants, T3Maryam3 and T1Tarik3, argued that NAS nevertheless lacked the ability to fully assess teachers' efforts and performance, given its primary focus on the assessment of student attainment, meaning perhaps that students' results alone could not be relied upon to judge teachers' performance. They did not mention anything about the extent to which teachers could benefit from these results in order to improve their performance, however. Finally, T2Pearl3 suggested that NAS indirectly seeks to encourage teachers to improve their teaching skills in order to keep pace with developments in science learning and curriculum content, as well as learning various new teaching methods that could help them to understand learning objectives, interpret them and translate them into their work with students. However, she did not identify any specific teaching skills or methods.

In summary, the majority of participants, notwithstanding their different roles and ranks, agreed that NAS has two main integrative purposes, as AFL and AOL, although two of them (T1Tarik2 and T1Hilal2) expressed a view of NAS as no more than an assessment of learning. Furthermore, while there was a degree of coherence and consistency between the views expressed, some stakeholders emphasized different intentions, examples being PB4's reference to autonomous thinking and T3Aisha3's contribution concerning the role of NAS in the control of students' behaviour.

5.2.2 Assessment document and criteria

This section examines the views of school staff on the assessment document issued by the MOE as part of its policy intentions and the assessment criteria contained in it.

Assessment document: One science teacher was strongly critical of the assessment document:

> This document is very long, not useful and not clear enough, i.e., it is difficult to understand. Only I benefit from the attached marks registration form. Even this form is very general and needs to provide more details. For example, there are no specifications that explain how to prepare, implement and assess the assessment tools, except for examinations. I think teachers need an assessment document to serve as a detailed guide. (T2Lama3)

Three themes arise from this interview excerpt. First, the Students' Assessment Document for Science was perceived as unhelpful to teachers, not only by T2Lama3 but also by T3Mohamed5 and by T2Seama3, who said: *"The assessment document never detailed the purpose of the assessment tools, how to use them to assess students, the details of the assessment process or the assessment criteria".* In addition, the document was viewed as focusing too narrowly on examinations as the only assessment tool. It appears that teachers needed more detail on the other NAS tools regarding specifications and criteria of their creating, implementing and assessing procedures. Some participants gave the impression that the document was prepared in a form inappropriate for teachers' needs. Indeed, a teacher, (T1Tarik8) and a principal (PB5) made two very important points in support of the three teachers above: that the assessment document was written in the style of a decision-maker, rather than as a guide for practitioners, and that it

was very long at over 70 pages. The inappropriate writing style of the document seems likely to have impaired its acceptance and understanding by practitioners, thus perhaps affecting their performance. However, the school principals PA6, PB5 and PC5 all stressed that in spite of its shortcomings, the assessment document did provide some assistance to teachers in guiding their classroom practice.

The second criticism made by T2Lama3 was that the marks register form or assessment record, referred to by the MOE as the follow-up form for student performance in assessment tools, was the only significant part of assessment document (see Appendix J). Two other teachers concurred: *"To be honest, I did not read it. I just took the marks registration form from my colleague to fill in students' marks"* (T1Hussain10). *"When I started teaching for the first time ten years ago, I read only a few pages of this document, related to the division of marks between the assessment tools"* (T3Mohamed5). As to heads of department, HC12 confirmed the above remarks by asserting that teachers did not care about the other details of the assessment document, being interested only in the marks registration form. By contrast, HA6 argued that teachers had insufficient flexibility and freedom to choose appropriate assessment tools and were instead obliged to apply the tools imposed on them by the assessment document. Therefore, they seemed to care only about the registration form, which stipulated these tools, rather than the document itself. It seems that the prescription of assessment tools forced teachers to take more interest in the marks registration form while ignoring other aspects of the document. This conflicts with the stated purpose of the assessment tools, to drive teaching to meet the learning goals, rather than the tools themselves being treated as independent goals (Al-Ksabi, 2005).

T2Lama3's third point, that the assessment document should be developed, accords with the suggestion by T1Tarik8 *"that the assessment document needs to be rewritten jointly by teachers and decision makers"*. This envisages a collaboration between policymakers and practitioners to produce an edited document that would be more useful, appropriate and applicable. T2Lama7 explained that this development should result in an assessment document that

would function as a detailed guide for teachers. When asked to give details, she replied:

> At least a short guide that can explain the MOE's intentions of how to design assessment tools and implement them by using them to assess students. The guide needs to give some examples to help teachers do this, bearing in mind that it should not restrict teachers to implementing certain tools or following particular methods. (T2Lama7)

The two main elements of this suggestion are first that the MOE should produce an assessment guide which includes instructions, examples and step-by-step explanations to help teachers to assess their students, while secondly allowing teachers more flexibility in selecting and implementing the assessment tools. These two demands appear at first glance to be contradictory; however, this may not be the case, as the suggested guide might contain only a few examples to illustrate the assessment tools, rather than imposing particular tools and methods. It might thus help teachers to understand the main ideas and intentions behind the implementation of NAS tools and how to apply them, while maintaining each teacher's freedom to select the most appropriate ones. T2Lama7's views were supported by this response of a fellow teacher:

> I would like the Ministry to provide a detailed assessment guide. It should contain some explanation examples about the assessment tools and their criteria. However, it must not limit the teachers' role and their free selection of assessment tools, and should not lead teachers to become heavily dependent on it. (T2Pearl58)

Assessment criteria: This subsection reviews the school staff members' responses concerning the second main element of the assessment document: the criteria associated with the assessment tools.

T2Seama4 described the assessment document as dividing assessment tools into three types: those having clear assessment criteria, such as examinations, those with unclear criteria, such as presentations and projects, and those without assessment criteria, such as oral argumentative skills and homework. Two other teachers, T3Maryam7 and T2Pearl55, agreed that they were satisfied with the clear criteria for some tools specified in the assessment document, whereas some other tools, which had been developed via a collaboration between teachers, heads of science and supervisors, then attached to the original assessment document, lacked clear criteria or even

had none at all. (The flexibility for practitioners to develop and amend assessment criteria is discussed further in Section 5.3.1).

Another teacher made a stronger criticism, that the majority of assessment tools had no clear and detailed criteria reflecting the MOE's intentions, regarding either the development or selection of assessment tools, or their use to judge students' performance. She added that examinations represented an exception, in that their specifications and criteria were explained clearly in the NAS document: *"Only the examinations have clear criteria, which were considered to be essential during their development and use in assessment"* (T2Lama44). Although the school principal PA4 emphasized that the criteria were fundamental to help teachers to design and implement the assessment tools, as well as to asses students reliably, he and other participants, such as HB21 and T1Hilal8, supported T2Lama44's critique: *"The criteria for most of the assessment tools except examinations were never clear in the assessment document"* PA4. T2Lama44 went on to suggest that the existence of the clear examination criteria reflected the extent of the MOE's interest in this tool compared to other NAS tools. This is consistent with the observation of HC13 that the assessment document was based on the previous assessment system, which depended on examinations as the only assessment tool.

In summary, it appears that the majority of teachers attached no great importance to the science assessment document, except for the marks registration form appended to it. Opinions differed as to the reasons behind teachers' reluctance to make use of this document. Among the suggestions were that it was superficial, that it restricted teachers and that its editorial style was inappropriate. Significantly, it was seen as giving greater weight to the existence and quality of the examination criteria over those for other tools. In addition, a head of department felt that teachers were given too little freedom or flexibility to choose the appropriate assessment tools. On the other hand, two teachers stated that they did have the freedom to develop criteria for some tools. Finally, a degree of coherence and consistency is apparent in the responses of many participants on this subject.

5.2.3 Perspectives on moderation

This section considers the opinions expressed by school staff on the moderation system introduced by the MOE as part of its NAS policy intentions, beginning with this statement by a departmental head:

> The moderation system is considered to be a key component of the current assessment system because it is primarily concerned with the credibility of assessment processes and is intended to reduce the risk of misuse of the process of awarding grades. Furthermore, it aims to accustom teachers to organize student activities and document them in the students' portfolios. (HB23)

This response emphasizes the status of moderation as a component of the NAS package and sets out its two main functions, the first being to audit teachers' implementation of the NAS tools and their awarding of students' marks. Consistent with this, a school principal described moderation as *"a system for tracking teachers' credibility in granting marks"* (PC17). In more detail, HC4 argued that moderation verified the credibility of teachers in assessing students in several ways, such as ensuring that schools acted according to the assessment procedures prescribed by the MOE and that they applied the assessment criteria for each tool. He added that it provided a comparison between students' examinations results and their marks on other tools. He appears to have meant that the aim of moderation is to examine the correlation between formative and summative assessment, thus providing some indication of the credibility of teachers' practices, which in turn would enable officials to take action regarding the accountability of NAS enactment. A teacher, T1Hilal20, similarly portrayed moderation as helping to minimize any mismatch between students' results in continuous assessment tools and final examinations.

Furthermore, PA11 asserted that by checking the credibility of teachers' work, moderation was very valuable in strengthening the relationship between the school and parents. In other words, as T3Maryam22 put it, one aim of moderation was to instil confidence among parents and civil society institutions in the results of NAS and in the education system in general.

The second main function of moderation to which HB23 referred was as a mechanism for examining the documentation of students' work. This seems

to treat the documenting stage as a basic prerequisite of moderation and is consistent with the statement of T3Aisha9 that through NAS, the MOE emphasizes the importance of documenting students' work in order to gain reliable evidence to present to the moderation team. Another teacher, T3Maryam11, similarly stated that NAS requires students' activities to be documented, then selects some to be included in their portfolios for presentation to the moderation team. Furthermore, she maintained that the team saw the documentation process as particularly important in tracking students' performance, either formally or informally. A fellow teacher had this to say regarding the portfolios: *"The idea of the documentation of students' activities in a portfolio was first raised when NAS was implemented by the MOE. It may be that this portfolio represents a performance record that provides evidence of a student's achievements"* (T2Lama30). It appears that the portfolios could perhaps help stakeholders to discuss students' progress by checking their activities, as well as probably helping them to ensure the credibility of teachers' implementation of NAS tools.

T2Pearl32 identified another main purpose of moderation: to provide feedback on teachers' performance. In detail, he explained that this feedback concerned the credibility of teachers' assessment practices and the extent to which they paid attention to the assessment criteria. It can be concluded from this and the contributions of other participants above that the two main purposes of moderation are to judge the credibility of teachers' implementation of NAS tools and to monitor their practices.

However, a school principal raised a serious limitation of the system: *"Despite moderation seeking to ascertain the credibility of the assessment system, the MOE's documents unfortunately direct it to Grade 12 rather than the other grades*" (PB12). There are two possible interpretations of this comment: perhaps PB12 believed that moderation was applied only to Grade 12 because it was appropriate to verify the proper application of NAS tools at this final stage of schooling; alternatively, she may have believed that the system should be applied to all grades, but that it was in reality implemented only at Grade12. (The reality of NAS enactment is dealt with in Section 5.3 of this chapter).

In summary, the majority of participants believed in the importance of the moderation system with regard to verifying the validity of the application of assessment tools and the credibility of marking. Furthermore, moderation reports were seen as providing teachers with varied feedback which might help them to develop and improve their practices. With the exceptions of one teacher (T2Pearl32) and one school principal (PB12), there was considerable consistency among the views expressed by the various participants.

5.2.4 Participation in TIMSS

This section analyses the interview responses of school staff on the participation of schools in the Trends in International Mathematics and Science Study. All participants appeared to be aware of this international study, in which the MOE had participated since the fourth session in 2007, but they varied in their views on its objectives and the reasons for schools to be involved. A school principal gave the following strongly positive account of his school's participation in TIMSS:

> Participation in this study adds value to the educational system and it has many benefits, especially since it does not affect students' marks, so there is no pressure on students' performance from it. The study has two main purposes, first to diagnose students' performance, teachers' practices and the educational system in general. Second, it can be considered as a competition that encourages students to compete and to make more effort. My school employs it as a competition, and the Ministry may benefit from it as a study that helps in the decision-making process. (PC25)

Four crucial points arise from these remarks. First, TIMSS was depicted positively, reflecting its wide acceptance among school staff. Similar viewpoints were expressed by T2Pearl42, T2Seama7, HA30 and a second school principal, who said:

> The decision of the MOE to participate in TIMSS is a wise decision in order to establish the ranking of our education system among the global education systems. The information it provides can help in the development and improvement of our system, both at the level of the student and the teacher, or the education system in general. (PB14)

T2Lama48 similarly considered it very important to participate periodically in TIMSS, because of its capacity to provide information that can be used to improve teaching and learning in science, as well as to obtain important background information which can be relied on in the decision-making process.

The second point is that since students' marks are unaffected by TIMSS tests, participation in the study represents no extra burden or source of worry for them. T2Lama48 went further, arguing that the implementation of such study tools could represent a new trend, by helping to overcome the prevailing beliefs of some students and school staff that the use of such tools is limited to the purpose of assessing students' attainment, rather than extending to the conduct of statistical surveys.

Third, the use of TIMSS can be seen as encouraging competition among students, schools and international educational systems. In line with the analysis of PC25, a head of science (HC25) and a teacher (T1Hussain23) identified one of the main aims of TIMSS as fostering competition locally between schools and globally between education systems. These views may be based on the aims of the first stage of conducting the study, related to sorting students according to their results in TIMSS tests, without consideration of the other aims. Alternatively, they may have been based on the actual implementation of TIMSS, as discussed later in Section 5.3.2.

The fourth point is that TIMSS participation can be viewed as a research activity, yielding information about the education system which the MOE would find useful in making decisions. PC25 specified its value in providing detailed information about the education system, including NAS as one of its components, but he offered no opinion on whether it might also be advantageous for school staff to make use of TIMSS data.

In fact, a considerable number of other participants, such as the teachers T1Hilal24, T1Hussain23, T3Aisha23 and T3Maryam26, and the heads of science HC25 and HB24, reported that the MOE urged teachers to use TIMSS material directly or indirectly in their lessons, because of its potential to enrich learning. HC25 explained that TIMSS test items can be used as models in training teachers to create questions for use in daily assessment tests in pursuit of curriculum objectives, while HB24 suggested that their direct use in teaching would improve students' attainment. He argued that this would occur by accustoming them to deal with TIMSS test items, which are usually well-prepared. In other words, as T2Seama7 explained, daily teaching could benefit from the use of TIMSS questions, especially those related to problem

solving, induction and deduction, by improving students' ability to answer such types of questions in the future. Another teacher added that *"the diversity of the content of TIMSS questions is designed to reinforce students' scientific culture and deepen their thinking"* (T3Maryam26). She appears to have meant that the TIMSS questions are not concerned with the content of a particular curriculum for a given grade, but rather with measuring students' knowledge and skills acquired throughout their years of study, as well as with educational systems as a whole.

In summary, the response discussed here represent participants' perceptions of the MOE's policy intentions regarding schools' participation in TIMSS, rather than their views on the reality of enactment. However, some of them may have been affected by considerations of enactment when sharing their views. Furthermore, while some participants appeared to see TIMSS as a competition, a considerable number concentrated on its aims related to the development of teachers' practice and students' performance.

5.2.5 Global Chains of Science Curriculum

Surprisingly, the majority of participating members of school staff, including heads of department, appeared ignorant of the intentions of the MOE regarding the introduction to the educational system of the Global Chains of Science Curriculum in Mathematics and Science. For instance, HB18 said: *"I have no idea about this curriculum initiative, because the MOE does not involve schools in making decisions"*. The involvement of schools in making decisions and all other aspects of implementation are addressed in Section 5.3. Meanwhile, this ignorance of the background to the project may be due to the fact that the research population was drawn from schools teaching Grade 5 and above and that data collection occurred during the school year 2016/2017, i.e. a year before implementation of the project in 2017/2018. Moreover, the project commenced with Grades 1-4, taught in separate (Cycle One) schools, meaning that the majority of study participants were likely to be unaware of the background to the project, since it was not due for implementation in their schools until 2018/2019. Many will certainly not yet have received detailed information on the project.

On the other hand, two department heads did respond more informatively. One said:

> This project seeks to develop and redraft the science and mathematics curricula, so that they correspond to the global curricula, which will help our students to compete globally and gain high positions among their global fellow students. (HC20)

Two main points arise here. Firstly, the main aim of the GCSC project is to base the development of science and mathematics curricula on global standards, with the aim of aligning and harmonizing them with global curricula. The response of HA17 was consistent with this appraisal: *"This development is intended to prepare the Omani educational system to become globally competitive, especially so that science and mathematics have unified and universal standards."*

Secondly, the newly developed curricula were seen as intended to equip Omani students with global competences in science and mathematics. Thus, it was expected that they would qualify students to participate in global competitions or studies such as TIMSS. There appears to be an interconnection and a unity of purpose between themes here, with all aspects of the MOE's initiatives supporting each other; for example, it was shown in Section 5.2.4 how participation in TIMSS could support the MOE's ambitions for the improvement of the education system in general, including the assessment system, while the Ministry's aim in developing the science and maths curricula also seems to have been the general improvement of education in Oman, including its global ranking among national education systems.

5.2.6 Professional development of school staff

This section explores staff members' views regarding their professional development in preparation for NAS enactment. Analysis of the interview data reveals three main themes: pre-service training, in-service training and CPD.

Pre-service training: A science teacher had this to say on pre-service training:

> One of the basic elements of teacher preparation is pre-service training, i.e., during university study, when I believe that education students should study all components of the education system, which are assessment, curricula and

> teaching methods, with an important focus on the practical through training in schools. This sort of training can help in preparing teachers for the real world of teaching. (T3Maryam5)

Two central points are worth examining. First, T3Maryam's words are in line with the MOE's policy position that teachers' pre-service training is very significant. Second, she raises the critical issue of the connection between teacher preparation institutions and schools, reflecting the apparent belief of the MOE that this relationship can help trainee teachers to become familiar with the reality of teaching and provide them with teaching experience through supervised teaching in the classroom. In detail, two other participants (T3Mohamed24 and PB10) described pre-service training as a type of preparatory phase, easing the start of the teacher's professional journey, as well as preparing for future developments in the education system.

In-service training: A school principal offered a detailed justification of the need for in-service training in the present context:

> NAS is an assessment system that operates on a new philosophy, working through teaching methods and a developed curriculum content. Accordingly, it is based on the principle of granting the teacher more responsibility in creating, selecting and implementing the appropriate assessment tools for each theme, as well as documenting students' work. Undoubtedly, these new roles and responsibilities require adequate training programmes to prepare teachers to easily deal with the system and its components, as well as preparing the other school staff and specialists who monitor the teachers. (PA7)

Three central themes emerge from this interview extract. Firstly, in common with the majority of research participants, such as T3Mohamed4, T1Tarik10, T3Aisha4, PC7, HB14, T2Lama42, T1Hilal7, PB9, T2Seama6 and T1Hussain6, PA7 seems to have been referring to the formal training courses delivered by the MOE.

Secondly, as specified by the MOE, NAS tends to give teachers more flexibility and empowerment regarding the assessment process. Furthermore, T2Lama36 stated that the NAS initiative included the parallel development of other components of the educational system, such as curriculum content, pedagogy and the relationships of teachers with students and their parents. PA7 was of the opinion that these changes required teachers to be prepared to assume additional duties, which could be achieved by the provision of

appropriate training courses. T2Lama17 made a similar point, as did a fellow teacher:

> The diversity of NAS tools, and their continuous use within new teaching strategies, requires the teacher to have the ability to create them and use their criteria, as well as monitoring their students' performance. This ability can be built by providing specialist training programmes. (T3Aisha4)

Similarly, PC8 affirmed that in order to support teachers in the enactment of NAS, the MOE intended that such courses should cover awareness-raising and that they should be appropriately specialized. It was important to make everyone concerned aware of NAS, through lectures, social media and other media. He explained that raising awareness in this way would positively affect acceptance of the initiative among school staff, as well helping to clarify the philosophy behind the introduction of such an assessment system. A number of other practitioners (T3Maryam8, HB14, T2Lama42 and T1Hilal7) concurred with PC8, adding that raising teachers' awareness of NAS would motivate them to enact it successfully, thus fulfilling the MOE's intention to benefit students. PC8 was supported by PB9, HB8, HA7, T2Lama6, T2Pearl17, T2Seama6, T1Hussain6, T1Tarik10 and T1Hilal2 in his other point, that the training courses should concentrate specifically on assessment and related issues. On this subject, T1Hilal2 argued that since NAS required students to acquire various basic competencies such as research skills, it was a prerequisite for teachers to possess these skills; hence the need for specialized training courses. Some other practitioners (HB8, T2Lama14 and T1Tarik8) added that while all teachers might need specialized training in NAS, novice teachers would need more than experienced ones, because their pre-service training would have concentrated on theory rather than practice and because they would be unfamiliar with facing the reality of the job, even if they had done a little teaching in their preparation institutions.

Thirdly, the MOE's intention was that NAS training courses should be provided not only to teachers but also to other school staff involved in monitoring teachers, such as heads of science, principals and supervisors. PA7 explained that all members of staff tasked with following up on teachers' enactment of NAS must be familiar its details, a justification supported by a departmental head:

> Supervisors must be well qualified through training programmes regarding the design and enactment of the assessment tools, so that teachers can benefit from them and find answers to their questions. (HC8)

Continuing professional development: Two highly experienced heads of department (HC9 and HB4), a school principal (PB19) and three teachers (T2Lama20, T2Pearl61 and T2Seama20) considered professional development to have a deeper and more comprehensive meaning. For them, the concept went beyond the formal and linear training provided by the MOE to include informal training, either through self-development or through voluntary attendance on training courses organized by other academic or educational institutions. Moreover, they emphasized the need to document all of these types of training for each teacher, as is the aim of the MOE, which implies a recognition of the key role of CPD. For example, PB19 said:

> School staff should be urged to be aware that training is not only by means of the MOE's formal courses, but can include informal training and self-development. Also, all formal and informal training courses should be documented in a record representing the history of the employee's professional development.

This contribution highlights two features of CPD: that the training concerned can be both formal and informal, and that it should be comprehensively documented on a database for each employee. T2Lama15 argued that informal training gives teachers the freedom to select what they feel is useful to improve their own teaching. This would seem to be one of the stronger advantages of informal training that could contribute to building the character of the creative teacher. As an example of informal training, T2Lama15 suggested that teachers could *"develop themselves in an area related to the concept of student-centred learning, without waiting for the MOE's formal training"*. Furthermore, she suggested that CPD could include studying for advanced qualifications such as higher diplomas, masters and PhD/EdD degrees, which would be very helpful and enriching, especially in the area of research techniques.

Another teacher, T2Pearl61, agreed with the MOE's policy of encouraging teachers to depend on themselves to update their knowledge in educational development, while T1Hussain 6 saw training provision as not solely the responsibility of the MOE, but also partly an individual one, with teachers and

the Ministry complementing each other's roles. He added that this collaboration would both help to develop teachers professionally and reduce the risk of misunderstandings during enactment.

In summary, the interview responses of school staff members appear aligned with most of the intentions of NAS policy, including the significance of training, both formal and informal, as well as the importance of teachers' CPD. Moreover, while participants differed in their emphasis on the various intentions, their contributions exhibited significant coherence and consistency.

5.2.7 Resources associated with NAS policy intentions

A head of science gave this response when asked about the provision of resources:

> NAS has significant aims and purposes which would have been difficult to achieve in the school environment which existed previously. Therefore, the MOE has attempted to develop this environment by providing basic resources, as well allocating some funding to support NAS enactment (HB7).

On the same subject, a teacher provided some concrete examples:

> Basically, before introducing any change in science education they should prepare for it by providing some essential resources. So, the MOE seeks to provide these resources, which could take several forms, such as professional development for teachers, funding for direct purchases, developing the classroom environment by providing new technology and by reducing the average number of students. They also need to build new laboratories or refurbish the existing ones and equip them with the required equipment. (T2Lama11)

These two participants appear to have realized the significance of the MOE's provision of such resources in preparation for the enactment of NAS. Professional development having been discussed in Section 5.2.6, this section now considers the other main aspects of resource provision raised, namely funding, laboratories, class size and technology.

PC7, PA9 and PB9 agreed that school funding was an important resource associated with NAS policy intentions. These school principals saw financial support, such as the allocation to each school of a financial provision for direct purchases, as a fundamental aspect of NAS enactment, because the new system had greater requirements than the previous one. In detail, this finance was perceived as enabling schools to cover their needs in such areas as

"stationery, learning aids, instructional materials, equipment, photocopying, printing and internal workshops" (PA9). PC8 also believed that school funding was significant in supporting teachers in the enactment process, by helping them to avoid spending their own money: *"This is to help them to not have to pay from their own pockets to cover the costs of NAS activities"*.

Recognizing the MOE's attempts to create new science laboratories, refurbish existing ones and supply them with updated chemicals and equipment, T2Lama12, T1Tarik2, PA4, HA29, HC7, T1Hilal2, T2Pearl9, T2Seama3 and T1Hussain5 expressed a belief that the availability of an adequate number of updated laboratories was significant for developing both teachers' practices and students' learning, by growing their practical skills. The following quotations illustrate the participants' views on this issue:

> Such laboratories can support teachers' practices, which in turn helps to provide their students with the practical skills that are specified by the MOE. (T2Lama12)
>
> This aligns with the aim of NAS to shape students' practical skills, such as conducting laboratory experiments, which are considered highly valuable. (HA29)
>
> The availability of laboratory chemicals, tools and equipment with valid use-by dates can provide students with a good opportunity to conduct the experiments that are specified by the MOE. (HC7)

It appears that these school staff members strongly believed in the significance of students acquiring practical skills in the laboratory. Thus, they agreed with the MOE's intention to update and upgrade school laboratories in order to achieve the purposes of NAS in this area.

Also perceived as a kind of resource underpinning preparations for NAS enactment was a reduction in average class sizes. Accordingly, two practitioners (HB7 and HC12) described NAS as based on ongoing activities liable to foster positive student-teacher interactions in order to achieve the purposes of NAS as an AFL tool. More directly, PA4 argued that class size would affect these interactions: *"It is impossible for the teacher to observe, discuss and provide feedback, as well as distinguishing between students' individual differences, for a large number of students within the limited class time"*. By the same token, T2Lama27 asserted that the lower the class size, the more able she and her fellow teachers would be to make use of the

allocated lesson time to achieve the learning targets effectively and vice versa. These participants' views are consistent with the MOE's intentions regarding class size and its impact on teacher practice and student performance.

It appears that NAS was viewed as being based on ongoing assessment tools and activities which required much effort and time from teachers in order to cover everything. Thus, the circumstances of NAS enactment were perceived as no less important than its components, such as its tools. However, it seems that these views were based on participants' general experience of teaching, so it must be asked whether class size should be considered relevant only to NAS, rather than to the previous assessment system.

The fourth aspect of resource provision mentioned by T2Lama11 was the introduction of technology. Her colleague T2Seama3 agreed that technology was fundamental to NAS enactment and gave SMART interactive whiteboards as an example of the resources that the MOE intended to provide in order to develop the classroom environment for NAS:

> NAS requires considerable effort from teachers and more time to implement its various tools. Also, this system focuses on the differences between students to make individual plans for each of them, so the existence of SMART interactive whiteboards can reduce the time needed to implement the assessment tools. (T2Seama3)

This response suggests that there is a kind of link between resources. For example, T2Seama3 refers to new technology saving time on the implementation of NAS tools, thus enabling teachers, as intended, to focus more closely on distinguishing between individual students, which, as discussed above, reduced class sizes were also thought to help teachers to do. It appears that saving time, which was perceived as a crucial factor, could achieved by several methods, all of which would thus support NAS enactment. I expected that the research participants would identify other advantages of this technology, but they did not give any further details.

Another teacher made the following crucial point:

> One of the essential resources that can support teachers and students to enact this system is the provision of learning resource centres, and providing these centres with specialized books and periodicals, as well as providing a good internet service to access global studies in any educational sectors. Also, I aspire to have more specialized public or private libraries in Oman. (T1Hilal2)

This is in accord with the view of HB7 regarding the MOE's attempt to develop the school environment by introducing such fundamental resources. A fellow teacher, T3Mohamed18, agreed with T1Hilal2 that the availability of learning resource centres and libraries specializing in all aspects of education, including assessment, would have a positive effect on teachers' practice, which in turn would improve students' learning. In detail, T1Hussain4 explained that the MOE wanted students to become used to writing reports and conducting short research projects, which would require them to research information in the learning resource centres; therefore, whenever these resources became available, they would be better able to accomplish such tasks. Finally, T1Hilal2's recommendations appear to have been addressed not exclusively to the MOE but also to those organizations responsible for establishing public libraries to serve the educational system.

In summary, analysis of the interview responses of practitioners on resources associated with NAS policy intentions indicates the perception that such resources are somewhat interrelated and that they complement each other in creating appropriate conditions for enactment. These participants' views appear relatively coherent and consistent with the MOE's intentions regarding NAS. There were differences of emphasis among participants and one person (T2Seama3) was alone in raising the introduction of technology such as interactive whiteboards into teaching.

5.2.8 Accountability for NAS enactment

As mentioned in Chapter 4 (Section 4.4), all stakeholders including school staff are supposed to be accountable for science education in Oman. This section examines the responses of school staff on the MOE's policy intentions regarding accountability for NAS enactment. Most respondents did not touch directly on the concept of accountability but referred instead to responsibilities, using a colloquial Arabic word which may be translated as 'responsibilities' although it also covers the meaning of 'accountability'. In other words, a person with responsibility for a given action or process is naturally considered to be accountable for it, although in Arab culture this may be implicitly understood rather than explicitly stated (Al-Ksabi, 2005).

A school principal gave the following interview response:

> The MOE seeks to share accountability for this assessment system among decision-makers and practitioners. Accordingly, I think it should involve them at all related stages of this initiative such as policymaking, enactment and the evaluation of the policy. Moreover, one of this system's advantages is that it has the potential to provide performance reports continuously, either descriptive or summative reports, as well as audit or moderation reports, which could help stakeholders to monitor enactment, thus ensuring accountability. (PC6)

Three central issues arise from PC6's words. First, all stakeholders should be accountable for NAS enactment. A teacher, T1Tarik13, confirmed that all stakeholders must take responsibility for it, each according to his or her position. Furthermore, this sharing of accountability was seen as able to create a sense that proper enactment was in the interest of all stakeholders, thus making it more likely to succeed.

A second teacher, T3Aisha6, presented a different viewpoint: that the main responsibility for implementing the system as planned by the MOE should fall first to teachers, then to parents. Her view may have been based on what she had seen of the information about NAS policy intentions, or she may have perceived teachers and parents as particularly close to the students, enabling them to act more directly and decisively. T3Mohamed18 agreed:

> Students spend most of their time at home, so the parents have a responsibility to follow up their children's learning through their teachers' comments. Thus, they take a considerable part of the responsibility for the enactment of the system. (T3Mohamed18)

Three more practitioners (T2Seama16, HA15 and T1Hussain8) explained that communication between schools and parents takes several forms, such as teachers' comments in student planners, school visits and parent-teacher association meetings. They considered such communication as supportive of their accountability for NAS enactment. Three others (HC24, T3Maryam19 and PB3) argued that students should also be accountable for enactment, as long as they were informed by teachers of the purpose of NAS to improve their learning. Indeed, PB3 and T2Lama17 argued that the variety of assessment tools, as well as the practice of student-centred learning, should motivate students to improve their learning, which could be considered as making them partially accountable for NAS enactment.

On the other hand, a head of science saw accountability as beginning with the Ministry:

> In the first stage of NAS enactment, accountability lies completely with the MOE, which must create the necessary conditions and resources for enactment, such as providing training to school staff and other requirements like laboratory materials and teaching aids. Once this is done, then teachers can be held accountable for enactment. (HC23)

This analysis was supported by three teachers (T2Pearl61, T2Seama16 and T1Tarik5), who argued that it would be unfair for teachers to be held accountable for NAS enactment without prior provision of resources such as professional development, fully equipped laboratories and sufficient school funding. Furthermore, T2Lama42 suggested that the MOE should establish a detailed job description for teachers, as well as the regulations controlling the enactment of NAS and accountability for it. PA4 would seem to be justified in asserting the need for a clear distribution of responsibilities and duties, as well as for regulations and guidelines to help stakeholders to put the MOE's plans into practice.

Secondly, if stakeholders are to be held accountable for NAS enactment, it is essential to involve them in all relevant stages of the initiative, namely policymaking, enactment and evaluation. In other words, according to PB3, participation in the initiative throughout, from policy to practice, would naturally apportion accountability for it to the stakeholders involved. By the same token, the teachers T3Maryam8 and T2Lama40 stated that the involvement of teachers in the decision-making process would help them to understand the NAS philosophy more clearly, which in turn would facilitate their exercise of accountability for its enactment.

Thirdly, reporting was said to be a significant feature of NAS, easing the task of determining who is accountable for enactment. Accordingly, T3Maryam22 and HB22 drew attention to the use of the system to document students' activities through portfolios and student planners, as well as to generate a variety of reports, such as descriptive and summative reports of students' attainment and moderation reports on teachers' practices. Similarly, PB3 and T2Lama46 affirmed that NAS gave stakeholders a variety of means to monitor and report the performance of both students and teachers, thus supporting their exercise of accountability for enactment of the system.

Finally, PA4 and T1Hilal11 highlighted a significant point, that teachers' values might influence their practices, which in turn could affect their accountability for enactment. It may therefore be appropriate to distinguish between accountability for enactment of the MOE's intentions operating through its instructions, tips and guidelines on one hand and self-accountability represented by a personal commitment to the new system regardless of any external compulsion on the other.

In summary, the responses of practitioners on accountability appear to confirm the principle that all stakeholders should be accountable to society in general for the enactment of NAS. Most of the views expressed on policy intentions were consistent across three groups. Although a few members of school staff, such as T1Hilal11, expressed differing individual opinions, most interviewees agreed with the others. Overall, the participants' remarks were coherent and broadly consistent with the MOE's intentions regarding NAS.

5.3 NAS policy enactment

This section examines the enactment of the NAS policy from the perspective of school staff members, by offering an analysis of their interview responses, supported by observations (see Chapter 3). The structure of the analysis is shown in Figure 5.3.

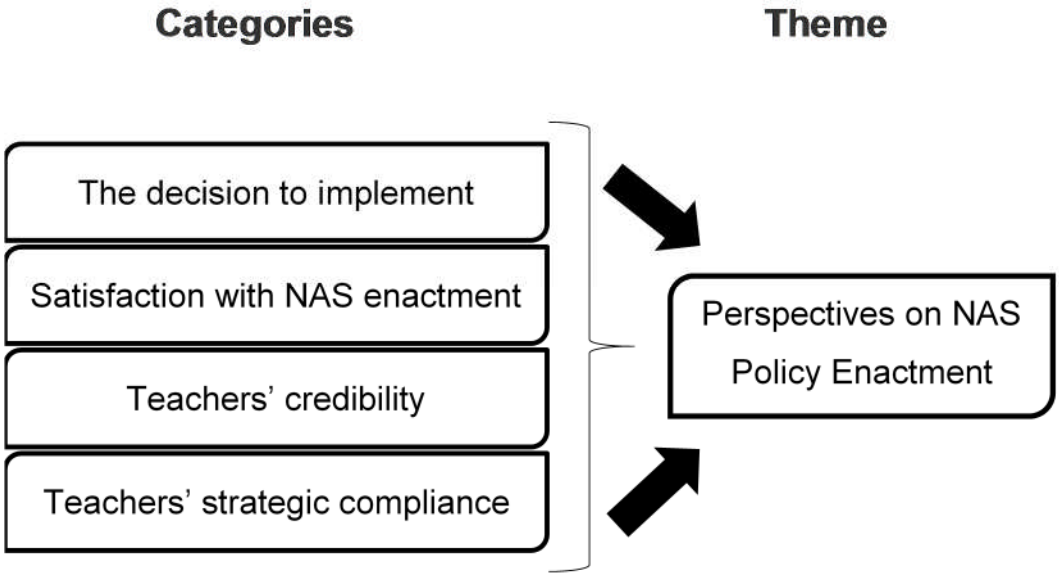


Figure 5.3: Structure of analysis of responses on NAS enactment.

5.3.1 The decision to implement

Once the MOE decided in 1998/1999 to start the implementation of Basic Education, with the New Assessment System at its core, school staff began to react to this change. The majority of school-level practitioners participating in the present research, including T1Hilal2, HC2, T2Lama3 and HB2, believed that the MOE initiative was a response to international pressure to develop the Omani educational system, although they did not identify any specific organizations as having exercised such pressure. Furthermore, none offered any details of the specific international experience protocols on which NAS implementation was based, perhaps because they were less interested in this than in the system's present components. A school principal, PC5, attributed the lack of knowledge about the background to NAS among school staff members to the existence of a gap between them and the policymakers. This assessment can be seen to be reflected in the following words of a science teacher:

> This system is based on many procedures, processes and tools. Therefore, it makes sense that there was a need for a variety of international experience protocols on which this system is based, which should be from countries that have implemented similar systems. On the other hand, the MOE should have implemented something that suited Omani society. (T2Seama3)

Two main points arise from this. First, during this major reform of the education system, it was seen as useful to follow the expertise developed in other countries with successful education systems. It seems that the protocols concerned functioned as guides for practitioners during the change process. Second, the sociocultural environment is one of the key dimensions that needs to be considered when making any change. Therefore, T2Seama3 emphasized the desirability of ensuring that the initiative would be well aligned with characteristics of Omani society. Agreement with this view is implicit in the criticism by PC5 that *"this decision did not suit our society's nature".* It is also in line with the argument of Sarason (1982) that national policymakers must adapt policies rather than adopting them wholesale, to give teachers more space to develop their experiences during enactment in schools, thus ensuring the success of the project.

Several other significant points can be seen to emerge from this longer extract of the interview with the same school principal:

> Unfortunately, the MOE did not take into consideration the schools' views as one of the main sources of information to assist in NAS decision-making. Instead, the decision to change suddenly appeared, and its implementation was very quick, and not gradual at all. As a result, teachers and all other school staff were shocked and this affected their performance. I do believe that the main aim of NAS is excellent, but to achieve better performance, it should be implemented in agreement with stakeholders at all levels, namely policymakers, practitioners, students and society. (PC5)

It seems clear that PC5 considered NAS a significant initiative for developing the educational system, while nonetheless insisting that any change in the education system should be gradual in order to avoid disruption for the practitioners concerned, as this might affect their performance. On the other hand, gradual implementation of change would obviously take more time to achieve its aims. More specifically, Wedell (2009, p.17) cites Fullan (2007) as warning that "large-scale change may take five to ten years to become part of normal classroom life in the majority of schools''. PC5's third point refers to the aforementioned gap between policymakers and practitioners, which could have had an effect on NAS enactment. He went on to explain this in detail:

> In fact, the news leaked out in public during the summer holiday that there was to be a change in the assessment system, but schools did not have any official notification of this change from the MOE. So we were assuring people that the MOE would not implement such an initiative without any announcement and preparation for schools. Then, contrary to our expectations, when we started the new academic year, we found that the leak was correct. Of course, this was a very big shock that negatively affected the motivation of teachers and other school staff. (PC7)

The principal appears to have assumed that the MOE would not exclude school staff from participating in the decision-making. Perhaps he thought that this involvement could create a comprehensive decision that would help the policy to be enacted more smoothly. HC6 supported this stance by arguing that involvement could create continuous communication and collaboration between policymakers and practitioners, which could be considered a keystone in the area of policy adoption and in motivating its creation and which would support practitioners during enactment. Accordingly, T2Lama10 contended that decisions on NAS enactment followed a top-down approach, without any consideration of feedback from schools, which was typical of the MOE's communications with the lower end of the hierarchy. This method of

policy enforcement meant that school-level practitioners *"were made to enact it without any further discussion"* (T2Lama10). A fellow teacher, T1Hussain5, explained that the MOE emphasized, through formal letters to schools, that staff must fully comply with the strict enactment of the system, focusing on enactment itself rather than debating how the decision was made. This obliged teachers to adopt a "compliance strategy" (PC5), as discussed in Section 5.3.4 of this chapter.

Indeed, the majority of the research participants agreed that decisions on NAS were made by the more senior personnel in the hierarchy, without taking into account the views of the lower-level staff, who were obliged to enact them. One teacher drew attention to the negative consequences of following the MOE's usual top-down approach in the case of NAS:

> The decisions on the NAS initiative were taken without any consideration of the teachers' views. This separation between policymakers and practitioners often leads to teachers being discouraged, which in turn results in poor student performance. For example, the MOE formulated a decision that specified some assessment tools without any input from schools. As a result, these tools were not suitable for students, so they viewed them as an extra burden without any improvement in their learning. (T1Hilal3)

In other words, this autocratic method of making, communicating and implementing decisions without any input from people in the lower levels of the hierarchy contrasts sharply with the desirable participation of school staff in decision-making which would foster consensus between them and the policymakers, with the potential to positively affect the performance of both teachers and students. A school principal supported this argument: *"Commonly, the MOE makes its decisions through the top-down method, without taking in to account school feedback. As a result, teachers' convictions do not then align with a lot of the contents of these decisions"* (HA6). The implication is that the absence of consensus between school staff and policymakers would weaken teachers' convictions, thus impairing their performance and their interactions with their students.

T1Tarik7 stated that the MOE often used the media to declare that groups of school staff were involved in making decisions as representatives of practitioners, whereas the reality was quite the opposite. He supported his claim by asserting that the MOE gave no precise or convincing details in its

media claims regarding the size of this representation, nor of the status and positions of the supposed participants. Furthermore, he claimed that since his arrival at his present school 15 years earlier, no one had been selected as a representative for any decision-making processes, either from that school or indeed from the ten nearby schools. He seemed keen to demonstrate that the MOE took no steps to involve school staff in educational decision-making, suggesting that its use of the media to claim that it did so was designed purely to influence public opinion. A head of science (HC6) gave a striking recent example of this exclusion of school staff from decision making, stating that the MOE had, at the time of data collection for the present research, elicited no input from schools to its decision that the GCSC was to be implemented in September 2017. Significantly, this interview was conducted only seven months before the implementation of the new curriculum, meaning that very little time remained to prepare schools for such change. (The curriculum is discussed further in Section 5.3.2 of this chapter.) Three of the above participants (T2Lama10, HC6 and T1Hilal3) went on to argue that it would have been more efficient for the Ministry to take a bottom-up approach to NAS implementation decisions, since this would mean much closer involvement of people in the schools, which were, after all, the main environment in which enactment would occur. These practitioners also strongly asserted that the bottom-up approach would have instilled a feeling of accountability for NAS enactment among school staff at all levels, thus making employees more effective in achieving their goals (Johnson, 2018).

However, Anson (1994) argues that adopting either the top-down or bottom-up method exclusively can cause the failure of educational reform, while a combination of the two can deliver a comprehensive and consistent model for change. In other words, effective change can occur through change from above and adaptability from beneath. It seems that it is important for the collaboration between policymakers and practitioners to lead to a consensus, thus achieving the organization’s goals, but this collaboration should be within clear and defined roles (Callahan, 2012).

Finally, to ensure teachers’ participation in decision-making, two science teachers (Seema8 and T1Tarik7) suggested the establishment of a national

union or association to represent all teachers in Oman. They also recommended that the MOE should work very closely with schools and listen to teachers' views, as this would improve the performance of both teachers and their students. There is empirical evidence for this: a study by Eberts and Stone (1987) concluded that productivity in public schools in districts where teachers' unions existed, measured in terms of student achievement, was seven per cent higher than in those without unions. More generally, the OECD (2011, p.56) states that "many of the countries with the strongest student performance also have strong teachers' unions".

In summary, it appears that the participation of practitioners in decision making is a fundamental element of the enactment stage of new initiatives. Moreover, the sociocultural environment is one of the key dimensions to be considered when making any change in the educational system, which also needs to be gradual. The participants' views were mostly consistent with each other, although a few members of school staff, such as HC6, T1Tarik7 and T2Seama3, expressed different views. More significantly, school-level participants' views tended not to be closely aligned with those of policymakers regarding the decision to implement NAS.

5.3.2 Satisfaction with NAS enactment

This section turns from the implementation decision to the responses of school staff regarding their satisfaction with enactment itself. A widespread view appears to have been that teachers' inability to enact NAS as intended by the MOE may have led to dissatisfaction with the system's potential to improve student learning. A considerable number of school staff members, such as T3Mohamed20, T1Tarik24, T3Aisha15, HB27, HC28, HA31, PC22 and PA17, believed that NAS policy intentions looked good on paper, but that enactment had often failed to realise these intentions. In other words, *"This system has great policy intentions to improve students' learning, but the reality of its enactment is rather far from this intention"* (HB27). Furthermore, a teacher (T2Pearl57) claimed that NAS enactment had been diverted from its intended path, which was to improve students' learning, and had become a somewhat static system whose first aim was merely to complete the marks register form. He added that the reality of NAS enactment focused more on assessment of

learning rather than assessment for learning. Nevertheless, T1Hussain25 asserted that NAS was incomparably better overall than the previous assessment system.

A third teacher, T3Maryam28, made an important point regarding variation: *"Teachers' interpretation and translation of this system into practice is a relative matter that depends on the circumstances surrounding each school and each teacher, such as their length of experience in this field*." Thus, the judgment of teachers' ability to put the NAS policy into practice was perceived not as absolute, but rather as dependent on the conditions of each teacher and each school. Accordingly, Seema8 and the head of science at her school, in an urban area school with over 1400 students, reported that a considerable proportion of their teaching colleagues were able to enact the NAS policy as intended. T3Maryam28, for her part, stated that more than two thirds of her school's teachers had a satisfactory understanding of NAS and the ability to enact it as intended, while a highly experienced teacher, T1Hussain25, noted that about half of the teachers at his school were able to do so satisfactorily. On the other hand, the principal of an urban school was less positive, estimating that no more than one third of his teachers completely understood the NAS policy and that the remaining two thirds did not *"have the ability to enact NAS as the MOE planned"* (PA15).

It is notable that all of the above assessments apply to schools located in urban areas and that conditions of enactment may well have been different in rural schools. For example, the school principal and head of science of one rural school (PC19 and HC27) reported that very few of their teachers were able to interpret the NAS policy correctly, then to translate it into practice as the MOE intended. They pointed out that their rural location meant that recently appointed staff members often preferred to move to schools closer to their homes, or to ones in areas with a greater availability of facilities, leading to a high annual turnover teaching staff in such schools, with a detrimental effect on the collective ability to enact NAS:

> In my experience, there are only a few teachers who understand this system and can enact it as was intended by the MOE. This is because many of them move on to other schools every year and are replaced with novice teachers. (PC19)

The school in question was located in a low-density rural residential zone, far from the urban centre of the governorate, with many members of staff coming not from the same governorate, but from various distant places. These teachers would tend to pursue any opportunity to move to schools which better suited their life choices. Despite such moves being restricted by ministerial regulations and the availability of vacancies, teachers' wishes were also taken into account (MOE, 2013), with the result, according to PC19, that up to 70 per cent of rural school staff moved annually. This in turn meant that the majority of vacancies for novice teachers and other staff were in rural schools, which would eventually find that the majority of their teachers were relatively inexperienced, with negative consequences for their ability to enact NAS as intended. This conclusion aligns with the view of Seema8 and T3Maryam28 that teachers' ability to interpret the NAS policy and put it into practice was affected by a lack of experience.

The enactment experience: The ability of teachers to implement NAS was seen as depending on the extent of their experience of the system. In line with the analysis above, PB15, principal of an urban school with more than two decades of experience of teaching and administration, stated that most of the teachers in her school were able to translate NAS policy into practice as required by the MOE, because the majority had gained good experience in this area through the many years of enactment. Therefore, she concurred with T3Aisha15 that there was a positive relationship between teachers' length of experience of NAS enactment and their ability to interpret and translate MOE policy as intended. In parallel with PB15, T3Maryam28 and T3Aisha15, another teacher, Seema8, declared that a considerable number of teachers at her school had this ability. However, she pointed out that some of the novice teachers were hesitant in their practice and were not highly motivated to deal with the new system, which she attributed to their limited experience of teaching in general and of the enactment of NAS tools in particular. T2Lama21 specified that a period of three years was needed for novice teachers to overcome the challenges of inexperience that might face them. She thus appeared indirectly to define novice teachers as those with less than three years of experience, which is in line with the evidence of MOE policymakers reported in Chapter 4.

In spite of the shortcomings of training, T3Mohamed6, T3Maryam16, T1Hussain25 and HC8 explained that they had overcome such challenges by trial and error, as well as the experience they had accumulated over the years. However, PC7 claimed that as a result of inadequate training, teachers often implemented NAS tools incorrectly. Since his school was located in a rural area, this failure to implement properly may well be related to the staff turnover factor discussed above.

Two departmental heads (HC8 and HB8) and a teacher (T2Pearl55) identified peer cooperation as a significant method of gaining experience in the tasks corresponding to the roles assigned by the MOE. This is consistent with what McCall et al. (1996) describe as the 70:20:10 model of learning and development, whereby 70 per cent of development comes from work assignments and experience, 20 per cent from colleagues' cooperation and feedback, and 10 per cent from courses, training and reading. By the same token, T1Hussain25, T3Aisha5, T3Maryam16, T3Mohamed6 and T2Lama22 expressed the belief that the experience gained from the first actual enactment stage of the initiative could play a major role in addressing the challenges that teachers could expect to face over the next few years. However, this leaves open the questions of whether learning time is affected by the presence of teachers who are not qualified, but are waiting to gain work experience, and whether it is acceptable to subject students to testing by trial and error.

Satisfaction with professional development: This section considers the ideas of school staff regarding their satisfaction with their professional development as preparation for NAS enactment, beginning with this interview response:

> As a teacher I lack a lot of the skills I need to implement the tools of this system. For example, students are required to prepare reports and short pieces of research in an organized scientific manner. However, I do not have the knowledge I should have to support them, because during my university studies and since being appointed as a teacher, I have not received any training in this area. (T1Hilal)

This indicates weaknesses in both pre-service and in-service training. First, T1Hilal asserted that in their preparation institutions, teachers received no training in the assessment system that they would be using in schools. Several school staff members (T3Mohamed, PB and T1Hussain) asserted that

teachers' professional development should begin in the preparation institutions, while a majority of participants, including T2Lama20, T3Maryam, T1Hussain, PA and T2Seama, claimed that in these institutions, they did not learn about the school-level reality of the assessment system and its tools, but only studied theoretical aspects of assessment. *"Unfortunately, during my bachelor's course, I did not learn about the assessment tools that are implemented in schools. Therefore, there is a gap between what I studied and the reality of my job"* (T2Lama20). It seems that the training that they undertook in coordination with schools through the teaching of various lessons was not enriching in this area, nor was the so-called micro-teaching.

As to the inadequacy of in-service training, HB and T2Seama stated that since being appointed at the MOE, they had attended only one training event, at the governorate training centre, in the form of a lecture on the quality of the assessment results, which provided theoretical information without practical application. Moreover, a group of teachers (T3Maryam16, T2Lama13, HC, HA, T3Mohamed, PB and T2Pearl) who had from six to sixteen years of experience in teaching, claimed that in spite of the significance of the training aspect of the change process, they had received no training on assessment since being appointed by the MOE. By the same token, the majority of the school staff members, such as PC, T3Aisha, HC and PA, complained that no actual practical training was organized within schools. A very few unplanned meetings and workshops were held, but these covered topics having nothing to do with teaching, instead addressing mainly administrative matters, as well as providing limited, general information rather than specialized training. For instance, T1Hilal explained that over the past two years, fellow teachers at his school had attended only one short workshop on details of the marks record form and the procedure for filling it in. Therefore, HC8 and four teachers (Hussian25, T3Mohamed6, T2Lama6 and T2Seama12) emphasized that both experienced and novice teachers still needed specialist training, especially in the areas of understanding the philosophy behind the new system, as well as creating and implementing NAS tools meeting the MOE's criteria. HC8 added that training should be undertaken by all school staff, including those responsible for monitoring teachers, such as principals, heads of department and supervision specialists.

Equally importantly, T1Hussain5, T2Lama6 and PA7 stated that the very few training programmes which the MOE made available to teachers were delivered mainly through the cascade model, which the participants strongly believed tended to distort the training message, to the point where its aims were not met. *"Whenever training courses are delivered directly to teachers by trainers without intermediaries, they tend to be better, as this reduces any loss of training quality. In other words, it avoids any distortion in the message of the training"* (T1Hussain5). This apparent dislike of training courses being delivered by cascade may be due to a desire for teachers to obtain accurate information about NAS from its original source, rather than a secondary one, because this would help them to fulfil the role assigned to them by the MOE. A related suggestion, by HA7, was that experienced teachers should be involved in training other members of the school's staff. He may have suggested this because teachers are very close to the teaching process and thus close to their peers, which may enable them to identify their actual training needs relatively accurately. On the other hand, he did not specify whether this involvement would be at the level of the central training team at MOE headquarters, for example, or in schools, under the cascade training model.

Some participants looked beyond formal training. T3Aisha and HC, for example, stated that they had overcome the lack of training by activating peer learning, while T2Lama15 mentioned that she had participated in various informal courses in order to develop herself in the assessment domain; however, she found herself repeating a rhetorical question: *"I improved myself, but what about the other teachers?"* This may be seen as reflecting the absence of various important concepts, such as cooperation, peer-to-peer training and school as a focal point of training. Four other participants (T2Pearl61, HC, T2Lama36 and PB) supported the view that school staff should not rely completely on the formal training provided by the MOE, but should also search independently for knowledge and global experience in assessment that could help them in NAS enactment. It appears that PB encouraged her colleagues to update their knowledge autonomously through CPD. It was noticed that teachers mostly waited for the training delivered by the MOE to be arranged, rather than initiating the provision of informal

courses, despite the assertion in MOE documents that responsibility for professional development is shared between the MOE and teachers.

Satisfaction with the implementation of NAS tools: As noted above, the ability to enact NAS correctly was found to vary from person to person and from school to school. This subsection examines in detail the interview responses of school staff members regarding satisfaction with NAS enactment, opening with a teacher's remarks:

> Most NAS tools are not related to the reality of student life. In other words, the environment surrounding the student is not taken into consideration during the selection of these tools. Also, some of them are inapplicable for lack of resources, so there is no compatibility between what is available and what is needed. Moreover, the teacher is very restricted in selecting suitable tools, as well as the allocation of marks for each tool, so there is no flexibility in this matter. For example, marks are given for homework, but I do not think they should be, because I consider it to be a formative assessment activity. Finally, length of teaching experience plays a major role in the teacher's ability to enact this system as intended. (T3Aisha15)

The main points arising here concern the environment and flexibility. T3Aisha's concern that the environment was not taken into consideration during the implementation of NAS tools was shared by T1Tarik 24, who felt that this applied to the creation and selection of the assessment tools and that there was therefore nothing interlinking them. The school's principal, PC19, supported the criticism made by the two teachers, noting that the design of the assessment tools took no account of the crucial issue of the diversity of Omani environments such as coastal regions, mountainous areas, deserts and plains. T1Tarik 24 argued that the generalization of the same assessment tools over all governorates, without considering their environmental diversity, imposed restrictions on teachers, preventing them from selecting the most appropriate and applicable tools, which in turn made assessment unrealistic.

In a related criticism, T1Hilal11 claimed that the end-of-term examinations, which were centrally prepared for students to sit in all schools, tested them on the content of this unrealistic assessment, thus forcing them to memorize information in order to answer the questions. Moreover, T1Tarik 24 objected that the assessment tools were viewed as independent objectives in themselves, rather than as tools to support the achievement of learning objectives. He appears to have meant that the MOE forced teachers to

implement these specific tools, regardless of their value in pursuing the learning objectives.

T1Tarik24 also agreed T3Aisha15 that teachers had insufficient flexibility in selecting assessment tools, while their fellow teacher T1Hilal 25 criticized NAS as being out of step with modern practice by imposing a very large number of inapplicable tools without giving teachers the opportunity to select them according to their students' needs. He also complained about the availability of the resources associated with enactment in schools, adding that teachers had no opportunity to distribute the assessment weight over the tools. By the same token, Muhammad16 said that although there were some materials associated with schools' environments, such as different types of rocks and minerals, as well as some plants which could be used in alternative experiments, the MOE gave teachers no flexibility to use these resources, insisting instead that every school must conduct the centrally selected experiments and include them in examination questions.

Satisfaction with the NAS assessment document: Two heads of department reported that their teachers had issues with the NAS assessment document:

> Most teachers ignore this document, which imposes a lot of tools and principles that restrict them, so they do not believe in the value of its contents, because they see themselves as more aware of their students' needs. In fact, they are only interested in one part of this document, which is the marks registration form. (HA6)

> In the first week of each school year, I sit with the teachers and discuss with them the main points of the assessment document and its updates. Nevertheless, some of them complain about being overloaded by the implementation of this document. (HB12)

This subsection begins by elaborating the five main points raised by these practitioners. First, the marks registration form was perceived as the most important part of the assessment document, in line with the assertion of HA6, PB5 and HC12 that the majority of teachers did not pay attention to reading the document, other than to pick up the marks registration form. They suggested that this might be due to the writing style of the document or perhaps to its length. Moreover, some teachers (T3Mohamed5, T2Seama3, T2Lama3 and T1Hilal7) reported that they had read it only once since joining

their current schools, where the least experienced of them had more than ten years of teaching experience. By contrast, T3Maryam10 expressed a clear interest in taking advantage of the document:

> It is significant, so I refer to it regularly, especially at the beginning of the school year in order to check if there are any updates. Also, it guides me in some issues, such as in how to assess students in particular activities.

The second point is that the assessment document was seen to be reviewed from time to time, which PB5 and T3Maryam8 explained was usually done by specialists at MOE headquarters. Heads of department would then typically meet with teachers in order to explain the changes. However, these interviewees added that updating did not occur every year, the most recent being two years earlier, in 2014.

Third, as HA6 and HC12 confirmed, the assessment document was seen as requiring teachers to make considerable efforts to deal with its detailed content, causing many of them to complain about the burden of enactment. In particular, teachers were said to be unhappy about the very high number of assessment tools and the associated heavy paperwork, which the previous assessment system had not required. Thus, T2Lama30 said that since documenting was a key requirement for NAS enactment, teachers worked hard to do this during the documenting of students' activities and results, which led to ongoing complaints about the workload.

HA6 also referred to the perceived restriction of practitioners; T1Hilal7 confirmed that teachers had insufficient freedom and flexibility to choose the appropriate assessment tools, being obliged to implement fully the stipulations of the document. The outcome is expressed in the first few words of HA6 cited above, namely that teachers' negative perceptions of the assessment document led them to ignore most of its content and resist its full enactment as the MOE planned. HC12 agreed, noting that most teachers did not even read the document in full, let alone follow all of its requirements. Three of the teachers (T2Lama42, T1Hilal7 and T1Tarik2) explained that their values obliged them to decide what was appropriate for their students and therefore to depart from the document in selecting assessment tools and allocating marks. They justified this by adding that they were unconvinced of the value of the contents of the NAS document, particularly the assessment tools, many

of which they considered unsuitable for the Omani school environment. It seems that the imposition of certain tools had forced teachers to use alternatives. In other words, imposing such tools appears to conflict with the idea that they should drive teaching to meet the various learning goals, rather than being goals in themselves (Al-Ksabi, 2005).

Likewise, Seema8, T2Lama5 and T1Tarik2 asserted that the assessment document did not explain the instructions for NAS enactment, nor did it cover some of the basics, such as clear criteria for some of the assessment tools, so each teacher implemented the tools without following certain procedures and principles. For instance, some instructed students to do their homework at school, while others told them to take it home. Another difference was that some teachers awarded their students five marks at once, or divided them over all of the homework, whereas others transferred them to other tools. However, HB12 argued that notwithstanding the missing or unclear criteria for some of the assessment tools, all practical activities (by which she apparently meant laboratory experiments) had individual assessment forms specifying the criteria and division of marks.

Surprisingly, one teacher (T1Hilal8) stated that the criteria were unclear not only for teachers, but also for supervisors, which their discussions show to be true. It seems that this was a very important issue facing those with responsibility for monitoring teachers' performance, raising the question of how they could confidently advise teachers on implementing NAS. Furthermore, this appears to confirm the lack of clarity of the criteria.

Alternatively, T2Seama4 reported that she would sometimes meet with her peers to set new assessment criteria for some tools, or to explain and simplify some of the existing criteria. However, she asserted that the modified criteria were not clear enough, because most of the teachers did not have sufficient experience in this area. T1Hussain5 agreed, adding that they also lacked training: *"Some of the tools do not have clear criteria and we've had to add them in, although we don't have enough experience and haven't had any training in this area"*. It should also be noted that the MOE document itself describes the criteria specified for some tools as "suggested" rather than

mandatory, thereby apparently inviting school staff to collaborate on setting or amending the criteria for those tools.

In contrast, T3Maryam7 stated that the criteria for some assessment tools, such as oral presentation, were clearly specified in the assessment document and that she was satisfied with them. She and HA23 also reported that there was a degree of cooperation between teachers, departmental heads and supervisors to explain the more confusing aspects of some criteria.

Equally importantly, T2Lama7 suggested that to address the deficiencies of the assessment document, it should be rewritten as a detailed assessment guide containing instructions and step-by-step explanations to help teachers to perform assessments in ways that they would see as suitable for their students. On the other hand, she said that the MOE should give teachers more flexibility to select and implement the assessment tools, as well as designing the criteria. At first glance, these two points appear to be contradictory, but they may not be, because as she explained, the suggested guide might only contain examples to illustrate some of the tools, rather than imposing particular tools, while also allowing teachers to apply the criteria and the assessment weights to these tools. Therefore, as T2Pearl58 confirmed, such a guide might help teachers to understand the principles behind the implementation of NAS tools and how to apply them, while maintaining teachers' freedom to select appropriate tools. However, it must be questioned whether teachers really have the power to present their experience and are ready to put more effort into NAS enactment.

In summary, there were different views on the importance of the assessment document and its usefulness to school staff. The majority of participants argued, with some detailed justification, that they did not benefit from it, except for the marks registration form, while only one participant (T3Maryam10) described the document as fully useful to her. Most members of school staff expressed views which were coherent and consistent with each other, although three participants (T3Maryam10, T2Lama7 and T1Hilal8) presented different individual opinions of the benefits of the document, suggesting that the MOE should provide a guide to assessment for teachers and that supervisors should help to clarify the criteria.

Satisfaction with resources associated with NAS enactment: As reported in Section 5.2.7, some of the assessment tools were perceived as inapplicable due to a lack of resources and necessary conditions of enactment. Therefore, HB27, T1Tarik 24 and T3Aisha15 spoke of a gap between the stipulations of the assessment document and the reality of enactment, which HB27 and T2Lama11 attributed to inadequate resources such as properly equipped laboratories. This subsection examines school-level interviewees' responses on their satisfaction with the availability of such resources, beginning with the words of a teacher and a school principal:

> One of the real challenges I face is that the number of students in the class has increased to 38. There is also only one laboratory in the school and it does not meet the teaching requirements, as a lot of equipment and chemicals are unavailable, or only available in very small quantities that do not meet our needs. Despite this, I'm supposed to teach laboratory skills to more than 1500 students. How am I expected to do that under these circumstances? I asked the principal to allocate at least one room for science if it was not possible to add another laboratory, but he answered that there was not enough space. (T1Tarik5)

> Before the academic year 2011/2012, there were insufficient resources, so teachers were paying out of their own pockets to provide what was needed for some activities, such as buying their own stationery, paying for copying, teaching aids and more, which they were not happy about and would simply ignore some of the activities. In contrast, since 2011/2012 the situation has improved, as the MOE has started to provide basic resources and allocates 1600 Omani Rial annually as a petty cash allowance, which can be increased up to 2500 Omani Rial. (PC8)

The three main themes examined here are class sizes, laboratories and funding. Participants saw the high average class size as representing a real challenge for teachers. T2Lama27 confirmed T1Tarik5's claim, supported by the researcher's own observations, that this had risen to 38 students and stated that this posed a real challenge, especially as lessons lasted only 35 to 40 minutes. T2Lama27 also complained that large classes prevented him from implementing some of the activities specified in the assessment document, while a fellow teacher (T2Seama23) reported problems with distinguishing the needs of individual students among such large numbers, which in turn made it difficult to write and implement remedial plans for each student. Conversely, PA2 asserted that reducing class sizes would play a key role in supporting the capability of teachers to translate NAS policy into practice as the MOE planned, by allowing them to spend more time with each individual student. In

short, these contributions constitute evidence of a relationship between class size and teachers' ability to enact NAS policy as intended.

As to science laboratories, it was noted that each school had only one poorly equipped lab, regardless of the total number of students in Grades 5-10. A head of department warned that this prevented schools from meeting the objectives of NAS:

> I thought one of the basic aims of this system was to teach students the required practical skills, such as laboratory skills, but unfortunately, the reality is very different, as NAS does not meet this objective due to various obstacles, such as insufficiently equipped school labs. (HA11)

A number of other participants (HB27, PB9, T2Lama12, T1Hussain5, T2Pearl9, T1Hilal2 and T2Seama3) reported that their schools had only one laboratory each, supposedly to be used by more than 1,400 students. HB27 and T2Lama12 quoted the assessment document as specifying that students should perform a series of laboratory experiments to be assessed individually and collectively, twice per term, which was impossible given the large number of students using a single lab, poorly equipped and lacking adequate supplies of chemicals. Furthermore, HC7 claimed that some teachers refused to allow students to carry out some of the experiments for fear that they might damage equipment which the MOE would be reluctant to replace. T3Maryam5, however, reported that her school laboratory was able to meet the requirements of all students. A partial explanation may lie in my observation that while class sizes had greatly increased in schools located in high density urban areas, T3Maryam5 taught in a rural school with only 90 students in Grades 5-10. On this topic, HC7 stated that the MOE based its allocation of resources on the type of school rather than its size, so that each Grade 5-10 school was allocated one lab of the same size, with the same supply of materials and equipment, whether it served 100 students or 1500.

Several senior participants (HC7, PB9 and PA9) agreed with PC8 that funding for the needs of NAS enactment such as stationery was now adequate, having been insufficient until 2011/2012. They explained that a teachers' strike in October 2011 had prompted the MOE to provide schools with adequate printers, photocopiers, teaching aids and posters, as well as an annual petty cash allowance of more than 2500 Omani Rial (approximately 5000 GBP), to

cover various purchases and equipment maintenance. It can be concluded that since the strike, the conditions of NAS enactment had somewhat improved.

In summary, there was broad agreement among participants on a degree of dissatisfaction with class sizes and laboratories, although one teacher, T3Maryam5, expressed satisfaction with laboratory provision in her school. There was also general satisfaction with an improved funding situation. Overall, there would seem to be a relationship between the availability of resources associated with NAS and teachers' ability to enact the policy.

Satisfaction with the supervision of NAS enactment: This section turns to the views of school staff on the role of supervisors in supporting science teachers during NAS enactment. My own experience at the MOE suggests that official supervision is often task-oriented, focusing, for example, on the completion of a certain curriculum and NAS enactment. A school principal gave this response:

> Supervisors are supposed to support teachers' work, including implementing this system, by advising them, but unfortunately a lot of them are under pressure, as each of them supervises more than 20 schools, which is more than 80 teachers. Therefore, they cannot visit teachers more than once each term. The teacher and supervisor are supposed to meet on a regular basis in order to address any obstacles and discuss any related issues. On the other hand, the head of department and the teachers are trying to work together and cooperate to support their performance. (PC10)

Two critical points emerge from this interview excerpt: the failure of supervisors to fulfil expectations and the support that heads of department can offer. The suggestion that excessive workload prevented supervisors from playing their expected role was endorsed by HC4, T1Hussain6 and T1Tarik13, who added that some then worked ineffectively because they did not have a good grasp of the philosophy behind NAS or enough experience of its enactment. Whatever the reasons for it, a considerable number of participants, including T3Aisha5, T3Mohamed26, T2Pearl20, HC4, T1Hussain6 and T1Tarik13, stated that their supervisors had not supported them during the implementation of NAS tools, nor had they answered their questions in this regard. In detail, they argued that the supervisors were more interested in following up the implementation of exams, in whether the scores were documented correctly (assessment of learning) and in the

implementation of the curriculum content according to the plan. One participant (HC4) said that the supervisors considered teachers to be well-qualified, with a comprehensive understanding of NAS enactment, and that they dealt with them accordingly. In other words, they chose not to observe their teaching and to provide them with useful feedback and advice. T2Lama31, HC4, T2Pearl20 and HA24 made a similar point, that the majority of supervisors paid more attention to administrative issues such as preparing teachers' appraisal reports than to advising them. Likewise, a school principal said, *"Typically, supervisors concentrate on administrative tasks, such as following up teachers who are frequently absent from school for long periods of time, and teachers' evaluation, rather than the teaching itself"* (PA19).

The majority of practitioners appeared to be dissatisfied with the performance of supervisors in supporting teachers in their enactment of NAS as an AFL tool. A few, however, such as T3Maryam14, HB19, T2Seama20 and T1Hilal8, expressed the belief that supervisors had two main roles: supporting teachers and providing them with advice in order to improve their practice, as well as evaluating their performance.

Finally, PC10 said that supervisors' performance depended on their experience, the schools' circumstances and the relationship between teachers and supervisors, which might be one of cooperation and common interests, or a relationship between the evaluator and the person being evaluated, which might affect the extent to which supervision services were utilized.

On PC10's second point, the three heads of department (HC4, HA24 and HB19) agreed that they sought to support teachers in NAS enactment as much as possible. However, they claimed that many obstacles, such as their workload, prevent them from doing as much as they might like.

> Basically, I have to teach 12 lessons a week and sometimes as much as 16, if a teacher is absent. Another of my duties is to advise my team of 20 teachers, especially when they face some pedagogical or administrative challenges. I'm also responsible for following up on the final exams and other tests, such as TIMSS, and I have to prepare the first drafts of teachers' annual appraisal reports. Those are only some examples of the tasks that I'm supposed to do even though I haven't had any training on some things, like implementation of some of the NAS tools. (HB19)

T2Lama31 partially corroborated this account by remarking that heads of department were usually very busy with administrative matters such as teachers' absence, rather than their teaching itself. Three other teachers (T1Hilal8, T1Tarik13 and T2Pearl20) gave another explanation for department heads' inability to support teachers and to answer their queries, namely that they had no more experience than the teachers and had not received any specialized training in NAS. Equally importantly, HC stated that he did not have the authority to modify or adapt the assessment tools to suit students' needs and the school environment. All of this suggests that heads of department had functions quite similar to those of their teachers. On the other hand, T2Seama20, T1Hussain6 and T3Aisha5 firmly believed that although department heads did not play a major role in advising teachers, they were active in managing cooperation among teachers in order to exchange knowledge and ideas, as well as activating so-called peer learning. The overall conclusion is that department heads were seen to play a limited role in advising teachers, both directly and indirectly, on their NAS practice.

Satisfaction with moderation: The limited extent of school-level participants' satisfaction with the moderation aspect of the assessment system is illustrated by the words of a principal:

> Despite moderation having significant purposes such as ascertaining the credibility of the assessment system, unfortunately the MOE's documents are mainly directed to Grade12 rather than other grades. (PB12)

As noted in Chapter 4, the assessment documents specify that moderation should cover all school grades from 1 to 12, yet a considerable number of school staff members, such as T1Hussain5, T1Hilal20 and PB12, claimed that the MOE carried out formal moderation for Grade 12 only, because it marked the end of schooling, when students obtained the General Certificate, considered to be a criterion for competing for higher education opportunities. Therefore, it was seen as necessary to investigate the proper application of NAS tools and to verify the credibility of students' results at that point. Furthermore, a majority of school staff members, including PC18, PA11, T2Lama30, T1Tarik19, T2Seama4, HC4 and T1Hilal20, highlighted the absence of even any informal moderation for Grades 1 to 11. It seems that the implementation of moderation was limited to the formal type, conducted

by a visiting committee from MOE headquarters, whose main concern was the assessment of Grade 12.

Accordingly, this subsection examines interviewees' opinions on the extent to which this formal moderation had achieved its stated purposes, as identified in the previous sections of this chapter and in Chapter 4. First, many perceived it as encouraging teachers to document their students' activities. T2Pearl28, for example, saw the moderation work method as based on checking students' portfolios, exam results, activity papers and marking records, while HB21 explained that it was only since the implementation of NAS that such documentation of students' work had been compulsory for teachers. On the other hand, T1Tarik16, T3Mohamed6 and HC4 criticized the moderation mechanism as paying more attention to paperwork than to teaching itself. Furthermore, T3Aisha4, T3Maryam11, T2Pearl28 and T3Mohamed6 stated that there was no agreement on how to document students' work or on how to collect and store the results. This criticism is consistent with observations made during the research that there was no agreement on the documenting of students' work, particularly in Grades 5-11. For example, I observed that some teachers recorded students' activities directly in their notebooks and that some collected them in portfolios, whilst others did nothing in this regard. I also noticed that some teachers kept two types of portfolios, one for collecting students' summative assessment work and another for formative assessment activities, whereas other teachers used one portfolio for collecting all of the work to be used in awarding marks, such as short tests (summative assessment), but stapled students' formative assessment activities into their notebooks. Yet another group of teachers were seen to use only one portfolio for all students, to collect their summative assessment activities, apparently in order to keep some work as evidence that could be presented to officials and parents. Grade 12 teachers seemed to be more interested in documenting their students' work in portfolios, perhaps in order to presence the type of evidence usually requested by the official moderation team. Finally, regardless of the type and mechanism of student documentation, it may be considered important as to whether it is used to improve learning or simply to facilitate the awarding of marks.

Second, moderation was seen as intended to evaluate the credibility of teachers' practices regarding the implementation of NAS tools and the awarding of student marks. However, while T2Seama4, T1Hussain5 and T3Aisha13 agreed that moderation monitored students' activities for this purpose, other members of staff (T2Lama23, T1Tarik19, PA11 and HC23) questioned the reliability of evidence such as student portfolios and marking records to be presented to the moderation committees, because this did not reflect the reality of teachers' practices. By the same token, the practitioners HC23 and T3Mohamed13 explained that teachers would often select items from students' portfolios which had been awarded high marks and present only these to the committee, in order to avoid being questioned about any discrepancy between students' high scores on the other tools compared to examinations.

The third point made by practitioners, which follows from this, was that moderation could help to reduce significant mismatches between students' final exam results and those on continuous assessment tools. Many staff members (HC23, T1Hilal20, HC23, PC18, T2Pearl28, HB21, T1Tarik19 and T2Lama23) drew attention to just such a lack of correlation, asserting that students very often scored much more highly on other NAS tools than in the exam. Regardless of the reasons for this marked difference, T1Hilal20, PC2, T1Tarik19 and T2Lama30 argued strongly that carrying out moderation at Grade12 had helped to reduce the width of the gap; in many cases, the moderation committees had decided to reduce students' continuous assessment scores accordingly, which in turn had made teachers review their marking practices.

School staff also saw moderation as strengthening school-parent relationships. A considerable number, such as PC18, T3Aisha13, T3Maryam11, T2Seama4 and T1Hussain5, described moderation as giving parents reassurance and a degree of satisfaction, as well as boosting their confidence in teachers' practices, both directly and indirectly: directly through the audit and ensuring the accuracy of Grade12 students' results, which would be very important for their enrolment in higher education, and indirectly

through the documenting of students' work, enabling parents to follow their performance and results.

Finally, T1Hilal20 and HB21 suggested that moderation should be carried out for all grades in order to encourage teachers to be more serious and more credible in their practices. Furthermore, HB21 reported that the actual practice of moderation in Grade 12 covered only a random sample of 20 to 30 per cent of students per class, which she believed to be insufficient, especially at this grade, arguing that all students should be included in order for the system to be fully effective and credible.

Satisfaction with TIMSS: This final subsection on school staff members' satisfaction with NAS enactment analyses their responses concerning participation in TIMSS. The majority appears to have believed, with PB14, PC25 and T3Maryam26, that the study had been widely accepted as a significant addition to the educational system. However, participants argued that it had been carried out in a way that did not meet the declared objectives.

> I thought that TIMSS would be significant in improving the teaching and learning of science. However, the exceptional circumstances of its implementation in schools, such as the intensive training of students using the booklets that were designed for TIMSS to explain some of the exemplar questions, and the techniques of items being answered, may have had an impact on student performance in this study. Thus, maybe it is difficult to rely on the results to improve learning. In fact, TIMSS tends to be more of a competition than a study. Therefore, the Ministry seems to be more interested in gaining public approval, by announcing that the Omani system is ready to be involved in international participation, than in the main objectives of such participation, such as improving curricula, teaching methods and assessment tools. (T2Lama48)

The three main areas of criticism made by this teacher concern the pursuit of public opinion, the fostering of competition and the low value of unreliable results in improving teaching and learning. First, MOE officials were perceived to be more interested in influencing public opinion than in achieving the basic objectives of TIMSS. In other words, as HB24, T1Hilal24 and T1Tarik23 put it, the MOE had decided to participate in TIMSS primarily to boost its public image, while HB24 and T2Seama7 argued that because of these special circumstances of its implementation, the study had not fully achieved its objectives, nor did the results reflect the reality of students' performance under normal teaching conditions. To put it differently, T2Lama16 and T1Tarik23

reported that there had been many inappropriate practices, such as a group of lessons having been removed from the science timetable to allow time for training students in various techniques to deal with TIMSS tools, including ways to memorize and recall the necessary information. Similarly, HA30 claimed that his principal had put pressure on him and the teachers to intensify such activities and to encourage students to memorize answers to most of the TIMSS questions; in other words, the study was conducted under artificial conditions. Respondents described this as “teaching for the test” and PB14 claimed that the students’ responses to the TIMSS tools were not made like this because they particularly wanted to do so, but because they felt that they were obliged to.

However, another school principal (PC25) stated that the TIMSS tools had been used objectively and completely transparently, under the normal conditions of the school and without any pressure, while T3Aisha20 reported that students at her school felt comfortable with TIMSS, as the results were not included in their summative assessments. Likewise, HB24 believed that the implementation of such study tools might represent a new trend, which could help to overcome the prevailing beliefs among some students and school staff that using such tools, for example, should be limited to the assessment of students’ attainment, rather than surveys.

It seems that some schools had implemented TIMSS under normal conditions, without any intervention in the teaching process, but that most had engaged in targeted preparation that involved replacing normal science classes with training in taking TIMSS tests, which may have interfered with the basic objectives of the science curriculum.

The second criticism was that TIMSS was viewed as more of a competition than a study aiming to improve the curriculum, teaching methods and assessment tools. A considerable number of school staff members, such as PC25, HC25, PB14, HA30 and T1Hussain23, emphasized their belief that the MOE benefited from the TIMSS results, mainly in the classification of schools, and that it rewarded the schools with the highest scores, even if they had not reached the global average of 500 points, by providing financial and in-kind prizes at lavish ceremonies. In contrast, they felt that the MOE paid no

attention to the schools that had the lowest scores, perhaps to encourage students, schools and families to work harder, but that focusing on competition for perceived honour, without providing feedback to all schools, was contrary to the main objectives of TIMSS.

Third, the TIMSS results were seen as inaccurate and therefore unhelpful to the MOE in improving teaching and learning in science. Thus, PC25, PB14, HC25 and HB24 stated that they did not believe that the TIMSS results benefited the MOE in this way and that they had not seen any change based on these results. Similarly, teachers from three different schools (T2Pearl42, T1Hilal24, T1Tarik23 and T3Maryam26) reported that after the results were published, teachers were given no detailed feedback on their students' performance and were offered no training on question design, for example; nor did they observe any change in the curriculum. It seems that they considered TIMSS to be a diagnostic tool that could help to identify training needs and areas where the curriculum could be improved.

Nevertheless, T3Maryam26 and PC25 went on to describe the TIMSS test items as useful for teachers, because they were not associated with the content of a particular curriculum for a given grade, but rather measured students' knowledge and skills acquired throughout their school years, as well as in all educational systems. In a similar manner, T3Aisha20, HC25, T3Maryam26, PB14, HB24 and T1Hussain23 argued that because the TIMSS items were extremely well designed, they considered them to be a model for teachers to create exams and quizzes. They added that they could be used to train students to respond to questions at higher cognitive levels.

Despite the exaggerated and artificial conditions of TIMSS implementation in the majority of schools, which were supposed to improve students' results, as well as the participation of Omani schools in three study cycles (2007, 2011 and 2015), all participants expressed some dissatisfaction with the performance of schools in the study, the Grade 4 and 8 results in both science and mathematics having fallen below the international mean score of 500. Some practitioners (T1Hussain23, T1Hilal24, T1Tarik23, T2Lama16, T2Pearl42 and T3Maryam26) attributed this to the fact that, as usual, no action was taken by the MOE after the publication of the results, especially on

aspects of the professional development of school staff and improving the assessment tools and curricula. The participants concluded that this criticism applied to all of the studies conducted by the MOE, moderation reports, supervisory visit reports and the students' routine achievement results. Therefore, learning and teaching stagnated, without development or change.

5.3.3 Teachers' credibility

This section explores school staff members' perspectives on practices reflecting the extent of teachers' credibility in implementing NAS, beginning with this appraisal by a school principal:

> As the assessment documents state, this system aims to improve student learning, which is the so-called assessment for learning. Therefore, despite the challenges that teachers may face in the enactment of the system, the credibility of their use of NAS tools is crucial. (PC13)

PA8 agreed that AFL constituted the main purpose of NAS; therefore, fulfilling the purpose of the system depended critically on the trust and competence of teachers. Reflecting the main emphases of the research participants, the following subsections consider teachers' credibility in relation to the AFL function of NAS, to the awarding of grades and to student-centred learning.

Teachers' credibility and NAS as assessment for learning: On the subject of the credibility of teachers' enactment of NAS as an assessment for learning, a considerable number of participants, such as HC3, T2Pearl12, T2Lama24, T3Maryam10, PB7, HB12 and T3Mohamed10, claimed that their practices basically focused on improving students' learning through the implementation of NAS tools. However, it can be seen that not all of their practices supported this claim. For example, one teacher said:

> I focus on students possessing various key skills, such as practical skills. Sometimes, I repeat experiments more than twice in order to ensure that the students have understood these skills, as well as to gain higher marks, so I can ensure that they move up to the next grade. (T2Lama23)

As shown in the following text box, the assessment document (MOE, (2014a, p.46) states that experiments are to be assessed once only, not after being repeated, yet I observed that T2Lama23 repeated some experiments up to five times for students who did not get very high marks.

ج. تقويم الاختبار العملي. هناك عدة جوانب يجب الأخذ بها عند تقويم أداة الاختبار العملي من بينها: - تقييم هذه الأداة مرة واحدة فقط في نهاية الفصل الدراسي الواحد وبشكل فردي وبدون إعادة حيث يمنح الطالب فرصة واحدة فقط.
C. The assessment of laboratory work. There are several aspects to consider when assessing laboratory work, including: - Laboratory work is assessed only once and individually without being repeated.

It is not clear whether T2Lama23 knew of these instructions; nor can it be confirmed that she measured the real understanding of students or their possession of these skills, because the lack of properly equipped laboratories meant that not all students participated in these experiments. Therefore, the teacher asked students what results they would expect from the experiments and listed their replies in their activity books, rather than recording the results of experiments that had actually been conducted. I observed that she asked them a number of questions which simply tested their memory and awarded marks on the basis of their replies. She seems therefore to have assessed them on their ability to memorize expected experimental results discussed in advance. In other words, her main aim was to award good marks, even if this entailed contravening the established principles of assessment. Moreover, I noticed that she used NAS tools primarily for diagnostic purposes, while claiming that she did so only as a first step to determine what action to take by implementing other NAS tools in order to improve her students' learning.

Three other participants (T2Pearl12, T2Seama9 and HA13) also stated that at the end of each topic or unit, they designed short tests and activities, not for the purpose of awarding marks, but to improve students' learning. It appears that they used these tools to diagnose students' learning as preparation for step taking action to improve their learning. Similarly, T3Maryam10 stated that she used NAS tools to diagnose students' learning so that she could design appropriate remedial plans. However, she explained that these plans were not always activated and were often not useful, due to time limitations and the absence of parental cooperation with the school, although she did provide parents with feedback on students' performance by

writing comments in their planners and notebooks. I observed that some teachers wrote comments for parents directly in the students' notebooks and that some attached the students' activities, while others did nothing in this regard. On this subject, PC22 argued that the weakness of designing and carrying out remedial plans, in conjunction with the simplicity of the procedures for moving students up to the next grade, tended to produce low-performing students.

On the other hand, PA8 and T1Tarik16 argued that very few members of school staff implemented NAS as AFL, since their practices, as well as those of the supervisors, contradicted NAS philosophy, and that they were more interested in recording marks, in other words, in AOL. This is consistent with the remarks of HC2 and HB27, that supervision specialists and all other official stakeholders involved in the monitoring of NAS enactment were interested only in the marks registration form, paying no attention to any of the other circumstances of NAS enactment, offering teachers no feedback on their performance, nor answering their questions. On the contrary, they were said to focus only on teachers' annual appraisals, rather than advising them. This would indicate that they were concerned with the final product of NAS rather than its processes. Moreover, I observed that teachers mainly used oral questions to provide students with ongoing feedback on their answers. While it must be noted that I conducted few observations of teachers, that teaching conditions probably varied from one lesson to another and that my presence in the classroom may have affected the teachers' performance, it does appear that they rarely used the other tools to provide ongoing feedback that could have been used to improve students' learning.

Surprisingly, a school principal (PA8) emphasized that a considerable number of teachers lacked credibility in their implementation of NAS tools, believing that these would help them to control their students' behaviour in the classroom. In other words, they served to intimidate students, due to the fact that teachers had the authority to award marks and therefore to decide whether particular students should move up to the next grade. Thus, relatively few teachers employed NAS tools to motivate students and improve their learning. The following response of a teacher illustrates this:

> NAS is a beautiful system that encourages students to be more active and interested in gaining marks, so it has an effect on their behaviour, making them more obedient to the teacher and more disciplined in the classroom. Therefore, it promotes the teacher's status and grants prestige and power among students, representing a source of pressure on the student which will lead him to be more interested. (T3Aisha3)

T3Aisha3 seems to have believed that classroom management could be helped by using NAS tools to intimidate students by awarding or withholding marks. Similarly, T3Mohamed12 claimed that the formal and non-formal registration of students' grades on the assessment tools could sometimes be used to reward or punish them, recognizing that this use of the records served classroom management and the control of student behaviour, rather than the real purpose of the assessment system.

It is important to recall that the difference between AOL and AFL depends not on the type of tools, but rather on their purpose. Thus, if teachers award marks for the majority of NAS tools and count these towards each student's final grade, this would seem to amount to the assessment of learning, whereas if the marks do not count towards the final grade, but rather serve the purpose of providing students with feedback on their learning, this would constitute assessment for learning. For example, a considerable number of participants, including T3Maryam16 and PB3, argued that homework should not be used to assess learning, because it is not appropriate to distinguish between students on an exercise which many will have completed by copying and pasting each other's work. Instead, homework can be used more profitably as an AFL tool.

It appears that there are multiple reasons for the lack of credibility of the practices of some teachers, including the insufficiency of various resources such as laboratories, the influence of certain convictions and beliefs on teachers' practices, poor understanding of NAS and a weak ability to distinguish between various terms such as AOL and AFL or formative, summative and continuous assessment.

Finally, as I am employed by the Educational Assessment Department of the MOE, it is appropriate to mention that the education system in Oman operates the principle of students either moving up or repeating the grade, relying not on remedial plans but on final grades obtained by adding formative

assessment to summative assessment. Therefore, as soon as students transition to the next grade, their existing portfolio recording their remedial plans and activities is no longer considered. This mechanism may have an effect on the practices of school staff members.

Teachers' credibility and the awarding of grades: This subsection analyses the responses of school staff concerning the credibility of teachers' practices in determining grades by means of NAS assessment tools, as well as the difference between students' results in formative and summative assessments. A head of department offered this detailed account:

> I design and implement NAS assessment tools so that their level is close to the nature of the final examinations, in order to prepare students for these exams. I try to assess students properly and fairly through these tools, but some teachers use them to give inflated marks. I consider this is a kind of cheating, a lack of credibility and an unrealistic implementation of the tools. These teachers usually do this to make it easier for students to gain more marks as a kind of security for moving up to the next grade, especially if the final exam is difficult. So this generosity in marking is seen as avoiding the teacher being blamed by the school administration, which wants their students to obtain high scores, which in turn has an effect on the MOE's opinion and public opinion, as well as avoiding pressure from parents. (HC23)

Three crucial points emerged during this part of the interview, concerning external pressure on teachers, reliance on final exams and the summative/ formative distinction. First, the credibility of teachers' enactment of NAS was seen to be affected by the pressure exerted on them by school administrations and parents to award students unjustifiably high grades. Part of the cause, as T3Aisha5 and PA14 explained, was that when MOE officials and specialists visited schools, they did not discuss the details of NAS enactment with teachers, their main concern being to check the records of students' scores without considering why they might have declined or improved; nor did they ask about the process of awarding grades. One teacher went so far as to claim that the authorities encouraged bad practice:

> Through the MOE visitors, the Ministry hints indirectly that schools should inflate their students' marks through various assessment tools, in order to enable them to move up to higher grades, thus improving the community's impression of the schools' performance, and hence of the Ministry's achievements. (T1Hilal6)

Additionally, HA3 argued that the ease with which a considerable number of teachers awarded marks up to 60% in some grades could lead to students not

taking their work seriously. He attributed this behaviour by teachers to pressure on them from parents and school principals to move students up to the next grade.

PB3 conceded that the MOE paid little attention to the detailed implementation of NAS tools, because it cared more about students' final results, but stated that she herself monitored both of these. Accordingly, she claimed that her school aimed to enhance student achievement by encouraging both staff and students to make more effort, thus improving the school's ranking among other schools. It seems that the values of some school staff members could lead them to achieve these objectives with credibility, rather than by underhanded and unacceptable means.

One teacher, T1Tarik2, surprisingly suggested that the MOE might have a policy to reduce the number of students repeating school years, despite the opportunity this would give some students to catch up with their peers. He added that the MOE saw repeating as having many negative consequences, such as increasing expenditure on education and compromising the quality of teaching by raising average class sizes. This hypothesis indicates the need to search further in the literature on the advantages and disadvantages of repeating the school year.

The second matter raised by HC23 was the great importance attributed to summative assessment, so that formative assessment tools were adapted to prepare students for the final exams. In other words, teachers were teaching to the exam, giving undue weight to AOL rather than AFL, as evidenced by what some teachers said about not having credible practices in NAS enactment. Indeed, T2Lama46, T3Aisha13 and T3Mohamed2 strongly asserted that they could not trust the results of any assessment tools except the final examination as a way to judge students' performance.

T2Seama12 agreed with her three fellow teachers that the final exam results were more accurate than those of other assessment tools, because the implementation of the latter varied from teacher to teacher, depending on their beliefs and perceptions. This variation might also be affected by absent or unclear criteria, as well as the lack of credibility in teachers' practices. Accordingly, she argued that officials could basically rely on exams in order to

analyse a school's performance, especially if they were designed centrally with the same specifications for all schools of Grades 5-12. Similarly, T2Lama47 explained that she felt unable to depend on assessment tools other than examinations to determine individual differences between students, because of the high convergence between students' marks. For instance, some teachers might use these tools to assess a class 34 students and award a very narrow range of 58-60 marks out of a possible 60, whereas there would be clear individual differences among the same students in their final exam scores. It seems that some participants had no confidence in the credibility of NAS tools other than exams for judging students' performance, because they were aware of their own considerable leniency in marking.

A closely related issue raised by HC23 was the significant observable difference between students' results in formative and summative assessment, the former tending to be much better. The majority of participants agreed that a gap existed, but they differed in whether they explained this phenomenon by reference to the behaviour of teachers or to the assessment tools themselves. A number of interviewees (T1Hilal20, HC23, PC18, T2Pearl28, HB21, T1Tarik19 and T2Lama23) argued that this gap resulted from the lack of credibility of some teachers' practices, influenced by values and beliefs, including excessive deference to the real or perceived wishes of school administrations and parents, which sometimes led them to be careless of established procedure. Thus, they would allow students to cheat during the use of NAS tools and would ignore the set criteria, such as by giving students three or four opportunities to repeat a tool in order to boost their marks, despite the assessment document clearly disallowing this.

Other members of school staff (T1Hilal20 and PC23) attributed the gap between formative and summative assessment results to the lowering of assessment tool specifications, complaining that these were not aligned with the actual needs of the students, being too crude and simple to serve the achievement of learning objectives. T1Hilal20 therefore suggested that the MOE should involve school staff in the development of improved assessment tools. His fellow teacher T3Maryam16 agreed that the tools needed to be reviewed and updated, especially as regards the weighting of marks,

suggesting that it was not desirable to assign marks for homework, for example, given that students often copied each other's work.

A school principal went considerably further in proposing reforms to address the formative/summative discrepancy:

> I believe that the most important issue is to review all assessment tools, including the final exams, to make them consistent with each other, as well as making the exams more realistic and closer to the actual level of students. The current situation requires the teacher to train students for the final exam and memorize information, which loses sight of many of the system's objectives, because the assessment only focuses on the ability to memorize and recall facts (PC18).

T1Tarik19 made a suggestion compatible with this proposal, namely that the final exams be prepared not centrally but locally in schools, where the actual level of the students could be taken into consideration.

Another teacher, T2Pearl28, offered a different explanation: that the gap was caused by most assessment results being dependent on the extent of students' participation during the implementation of the tools, with the availability of multiple opportunities to gain more marks, whereas exams were conducted under very different conditions, such as limited time, the usual psychological state of students and the pressure on performance that naturally accompanies the exam period.

Overall, the school-level participants appear to have addressed issues concerning the use of formative NAS tools primarily in terms of the summative purpose of assessment, rather than the promotion of learning. Moreover, they felt that teachers should ensure the fairness and credibility of all assessment results.

Teachers' credibility and student-centred learning: This section examines school staff members' perspectives on the credibility of teachers' practices in NAS enactment through a student-centred learning approach, starting with these words of a head of department:

> I think a lot of teachers have a lack of credibility in their practices regarding the achievement of one of the main aims of this system, which is the enactment of this system through a student-centred learning method. So, the teacher is still taking the role of lecturer, delivering information in one direction, and the student is often just a receiver. And the teachers behave in

> this way because they are influenced by various factors, such as the unavailability of resources. (HB17)

The twin issues raised here concern teachers' failure to deliver student-centred learning and the factors influencing them to do so. Several participants (PB14, PC14, T3Aisha10, HC26, T3Maryam25, T3Mohamed14, T2Lama37 and T2Seama19) stated that they accepted the importance of student-centred learning, believing that students should be engaged effectively, but the teachers among them admitted not following this approach, citing a number of obstacles discussed below.

The 18 lesson observations conducted as part of this research revealed that a majority of teachers did indeed take a largely teacher-centred approach, where they had the main role of developing ideas throughout the lesson. Furthermore, they were unduly interested in testing students' memory and their recall of facts and basic concepts. Therefore, the lessons took the form of lectures, where the teacher spoke while the students sat and listened. Some teachers were observed to work partly through the student-centred approach, involving their students in developing ideas during the lessons, but there were only two such instances among the 18 lessons. One of these teachers divided the class into five working groups, whose members held active discussions of the topic then worked together with their teacher to develop the ideas that emerged. I also observed that a considerable number of other teachers divided students into groups in the form of cooperative learning, but the teachers were not themselves active in these groups, giving the impression that they had conducted the lessons in this way as a presentation of student-centred learning rather than a true performance of this approach.

The failure of most teachers to credibly put student-centred learning into practice was seen as being due to the influence of certain circumstances, such as a lack of resources. In detail, PB14 and T2Seama19 stated that teachers were unable to apply this approach with credibility because they had too little freedom to select NAS tools and were subject to pressure from the MOE to meet the requirement of covering all of the curriculum content listed in the textbooks, which was usually a very demanding goal in the limited time available. These circumstances forced them to use the fastest methods they

knew, as a form of strategic compliance (discussed below). In addition, PC14 and T3Aisha10 agreed with HB17 that another real obstacle to teachers adopting the student-centred approach was the shortage of resources associated with enactment, such as specialized training and properly equipped laboratories. One teacher (T3Maryam25) identified another real challenge for teachers in parents' failure to encourage their children to be ready for learning, with the result that students could appear lazy and disengaged. Finally, she added that there were not enough activities in which students could participate with the teacher in order to develop the ideas raised in lessons.

5.3.4 Teachers' strategic compliance with NAS enactment

This final section of analysis considers school staff members' views of teachers' strategic compliance with NAS enactment, which this teacher admitted to:

> I'm not convinced by many aspects of this system, such as the tools and the lack of correlation between the availability of resources and the way we're supposed to implement these tools, as well as the exhausting documenting of all the activities of our students, so my beliefs can sometimes lead me to enact NAS differently from what the MOE has decided. However, I do try to meet at least some of the MOE's requirements in part, in order to avoid criticism from the principal and officials. (T1Tarik10)

The essence of this account is that teachers' beliefs would sometimes lead them to enact NAS differently from the official policy, but that they would nevertheless comply superficially as a deliberate strategy. For instance, T3Mohamed10 stated that he and many other teachers would record lesson plans that appeared to conform with MOE requirements, while actually delivering the lessons as they saw fit for their students, even if doing so contravened official instructions, especially those specifying particular assessment tools for certain topics. Another example, given by T2Seama15, T1Hilal20 and T3Maryam16, was that the majority of teachers believed it to be pointless to assign marks for homework as part of the students' final assessment, because of the likelihood of plagiarism, so they would use other tools to award these marks, but falsely record them as being for homework assignments to give the strategic impression of compliance with MOE policy.

Surprisingly, PA13 claimed that while the assessment document allocated five per cent of the total marks for homework and five for presentation, some teachers instead allocated all of these marks to an assessment of behaviour towards other students. Therefore, rather than assessing the factors which these tools were intended to measure, such teachers gave the full ten per cent to well-behaved students and no marks to those who behaved badly. This principal's account is consistent with the suggestion of T3Aisha3 and T3Mohamed12 (Section 5.3.3) that NAS tools could be used as a classroom management device, by intimidating students into behaving well in order to gain marks.

Crucially, in spite of teachers indulging their own beliefs and values that might not align with the MOE's intentions regarding NAS enactment, they can be seen as carrying out some form of strategic compliance. For example, T2Pearl25, HC2 and PC6 reported that some teachers would record marks for tools which they had not actually used, simply to be able to present them to whoever asked to see them. It could be argued that the design of the official records might encourage teachers to engage in such practices, because it was based on assessing NAS tools as an aim in itself, rather than assessing the achievement of learning objectives through their use. Figure 5.4 shows that the record sheet listed the tools at the top of each column and the students' names at the beginning of each row, with no mention of the learning objectives, which may have been taken to suggest that these tools were an aim in themselves.

استمارة متابعة ورصد أداء الطلبة في أدوات التقويم

م	أداة التقويم	الأعمال الشفوية		الواجبات المنزلية	المشروع	الأنشطة العملية	الاختبارات القصيرة			المجموع	الاختبار النهائي	المجموع الكلي	مستوى الطالب (بالرمز)
	الدرجة / أسماء الطلبة	العرض الشفوي	الحوار الشفوي										
		٥	٥	٥	٥	١٠	١٠	١٠	١٠	٦٠	٤٠	١٠٠	
١													
٢													

No.	Students Names	Assessment Tools/Marks								
		Presentation	Oral Dialogue	Homework	Project	Lab work	Quizzes	Total without Exam	Final Exam	Total
		5	5	5	5	10	30	60	40	100
1										
2										

Figure 5.4: Register of students' performance in the assessment tools (translation below)

Similarly, PA14, T3Aisha5, HC23 and T1Hilal6 expressed the opinion that the MOE officials' main concern was to check students' marking records, rather than asking about the detailed processes of awarding these marks, and that this might encourage teachers to focus on the format of the records as a form of strategic compliance.

A further admission, by T3Aisha5, PA14, HC23, T1Hilal6, T1Tarik2 and T1Hussain5, was that some teachers, against their better judgement, inflated the marks of students who had not achieved the pass grade. The practitioners attributed this reluctant manipulation of scores to the fact that school administrations and parents exerted pressure on teachers to artificially boost the schools' results and reduce the number of students repeating a year. They added that teachers behaved in this way to avoid conflict not only with the administration and parents, but also with some students, who might, if dissatisfied with their grades, react by harassing the teachers concerned or vandalizing their cars. An alternative explanation, by T1Hussain5, was that teachers saw themselves principally as employees of the MOE, which paid them a good salary, and that they should therefore do whatever was

considered appropriate as a kind of strategic compliance to avoid any penalty, such as a salary cut or transfer to a more remote school.

On the other hand, some teachers used strategic compliance to focus on improving students' learning by benefiting from the advantages of the system. Thus, Seema8 and T1Tarik7 argued that teachers did not have sufficient power in the community, nor did they have membership of an independent body such as a national teachers' union which could help them to defend their rights, so they were forced to practise a form of strategic compliance, even though it conflicted with their beliefs and values.

Finally, T2Lama47 and HC23 asserted that a considerable number of teachers did not practise any form of strategic compliance, but adhered to the dictates of their beliefs and values, despite continually running the risk of exposure to official criticism and censure.

5.4 Summary

In summary, despite the variety of school staff members who participated in the research, it can be concluded that they all realized that NAS had a very clear primary aim to improve science education in Oman, in other words that NAS was intended as an assessment for learning. Furthermore, there seems to have been relative coherence and consistency in the views that the majority of these stakeholders' expressed regarding NAS policy intentions, such as those concerning moderation, accountability and resources. As to the reality of enactment, however, a considerable number of participants made contributions which diverged from policymakers' views on matters such as the decision to implement NAS and professional development. In contrast, a few school staff members were in line with the policymakers' views regarding the reality of the enactment of some policy intentions, such as its advantages and the extent to which assessment documents supported teachers' practices. Finally, some factors such as the cultural context can be seen to have influenced assessment practices, which in turn affected the enactment of NAS as an AFL initiative.

Chapter 6
Discussion

6.1 Introduction

Overall, the findings have shown that some effort has been made by the MOE to improve science education in Oman, such as through the professional development of science teachers and by providing the resources that are associated with the enactment of the NAS policy. Moreover, there is an alignment between the school staff members' interview responses and the declared policy intention that NAS should function as an assessment for learning. However, I have found that the reality of NAS policy enactment was not entirely consistent with this intention and that the extent of alignment depended on several factors including practitioners' experience. The aim of this chapter is to relate the findings set out in Chapters 4 and 5 to the existing literature. In more detail, Section 6.2 discusses NAS policy intentions, Section 6.3 examines teachers' enactment of NAS and Section 6.4 considers the influence of local culture on policy development and enactment in the education system.

6.2 NAS policy intentions

This study's findings demonstrate that science education has both unified and universal standards and has been given unprecedented attention and priority compared to other subjects, so the intentions behind NAS accord with global trends towards improving science education (Osborne & Dillon, 2008). The following subsections discuss some points that have emerged from this study indicating support for the MOE's intention to improve science education in Oman through the enactment of its NAS policy and other related projects.

6.2.1 Decisions on policy development

This study's findings have shown that NAS was introduced abruptly and without warning, so that practitioners lacked advance knowledge of the background to the project. According to the study participants, this can be attributed to the existence of a gap between practitioners and policymakers

(see Section 5.3.1). It was also found that the MOE usually develops its policies in isolation from local authorities and schools, then imposes them from the top down, and that the development of NAS policy was an example of this approach.

A considerable amount of published research indicates that policies are usually developed in several stages, namely identifying and defining needs, gathering information, drafting policy, consulting with stakeholders or interested parties, reviewing, finalizing and approving the policy (Anderson, 2014; Benoit, 2013; Brewer & DeLeon, 1983; DeLeon, 1999; DIY, 2019; Jones, 1997; Michael et al., 2003; Sabatier, 1986; Smith & Larimer, 2009). Typically, in the Omani context, policies are developed without the involvement of practitioners in the lower tier of the organizational structure, such as school staff members in the case of education. Instead, teachers are excluded from all stages of decision making and involved only in policy enactment; in other words, there is no initial drafting of the policy to present to stakeholders for consultation before it is reviewed and approved (Al-Hadad, 2001; Al-Hammami, 1999; Al-Ksabi, 2005; Al-Sarmi, 2005; Al-Shukaili, 2007; Al Khatib, 1988; Almoharby, 2010). It appears that policy development in Oman is based on the assumption that the government knows what is best.

In Western countries such as the UK, by contrast, there is often a consultation stage in policy development, although there is not necessarily a strongly active engagement in policymaking as a whole (Bowler, 2010; Cheung, 2011; Hall et al., 2013; Hallsworth, 2011; Joseph, 2016; Walker et al., 2019). Some authors have argued that ostensible consultation is sometimes illusory in the UK, giving the impression of involvement which in reality is not a significant element of policy development (Linsley et al., 2016; Walker et al., 2019). However, there is still a consultation stage in most policy development in Western countries, whereas this is not the case in Oman, despite the fact that as a Muslim country, matters such as education which affect people's lives should be decided through the Islamic process of Alshura.

Alshura means the participation of stakeholders in decision making through consultation with them (Alansari, 1996; Albadawi, 1994; IbnAlarabi, 1957). This participative and consultative approach takes the form of open discussion

that enlightens stakeholders about the situation of their organization and its development plans in order to make appropriate decisions, especially as it provides an integrated discussion of many aspects of the decision involving all categories of stakeholders with varying talents and interests (Alkhalili, 2000; Almoharby, 2010). Accordingly, Aljazairi (1995) argues that Alshura can minimize any autocracy in policymaking, quoting the Prophet Mohammed (here translated by Almoharby, 2010, p.7) as saying: “Those who seek what is best shall never fail, and those who consult shall never regret”. Furthermore, this consultation is considered to strengthen the relationship between policymakers and practitioners, which in turn feeds into a sense of belonging and ownership, thus supporting proper policy enactment (Almoharby, 2010; Giacchino, 2003; Giacchino & Kakabadse, 2003).

However, despite Islamic culture strongly encouraging the use of Alshura in decision making, my recent experience in senior administration and management at the MOE is that this solidly Islamic approach seems to have largely disappeared from the policy development process in Oman, with the exception of some tentative practices among decision makers themselves. The source of this shortcoming in the decision-making process (Rabi, 2002) does not appear to be Islamic culture itself, which in this regard is relatively compatible with Western culture; it is arguably a result of the greater influence of Arab culture, which places great emphasis on customs and traditions such as authoritarianism (Rahman, 1984).

Equally importantly, this study has shown that practitioners favoured a bottom-up approach to policy development. It seems that participants’ views were based on a misconception of the top-down/bottom-up distinction, which may have arisen as a result of the misapplication of the former approach, in particular the failure to consult with practitioners. It was noticeable that interviewees focused on practitioners’ involvement in policy development, i.e. on consultation, suggesting that they may have meant simply that the existing top-down approach should be ameliorated by the inclusion of a consultation stage, rather than that policy development should literally be initiated at the bottom of the hierarchy. They may have been expressing a desire to fully verify the intentions of the policy as planned, by means of a combination of the two

approaches (Cerna, 2013). If instead the study participants really meant that they would prefer an exclusively bottom-up approach to policy development, this would be inconsistent with the findings of a considerable amount of previous research, to the effect that both approaches have their own strengths and weaknesses (Cerna, 2013; Elmore, 1985; Fullan, 2007; Goggin et al., 1990; Matland, 1995; O'Toole, 2000; Sabatier & Jenkins-Smith, 1999; Suggett, 2011; Walker et al., 2001). By the same token, Fullan (2004) and Anson (1994) argue that treating the top-down and bottom-up methods as mutually exclusive can cause a failure to achieve the desired change in educational reform.

I personally support combining the two approaches to foster interaction and cooperation between central policymakers and local actors on the ground, who know about contextual circumstances and difficulties. This combination could represent significant factors that work together to achieve successful enactment, as well as instilling a feeling of accountability among all interested parties, thus making them more effective in achieving their goals (Callahan, 2012; Johnson, 2018). Finally, I fully agree with the study's finding that the MOE continues to create and promulgate its policies without consulting practitioners. There was a brief period in 2011, coinciding with the Arab Spring and a strike by Omani teachers, when a number of consultation events took place, involving local actors and schools, but this change was short-lived; for instance, the MOE decided to implement the Global Chain for the Science and Mathematics Curriculum in September 2017 without consulting any of the actors on the ground.

6.2.2 Development of policy to support assessment for learning

Regardless of the reality of NAS policy enactment, the findings indicate that the MOE's policy intentions regarding the purposes of NAS were significantly mirrored by participating practitioners' perspectives on these purposes. However, it cannot be ascertained whether this concurrence resulted from practitioners' knowledge of the intentions behind the policy through communication between the MOE and schools, or whether both parties had ultimately derived their views from the orthodox position expressed in the pedagogical literature. There is a potentially positive interpretation of each of

these possibilities: If practitioners were aware of the MOE's policy intentions, this would indicate that there was a robust communication channel between policymakers and schools, whereas the alternative explanation would mean that the MOE's policy regarding the development of the education system was soundly based on the mainstream educational literature. Responses given by several members of school staff (T1Hilal2, HC2, T2Lama7 and HB2) can be seen as supporting the second interpretation, in that they claimed not to be familiar with the philosophy behind the development of NAS policy, although they were in agreement with the MOE concerning NAS intentions. Equally importantly, while it may be conceded that practitioners' familiarity with policy intentions can help to smooth enactment and avoid conflict (Fullan, 2013; Wedell and Malderez, 2013), this does not mean that practitioners will enact the policy entirely as planned. In other words, even where policy corresponds with teachers' views, it may still not work well in classrooms (Adey, 2004). This argument is revisited in the following sections.

This subsection discusses the MOE's central intention, that NAS should function as assessment for learning; for instance, it should seek to improve science teachers' practices in the classroom in order to improve students' learning, providing them with a variety of assessment tools (Stufflebeam (2004). In other words, the significance of shifting from the traditional AOL approach, with its focus on reporting and classifying students' performance based on examination results (Herman et al., 2006), to AFL through the use of a variety of assessment tools can be expressed as follows:

> In order for assessment to play a more useful role in helping students learn, it should be moved into the middle of the teaching and learning process instead of being postponed as only the end-point of instruction. (Shepard, 2000a)

The theme of NAS as AFL can be seen as represented in the study findings by three main threads. The first is that of NAS as an ongoing and continuous process; that is, its central feature is its continuity, as opposed to a system of assessment which operates just once, at the end of a period of instruction. Thus, it seeks to provide students with various concepts and important skills such as communicating, critical thinking and problem solving, in that it connects the assessment process with the learning and teaching processes, which in turn links it with learning outcomes (Gronlund, 1998). It focuses on

all aspects of the learning process, not only on the cognitive aspect, through the integration of knowledge, information and skills. The NRC (2007) attests that this continuity creates a kind of integration and alignment between curriculum, teaching and assessment, which is significant for improving science education.

The second AFL-related thread is the finding that NAS was designed to work through student-centred learning (SCL) to achieve its main goal, which is to be an assessment for learning (Brown et al., 2013; Wiggins, 1990). This means that the role of the teacher is to direct students' learning rather than to merely indoctrinate them with knowledge (Simon, 1999). Put differently, the SCL method seeks to achieve a discernible improvement in interaction between students and teachers, as well as improving the students' role in the classroom (O'Neill & McMahon, 2005). It seems that NAS policy was to improve science education through the implementation of the concept of authentic assessment, using SCL to enrich learning and teaching by engaging learners in assessment; in other words, giving the students a voice in collaboration with the teacher to decide which assessment tools best suit their needs (Brown et al., 2013; Wiggins, 1990).

However, while recognizing the significance of student-centred learning, it must be noted that no explicit definition of SCL appears in the study's findings and that participating teachers referred to no specific practices belonging to this method of teaching. It can be concluded that their focus was on giving students more opportunity to participate during lessons in order to engage them in concept building; that is, on increasing students' participation and interaction with the teacher. Notably, they did not raise any related issues such as their participation in selecting appropriate assessment tools and peer assessment. This is in line with a reference in the literature to "considerable disagreement about what student-centred learning actually is" (Farrington, 1991, p.16). Apparently, this disagreement persists, so that individual educators tend to interpret SCL differently (Schweisfurth, 2013). It may therefore be that despite the expected role of SCL in teaching, uncertainty about its actual nature led some study participants to see it as potentially useful in some sessions, but not in all. For instance, the interaction between

students and teachers might not closely follow the SCL model, as students sometimes need to focus on listening to the teacher and memorizing information, with little interaction between them.

It seems that any attempt to completely replace teacher-centred with student-centred learning will tend to be limited by factors related to teachers' beliefs, the nature of the relationship between teacher and students, the nature of the topic and the teacher's experience and skills. This is congruent with Fullan's (2007) description of the complex nature of change, involving interactions between multiple actors and mutual influence among stakeholders at all levels, involving a new or revised curriculum, appropriate teaching methods and changed beliefs. Simply put, change can be technically simple but socially complex (Cerna, 2013). In my view, the change in question is not so much complicated as related to aspects of human experience such as cognition, emotion, motivation, beliefs and individual differences; and this apparent complexity is normal, because such issues cannot be separated from each other.

The third SCL-related thread in the study's findings is that following the student-centred learning method can help teachers to appreciate individual differences in the way that students learn, particularly by using a variety of NAS tools (Section 5.2.1). This allows teachers to minutely assess students' knowledge and practical skills, showing where they differ in their skills, readiness, interest and ability to learn (Goldberg & Baker, 1970). The teacher can then respond to the fact that students with learning difficulties need specific activities and extra help, while more talented students typically require higher-level activities and tend to learn independently, or with very little help (Moore, 2001; Good and Lavigne, 2017). Independently of this distinction, each student also has his or her own preferred way of learning, such as by hearing, reading or practical work (Shaughnessy, 1998).

However, in spite of the compatibility between the study participants' views and NAS intentions regarding the importance of taking into account individual differences to improve students' learning, the study found that teachers' actual practices did not meet the MOE's policy ambitions. Thus, I observed a mismatch between the policy intentions and teachers' practices in the matter

of students' individual remedial plans, which teachers saw as "mere ink on paper" that they drew up to present to officials as a compliance strategy. Moreover, teachers' predominant practice of teacher-centred learning rather than SCL, discussed above, was likely to influence their ability to recognize individual differences between students (Bremner, 2017). In short, the underuse of SCL may have disadvantaged teachers in terms of clearly identifying students' individual differences, as well as identifying the strategies and techniques most fitted to their needs, thus causing a decline in their performance levels (D'Amico & Gallaway, 2008).

6.2.3 The globalization of science curricula

The findings presented in Sections 4.3.6 and 5.2.5 reveal that the introduction of the Global Chains of Science Curriculum was considered to be a type of change that "transcends national borders" (Astiz et al., 2002). It came in response to the recent trend towards the globalization of science curricula, with the aim of improving the national curriculum so that graduates would be better able to compete globally. The impact of national reports and international studies such as TIMSS also played "a major role in the standardization of education", which had driven changes in the science curricula in Oman (Spring, 2008).

The study identified some motives for curriculum globalization, such as to keep pace with the rest of the world in the development of knowledge-based economies in an era of information explosion and technological revolution (Spring, 2008; Stacey et al., 2018). The research found that this change was needed to provide students with the competencies and skills that they would need to succeed in the global economy, especially as Oman, in common with neighbouring Gulf states, has a heavily hydrocarbon-dependent economy (OECD, 1996; Weber, 2011). Notably, the 21st century has seen extremely rapid developments in information technology (Dede, 2000), allowing education systems around the world to use and share information and ideas through multinational institutions and companies (Stacey et al., 2018). This facilitates the development of traditional curricula based on knowledge so that they focus instead on the acquisition of skills (Cornali & Tirocchi, 2012). This may be one of the considerations motivating the MOE to sign an agreement

with the University of Cambridge in order to develop Oman's science curricula in the Global Chains initiative.

The introduction of the new curriculum in Omani schools, by adapting a global chain, is a form of policy borrowing, where the MOE has adapted a new science curriculum that is known to be successful in its country of origin, England, based on the results of large-scale assessments such as TIMSS (MOE, 2017a). It appears that policy borrowing has become acceptable and is increasingly practised (Rutkowski & Rutkowski, 2009). However, as Sarason (1982) argues, policymakers must adapt policies rather than adopt them, giving practitioners more room to develop their own experience during enactment. Accordingly, some study participants (S.Moshrifa15; A.Shahab11) stressed the importance of taking into account the Omani cultural dimension when adapting the global curricula. It appears that the cultural dimension is a keystone in the structure of change, in that the local culture can support or counteract an intended change (Stacey et al., 2018; Wallace & Priestley, 2011). This is consistent with the observation of Cogan et al. (2001) that whilst the policymakers intended to globalize the curricula, the local culture may have had an effect on the enactment of this policy.

However, as noted in Section 5.2.5, the research participants had not yet been due to implement the new curriculum at the time of data collection and may not have received detailed information about the project's enactment.

6.2.4 Resources and facilities as a benchmark for improving science education

As reported in Chapter 5, participating teachers referred to a variety of factors related to resources and facilities, such as school funding, class sizes and laboratories. This subsection focuses on laboratories, as a prerequisite of practical work in science, discussing participants' views on their provision in relation to the existing literature. The MOE's policy intentions regarding the importance of practical work in students' learning were found to be aligned with practitioners' perspectives (Sections 4.2.2, 4.3.3 and 5.2.1). They are also consistent with the assertions of the Abrahams et al. (2011), Bybee (2000), Cerini et al. (2003), Lunetta (1998), the National Research Council (1996) and Roberts (2002) that practical work is useful and enjoyable for

students, more so than other science activities, and that it is helpful in developing their skills and attitudes towards science, which can have a positive effect on preparing them to study at higher education institutions, as well as helping them later to meet the needs of the community and the labour market. Likewise, Hofstein and Lunetta (1982), Ramsey and Howe (1969) and Tobin (1990) argue that practical work is a significant element of science education, as it encourages students' engagement in building concepts. Accordingly, the school staff members agreed with the MOE policymakers that science education in suitably equipped laboratories, where imparted knowledge can be tested, confirmed and expanded, will have better outcomes than if such facilities are absent (see Section 4.3.3).

Conversely, the lack of sufficiently equipped school laboratories may have an effect on practical work and thus on achieving the advantages of SCL (Section 6.2.2) in delivering significant, meaningful and purposeful learning, directed by students themselves (Baird, 1990; Barron et al., 1998; Gunstone & Champagne, 1990; O'Neill & McMahon, 2005). Hickman (2017) refers to a report by the Gatsby Foundation identifying various benchmarks that could be used to improve science education in England, including the extent to which schools focus on resources such as laboratory facilities and equipment in comparison with global standards. However, in contrast to the study's findings on the MOE's motivation regarding practical work and its significance for improving students' learning, I observed that the actual situation was quite different, since the availability of suitably equipped laboratories fell short of the provision suggested by the Ministry's declared intentions. This discrepancy appears to be the result of the MOE's own regulations, which state that each school's allocation of resources is based on the type of school, that is, the grades taught there, rather than the number of students attending it (MOE, 2003). For example, each Grade 5 to 10 school has one laboratory of the same size, with the same amount of materials and equipment, whether it has 100 students or 1500. My observations indicate that laboratory provision was thus sufficient only in the case of rural schools located in low density residential zones, while urban schools were ill-equipped for lab work.

Finally, Abrahams (2007), Haste (2004), Osborne et al. (2003) and Sharpe (2012) state that students' attitudes towards practical work are age-related, in that those in the school years equivalent to the Omani Grades 6 to 9 are very enthusiastic, but that this enthusiasm gradually wanes thereafter. Contrary to this finding, I observed that the MOE was more interested in providing well-equipped laboratories to Grade 11 and 12 schools, to each of which it allocated three labs, compared with only one for the Grade 5 to 10 schools.

6.2.5 Accountability for the improvement of science education

The Ministry of Development (1995) declares that responsibility and accountability for the development of science education in Oman rests with all stakeholders, including government bodies, private sector organizations and civil society institutions. In the colloquial Arabic in which the document is written, the word *مسؤولية* can be said to cover both 'responsibility' and 'accountability' in English. In other words, the person responsible for something is naturally accountable for it and this is not explicitly stated, but can be understood implicitly in its cultural context (Al-Ksabi, 2005). Accordingly, documents issued by the MOE and other official and unofficial Omani bodies do not directly touch on the concept of accountability, but refer instead to responsibilities alone. For example, in the General Document for Assessment of Student Learning (MOE, 2015a), there is no specification as to who is accountable for the enactment of NAS, although there are many statements specifying certain responsibilities of teachers, which, in the Omani context, imply accountability. Also, the absence of any clear documentation that details staff responsibilities could cause an overlap between these terms, although accountability focuses on "to whom" and "for what", according to McDermott (2011). For example, the Arabic sentence:

تقع على المعلم *مسؤولية* تنفيذ هذا النظام

can be translated into English as "The teacher is responsible for enacting NAS and will be held accountable for this". Here, the single underlined word in the original is rendered in translation by two words perceived to have distinct meanings in English.

Moreover, in spite of the availability of various procedures, tools and mechanisms, such as high-stakes tests, national tests, international studies (TIMSS) and end-of-term examinations, whose results relate to the assessment of learning and typically serve as accountability criteria, some education systems, such as that of Oman, do not yet have an accountability framework (Black et al., 2003a; Gill & Lerner, 2017; MOE & WB, 2012). However, Brundrett and Rhodes (2010) argue that accountability is more than a central framework; it is rather a relationship between two parties, one of which is committed to accounting for its actions or performance to the other.

To the extent that it is accurate to speak of accountability in the Arabic context and in the absence of an explicit accountability framework, the study's results indicate that accountability for improving science education by enacting the NAS policy is to be largely understood as professional rather than political. In other words, the MOE has not yet begun to grant schools autonomy in deciding their curricula and assessment strategies or in controlling resources; rather than leading from a distance, it continues to steer directly, in line with the type of accountability that Kickert (1995), Marceau (1993), OECD (2010) and Romzek (2000) ascribe to some education systems. This professional accountability can be described by two alternative integrated models, one focusing on achieving outputs and the other on improving quality (Elliott, 1981; Hopkins, 2007). On the other hand, Gill and Lerner (2017) and Ofsted (2019) critique total reliance on outcome-based accountability due to its negative effects, such as teaching to the test, narrowing the curriculum and cheating. Other forms of accountability are needed in order to temper these negative effects; therefore, these authors suggest that accountability be based on the observation of practice and feedback, in order to make the kinds of improvement which can be achieved through peer-learning.

Moreover, the Omani MOE carries out several procedures, such as supervision, inspection and moderation of teachers' practices, which are considered 'soft' mechanisms that go no further than monitoring, explanation and some justification (see Chapter 5). The findings indicate that although school staff preferred such soft accountability, they also felt that 'hard' accountability should exist alongside it, depending on the learning situation.

They appear to have meant that in the initial stages of accountability, soft measures would be appropriate in order to assist them in the development of their practice, whereas harder measure could be taken at a later stage in order to discourage wrongdoing or reward excellence and creativity. This corresponds to the finding of Huisman and Currie (2004, p.547) that in the Western context, "'soft' accountability measures were favoured over 'hard' measures that would involve rewards and sanctions".

In a similar manner, my study found that when new initiatives were first enacted, accountability should lie with the policymakers, in order to create an appropriate environment for enactment, such as providing the necessary resources and fostering the professional development of practitioners. The higher accountability then lies with practitioners, especially teachers, who are responsible for the enactment of the initiative and the consequences thereof, by improving their students' learning (Anderson, 2005; Darling-Hammond et al., 2014; Gill et al., 2016; Neave, 1987). On the other hand, in spite of the significance of teachers being empowered to enact the initiative by selecting what they consider appropriate for their students as a first step in accountability, the study found that Omani teachers still did not have enough empowerment in this regard (Gilbert, 2012).

Furthermore, the data gathered in observations and interviews led me to the conclusion that some teachers were not particularly concerned about improving science education in Oman and therefore fulfilled their duties only to the extent necessary to comply with their own limited compliance strategy, thus avoiding blame or questioning. It would seem that assuming accountability for improving science education required more effort than they were prepared to make. Perhaps the lack of incentives, promotion and sanctions, as well as a shortage of key resources such as laboratories, played a role in weakening their motivation (Jacob, 2005; Koretz, 1996).

In spite of the conclusion that accountability was understood in terms of holding accountable those who fail to fulfil their responsibilities, rather than in the sense of teachers' self-accountability for the improvement of science learning without external compulsion, a significant finding was that teachers' values and beliefs may have affected their practice, which in turn had an effect

on their accountability for the implementation of the system (Borg, 1999; Rios, 1996).

Equally importantly, and contrary to my expectations, nothing that the teachers said appeared to demonstrate a sense of accountability for science education, beyond being accountable, as teachers, to students and parents. In other words, I found no evidence of accountability to the community at large, indicating a separation between real life and the learning taking place in schools; teachers were content to teach to the test, rather than addressing the need to relate science education to contemporary societal issues, or considering the future scope of science education. Some examples of these socio-scientific issues are the ethics of DNA analysis, GM food scares and the employment of science in manufacturing and technology (Jenkins, 1999; Levinson, 2006). Isolating science education in this way risks students acquiring inapplicable knowledge that cannot serve the community. This in line with the argument of the OECD (2006), De Vos et al. (2002), Gilbert (2006), Holbrook (2005), Levinson (2006) and Osborne and Collins (2001) that focusing on teaching students bare facts in isolation from their roots is to omit a dimension of school science vital to its usefulness to the community at large.

Lastly, the literature reveals that teachers in Western countries such as the UK are accountable for science education, even outside the scope of the school, as they are concerned with socio-scientific issues affecting the community and have voice through governmental and non-governmental bodies (Jenkins, 1999; Levinson, 2006; O'Neill, 2002; Osborne et al., 2002). In contrast, this study explored the fact that accountability for science education in Oman is not the business of any specific body, such as a union or association that is independent of government (in particular the Ministries of Education and Higher Education), through which teachers could demonstrate their accountability.

6.2.6 Moderation to improve assessment outcomes

I have found relatively close agreement between the MOE's intentions and school staff members' perspectives on the significance of moderation in verifying the validity and fairness of assessment for judging students'

performance and its value in improving teachers' assessment practices (Sections 4.3.4, 4.4, 5.2.3, 5.2.8 and 5.3.2).

The moderation system was established in Omani education in the academic year 2004/2005, five years after the introduction of Basic Education (MOE, 2018b; MOE, 2015a), which is relatively recently in comparison with developed countries such as the United Kingdom and Australia, where such systems have been in operation for more than five decades (Gipps, 1996b; Gipps & Stobart, 2003; Harlen, 2005; Shavelson et al., 2007; Strachan, 2001). Despite this difference in length of operation, there is a degree of alignment between the policy intentions in Oman and in these other countries regarding the twofold purposes of moderation, which are accountability and improvement, operating through official reporting and professional development respectively (Adie, 2013; Gipps, 1994; Hutchinson and Hayward, 2005; Lim, 1993; Maxwell, 2002; Maxwell, 2007; Orr, 2007; Ministry of Education New Zealand, 2019; Wilson, 2004). Typically, moderation for accountability takes an external and formal form (Beutel et al., 2017), while moderation for improvement—also known as 'social moderation' or 'consensus moderation'—takes an internal and informal form (Gipps, 1994; Lim, 1993). School-level participants identified some additional purposes of moderation such as monitoring the consistency of teachers' judgment (Gipps, 1994; Maxwell, 2002), for example by measuring the extent of coherence and consistency between the results of continuous assessment tools and those of final examinations (Section 5.3.2). They added that this concern for coherence and consistency in professional judgments made teachers review their practices in this regard and this is confirmed by others (Adie, 2013; Klenowski & Wyatt-Smith, 2013; Maxwell, 2002). Moderation can also be seen as aiming to instil confidence in parents and civil society institutions about the results of NAS and the education system in general (Klenowski & Wyatt-Smith, 2013; Ministry of Education New Zealand, 2019). Furthermore, the international literature asserts that the centrepiece of moderation for improving teachers' practices and the capacity of their assessment to support learning is discussions among them about their assessment practices (Gardner, 2006; Maxwell, 2007; OECD, 2005; Wilson, 2004).

However, participating school staff members stated that the MOE has a practical focus on working through the formal moderation system alone, being mainly concerned with the assessment of Grade 12 students, as they are at the last stage of their schooling (Sections 5.2.3 and 5.3.2). This formal moderation is mainly directed towards accountability (reporting), rather than teachers' professional development or improving their practices. By the same token, the study found little or no evidence of either formal or social moderation at Grades 1 to 11, despite the insistence of the MOE (2015a) and the Ministry of Education and the New Zealand Education Consortium (2017b) on the importance of carrying out all types of moderation at all grades. In other words, Omani teachers practice neither formal nor social moderation, except to the extent that they document students' assessment activities in portfolios, which were found to be poorly organized, randomly implemented and with structures and contents varying from school to school and even from one teacher to another within the same school (Section 5.3.2). They cannot therefore be relied upon, as confirmed by Maxwell (2002), who warns that ill-prepared portfolios can cause moderation to fail.

From my point of view, it seems that contextual factors such as the lack of consultation on policy development and insufficient preparation for policy enactment (e.g. lack of training and the absence of clear standards and criteria for continuous assessment tools) were likely to have affected the enactment of all components of NAS policy, including moderation practices. This is consistent with the argument of several authors (Heritage, 2015; Maxwell, 2002; Ministry of Education New Zealand, 2019) regarding the effect of contextual factors on moderation enactment. In contrast to the study findings, however, my personal experience at the MOE suggests that teachers at all grades from 1 to 12 in Oman do engage in activities that can be considered to fall within the concept of moderation for accountability and improvement, such as peer discussions, which usually occur as a result of teachers exchanging classroom visits, and post-examination discussions. The fact that school-level interviewees did not mention these practices can be attributed to the reality of enactment, which may have led them to perceive the term 'moderation' as applying only to Grade 12 as the last stage of schooling. Alternatively, this false belief may have originated in the MOE's translation

into Arabic of the term as *الفحص والتدقيق*, which has the literal meaning of 'examining and auditing', a phrase usually applied to the accountability practices of external committees (Al-Shukaili, 2007). This translation appears to have given the impression that the associated practices were specifically limited to the auditing of students' results in final exams. Therefore, a shift is required in the assessment culture of practitioners, as well as those responsible for following up the enactment of moderation, regarding its function as serving accountability and improving practice. This would require time, effort and encouragement, as argued by Beutel et al. (2017).

6.2.7 TIMSS to improve assessment outcomes

Based on the study's findings, there appears to be an alignment between practitioners' and policymakers' views about the significance of schools' participation in TIMSS, with regard to its potential in the development of both teacher performance and student achievement (Sections 4.3.5 and 5.2.4). These views are also in line with the assertion of Mullis et al. (2009) that TIMSS has provided participating countries with much significant data, which could assist them in developing several components of their education systems, such as curriculum content, pedagogy, assessment and resources. These benefits arise in part from comprehensive international data on what students have learned in science, their progress in learning over time against international benchmarks, the effectiveness of teaching and learning, the effects of context on learning and its relationship with policy intentions. However, some practitioners participating in the present study claimed that the MOE viewed TIMSS as competing for public opinion more than working to achieve its basic objectives (Section 5.2.4). This claim appears to have been based on the actual implementation of TIMSS in Oman.

In spite of the findings of this study regarding the deceit being practised in conducting TIMSS, such as its implementation in artificial conditions by teaching to the test, as well as guiding students to simply memorize and recall information (Section 5.3.2), I personally feel that TIMSS was partly able to mirror the MOE's accountability for improving science education in Oman. In detail, as argued by the Ministry of Education (2017a), the TIMSS results, along with other national and international reports, support the

recommendations on the improvement and globalization of the science curricula in the Sultanate of Oman, culminating in the introduction of the Global Chains of Science Curriculum, in line with the assertion of Dale (2000) and Rutkowski and Rutkowski (2009) that global activities such as participation in TIMSS encourage and promote curriculum development in order to gain international educational outcomes. It appears that global forces act on national education systems, where they contribute mainly to curriculum policy development (Monkman & Stromquist, 2000; Stromquist & Monkman, 2001). This is consistent with the study's finding that some participants considered the NAS initiative to have originated as a response to international pressure, in order to develop the Omani education system (Section 5.3.1). Moreover, TIMSS participation contributed to teachers' professional development by changing their conventional belief that students' attainment could be properly assessed only by means of tests and exams, rather than surveys (Section 4.3.5). In other words, I found that TIMSS had instilled in teachers a culture of conducting studies and surveys; therefore, it can be considered a successful policy which has changed the culture prevalent in Omani schools. This aligns with the argument of Braun et al. (2012), Maguire et al. (2019) and Cleland et al. (2015) that cultural context is not fixed but dynamic and shifting.

Finally, the study has found that the TIMSS results in three cycles (2007, 2011 and 2015) were below the international average, and it can be emphasized that all cultural context dimensions collectively effect policy enactment (see Section 6.4). Therefore, if there is any shortcoming in one of these areas, it can have an effect on the others. It should also be noted that TIMSS has some shortcomings, such as its focus on tests to the detriment of other assessment tools.

6.3 Teachers' enactment of NAS

As discussed in the literature review (Chapter 2), my use of the term 'enactment' in this study refers to the interpretation of policy and its translation into practice by practitioners such as teachers (Braun et al., 2010). This section discusses four themes emerging from teachers' enactment of the NAS

initiative in the Omani education system: the characteristics of enactment, professional development, teacher agency and credibility.

6.3.1 Policy enactment characteristics

The study found that the absence of consultation with practitioners at successive stages of NAS policy development and poor preparation for enactment caused enactment itself to appear abrupt and somewhat of a shock to practitioners, especially teachers (Section 5.3.1). Policymakers appear to have ignored the warnings of Blignaut (2008), Cerna (2013), Dewatripont and Roland (1995), Hoekstra and Kaptein (2014), Lindblom (1959), Meerkotter (1998), Roland (2000) and Roland (2004) that change enactment should be gradual in order to avoid any kind of shock which might affect the performance of practitioners. Similarly, Wedell (2009, p.17) cites Fullan (2007) as suggesting that “large-scale change may take five to ten years to become part of normal classroom life in the majority of schools”. It appears that there is a similarity between the Western and Omani contexts, since the study’s results indicate that it can take from three to five years, or sometimes more, for change to become part of practitioner practice (Section 5.3.1).

I agree that the enactment of any initiative in society needs to be gradual. A useful first step is to raise stakeholders’ awareness of the potential and intentions of the initiative, in order to instil confidence in its benefits, followed by a pilot phase to prepare practitioners for enactment, to develop the initiative and to address any challenges and shortcomings that may arise. As time goes on, the initiative will become part of practitioners’ routine. My own experience indicates that the time required for the initiative to become embedded in normal practice in this way will depend on the type and extent of the change and the degree of pre-enactment readiness; in other words, the context of enactment. Thus, as little as a year or more than five years may be needed to complete the process, depending on context and circumstances.

Indeed, the study found that policy enactment is a relative matter, subject to the circumstances affecting each school and each teacher, such as length of experience in the field (Datnow & Castellano, 2000; Nielsen et al., 2008; Rosenholtz, 1989; Stuart et al., 2011). Published research has shown that teachers with over 20 years of experience seem reticent to adopt change and

tend to resist it more strongly than their mid-career colleagues with six to 20 years of experience, who are better able to deal with it because they possess the required competence and confidence (Donnell & Gettinger, 2015; Hargreaves, 2005).

The results of the study seem to be in general agreement with the findings reported in literature in this regard, but the lack of a clear and specific definition of what constitutes a novice or experienced teacher—or indeed of any of the stages of a teaching career—makes the extent of this agreement uncertain (Section 4.3.2). On the other hand, my familiarity with teachers who, like the research participants, were at what Hargreaves (2005) would call the mid-career stage (6 to 20 years) supports the assertion of congruence between their views and those reported in the literature. Thus, the study found that more experienced teachers in urban schools tended to be better able to enact the policy than their counterparts in rural schools (Section 5.3.2) (Ministry of Education, 2006; Ministry of Education & The World Bank, 2012; Ministry of Education and the New Zealand Education Consortium, 2017b). This is consistent with the observation by Monk (2007) that rural schools usually employ relatively few well-trained teachers, for several possible reasons. For example, no additional effort may be made or no incentive offered to attract and retain them, or the provision of facilities and services in these areas may be inferior, leading to a high turnover of experienced teachers in these schools and their replacement by novices.

Finally, it can be noted that the abrupt nature of policy enactment in Oman contrasts with its more measured nature in Western countries, despite recognition of the importance of change being introduced gradually. Moreover, despite some differences of detail, there is general consensus between the Omani and Western contexts that policy enactment is relative and depends on the circumstances of enactment.

6.3.2 Professional development of practitioners

The study's findings indicate close agreement between the MOE's policy intentions and practitioners' perspectives regarding the importance of professional development for all those involved in the enactment of NAS, which is considered to be a major change in the education system (Sections

4.3.2, 5.2.6 and 5.3.2). On the other hand, as explained in Section 5.2.6, the research participants concentrated primarily on formal and linear training, while Kennedy (2007) argues that professional development is a broader and more comprehensive concept. Participants also expressed some dissatisfaction with the adequacy of training and the quality the courses, leading them to perform their duties in a trial-and-error fashion (Micari et al., 2005; Peluso and Hafler, 2011). This subsection discusses continuing professional development in the context of Oman.

The findings reported in Section 5.3.2 reflect teachers' dissatisfaction with the cascade training mechanism employed by the MOE to instruct them in NAS enactment. The cascade model is widely viewed as risking the distortion of the training message, leading to its aims being missed. Misinterpretation is a consequence of messages being watered down by the "trickle-down effect" or "the telephone game" (Chisholm, 2005; Suzuki, 2008) as they percolate through many layers of implementers. Bett (2016), De Swardt et al. (2007) and Fiske et al. (2004) report that the use of cascade training about curriculum change in South Africa caused a misinterpretation of a considerable number of change information messages, thus failing to meet teachers' needs. Similarly, Dichaba and Mokhele (2012) argue that the cascade model seems to have failed to improve practitioners' performance significantly. However, the present study found that the cascade model was useful, particularly given the large number of teachers to be trained by a small number of trainers and the relatively large distances between governorates. This is consistent with the assertion of Suzuki (2008, p.1) that cascade training can "deliver many trained teachers quickly and economically", providing advantages for planners, especially where change is rapid and fundamental, in saving money, time and human resources (Hayes, 2000; Hardman et al., 2011; Dichaba and Mokhele, 2012). Thus, in spite of some admitted disadvantages, the cascade model is considered an acceptable approach to training, especially in the initial dissemination of information on curriculum change, such as in the case of NAS enactment, especially if the trainers are selected carefully at all levels (Bett, 2016).

In accord with Gilprin (1997, cited by Hayes, 2000), participants were unanimous and unequivocal in calling for the involvement of NAS implementers, such as experienced teachers, in the preparation of training materials and participation in cascade training. It seems significant to bear in mind that an approach which has been successful in one setting may not necessarily work well in another context (Hardman et al., 2011). Based on the study's findings, the cascade model was seen as not being able to distinguish between teachers according to their experience (Bantwini, 2009). It would seem that whether in Oman and other Arab countries, or in other contexts such as that of Western nations and South Africa, there is a consistency of views about the advantages and disadvantages of using cascade training in policy enactment.

In order to avoid the shortcomings of this model, school staff typically employ collaborative school-based strategies (Ushie, 2009), which Fraser et al. (2007) describe as crucial for effective CPD. Therefore, the results of the present study indicate that professional development has a deeper and more comprehensive meaning than merely formal cascade training programmes and that it should be a continuous process (Friedman & Phillips, 2004). Participants also felt that responsibility for training provision was not held by the MOE alone, but should be shared by individual practitioners and schools, with all parties complementing each other's roles. On the other hand, I noticed that neither practitioners nor policymakers mentioned the concept of CPD directly, nor were they explicit as to CPD policy, strategies or programmes; instead, there was a very simple and general annual plan for formal training programmes at the level of local education authorities (governorates) and MOE headquarters. The Ministry made disparate efforts, without a systematic plan for the organization of CPD for school staff and other implementers (Al-Hadad, 2001; Al-Shukaili, 2007). This could be seen as extraordinary, given the large population of Omani school staff (Friedman et al., 2000; Friedman and Phillips, 2004), since in most countries the characteristics and details of educational CPD programmes are normally determined either by the education ministry, by an appropriate professional association, or by both in collaboration (Friedman & Phillips, 2004). As noted in Chapter 5, there is no labour union or national association that represents teachers in Oman, which

may explain the absence of a CPD framework and strategy for school staff. The research of Eberts and Stone (1987) into the effect of teaching unions on productivity indicates that such a body normally plays a key role in developing teachers professionally; they found that state schools whose teachers were represented by a union were on average seven per cent more productive than non-unionized schools and that student achievement was raised accordingly. Similarly, the (OECD, 2011: p.56) states that “many of the countries with the strongest student performance also have strong teacher unions” and that the whole education system is likely to perform better.

Notwithstanding the research participants’ failure, noted above, to distinguish between the concepts of CPD and professional development (Coffield, 2000; Friedman & Phillips, 2004), there are some miscellaneous practices and activities that may fall under CPD, but which they did not identify as belonging to it. For example, some of the formal training courses conducted by the Specialized Institute for Professional Training of Teachers, whose aim was to provide teachers with formal training that would encourage them in self-development, may be equated with the ‘personalized’ feature of CPD, intended to suit each teacher’s individual needs and interests, in contrast to the ‘one size fits all’ approach (Bailey et al., 1998; Hustler, 2003). Beside the need of practitioners for formal training, they realized that they also needed informal courses and activities, arranged locally and through the support and collaboration of colleagues, such as workshops, seminars, personal reading, peer learning, WhatsApp groups and exchange visits, both local and international (Coolahan, 2002). Typically, most of these activities involving collaboration between experienced and/or novice teachers are shaped by subject and course partnerships (Gagen & Bowie, 2005; Hustler et al., 2003; Monk, 2007).

With regard to the enactment of NAS and its new ideas, the study’s results reveal a need to acquire new skills which takes time, because they are built gradually through experimentation and improvement, so that this ‘sustainability’ is more effective for practitioners, by encouraging them to continually modify their classroom practices to achieve the goals of change (Hargreaves & Fullan, 1992). Additionally, the findings underline the

importance of study in pursuit of higher qualifications, such as higher diplomas, master's degrees and doctorates, in order to improve staff professionally as another form of access to CPD (Hustler et al., 2003). The majority of research participants also stressed the need for in-depth training in assessment, in line with a feature of CPD: that it should be focused on a particular area, such as assessment (Asmari, 2016; Ono & Ferreira, 2010). Equally important is the request by school staff members for the documentation of training activities and events for each employee as part of their career history record. This aligns with the stress placed by Berkeley (2001) on "the importance of documentation of CPD activities to shape the basis of career-long records".

In Oman, it seems that CPD has not been defined and set up independently as a strategy for training science teachers and other school staff members, although many of the activities organized by the MOE and by schools do fall under the CPD concept, providing evidence that the context of practice influences CPD (Leibowitz et al., 2015; Smith, 2012; Stes et al., 2008; Thoonen et al., 2011; Trowler & Cooper, 2002). Finally, regardless of the vagueness of the CPD concept, it can be concluded that there is a belief that these effective activities can be seen as facilitating the enactment of change.

6.3.3 Teacher agency and policy enactment

In spite of the variety of research and theoretical work on teacher agency in Western countries (Archer & Archer, 2000; Archer & Archer, 2003; Emirbayer & Mische, 1998; Giddens, 1984; Pignatelli, 1993; Priestley et al., 2015b; Priestley et al., 2012; Pyhältö et al., 2012), there is no published research, to the best of my knowledge, that has examined teacher agency in the Arab world. Therefore, the findings reported in Chapter 5 on teachers' enactment of the NAS policy are analysed in this section with respect to international literature on the concept of teacher agency. Furthermore, this gap in the existing scholarship allows the present study to make a distinctive contribution in this regard.

The concept of teacher agency would seem to be a Western one (Eteläpelto et al., 2013; Freire, 1973; Habermas, 1984; Mezirow, 1981), often defined as "the teachers' capacity to act purposefully and constructively" (Priestley et al.,

2012, p.194). In other words, it seeks to overcome the usual work routine structurally, through teachers' contributions to creating what they see fit to improve their students' learning (Biesta et al., 2015; Emirbayer & Mische, 1998; Goodson, 2003; Priestley, 2011). Accordingly, some teachers' practices observed in the Omani context can be said to fall within the concept of teacher agency and I will therefore use this term metaphorically in reference to these practices.

In Oman, despite the MOE using its power structure to impose on its teachers a particular prescription of teaching and learning approaches and tasks, and an assessment system, the study identified a policy intention by the MOE that the implementation of NAS would grant teachers greater autonomy and freedom in some matters, such as selecting appropriate assessment tools and deciding their criteria, which can be considered an indirect attempt to develop teacher agency (Sections 4.3.1, 4.3.2 and 4.4). In contrast, the research findings have illustrated that there is no direct mention or conceptualization of agency, that it was not designed in the system, that it did not have a specific framework and that it was not reinforced by ministry officials, but rather that it was manifested in teachers' practices (Sections 4.2.1, 5.2.8, 5.3.2, 5.3.3 and 5.3.4).

This study also emphasizes that these manifestations depended primarily on teachers' values (Biesta et al., 2015; Eteläpelto et al., 2013; Priestley et al., 2012; Ramanathan & Morgan, 2007; Ryder et al., 2018), which in turn controlled their practices; for example, some of them partly resisted the NAS policy and some enacted it only as a compliance strategy, or as they considered appropriate for their students. In other words, teachers had a number of motivations for operating various forms of agency, such as believing that it would be too difficult to change their practices, or that there would be no extra pay for doing such work. Many had their own values as to what science education should be and why they had chosen to teach science; some had their own principles that did not coincide with those of the MOE, making their own decisions on the basis of their professional knowledge.

The gap between policy intentions and the reality of enactment in this regard may be attributed to several factors. First, as discussed in Section 6.2.1, the

absence of a consultation stage in policy development may have led to the imposition of an external policy that sought to change teachers' practices without reference to the philosophy behind the policy. This could have had an effect on their practices, which in turn may have led to a blurring of the manifestations of teacher agency (Biesta et al., 2015; Riveros et al., 2012). Likewise, I observed that the context in which schools operated in Oman, especially before the introduction of Basic Education with NAS at its heart, did not encourage teachers to contribute to creating conditions appropriate to the needs of their students; on the contrary, it required the Ministry's instructions to be followed strictly. In other words, the MOE played an influential role as policy power in shaping and constraining teachers' practices (Eteläpelto et al., 2013; Ryder et al., 2018), subjecting them, for instance, to pressure to cover all of the curriculum content as listed in the textbook, as well as imposing the use of specific assessment tools (Sections 5.3.3 and 5.3.2). This allowed teachers no opportunity or time for creativity, which is considered essential for teacher agency (Eteläpelto et al., 2013; Glăveanu, 2010; Littleton & Miell, 2004; Sawyer, 2007).

On the other hand, in those minor areas within NAS where the MOE gave teachers freedom to choose what suited their students, I observed that they were hesitant to exercise even this limited freedom (Sections 4.3.1 and 5.3.2). It seems that becoming used to practices in a given context for an extended period of time makes it difficult to develop and transform them when given that option. Additionally, teacher agency may be seen as relative, similarly to enactment, as discussed in Section 6.3.1. Agency is thus related to the professional development and experience of each teacher and influenced by aspects of the school environment such as resources and work culture (Eteläpelto et al., 2013; Ryder et al., 2018). For the desired transformation to occur, therefore, teachers must receive appropriate training and be given the opportunity to gain experience, to change their beliefs and to transform their attitudes; importantly, parallel changes in beliefs and attitudes are required among ministerial supervisors, school inspectors and assessment specialists, in order to boost teachers' confidence and thus to accelerate the transformation (Biesta et al., 2015; Ryder et al., 2018; Tarnoczi, 2006). I observed that experienced teachers had more expressions of teacher agency,

which is in line with the conclusion of Ryder et al. (2018) that teacher agency is not a result of one situation, but rather an ongoing development.

Although there is no explicit mention of teacher agency within educational reform in the Omani context, some of its features could be identified. It is also notable that teacher agency, in the context of Oman as an Arab country, is influenced by the culture of policy development, as well as individuals' professional background, context, experience and values.

6.3.4 The credibility of teachers' practices

Participating teachers commonly claimed that their assessment practices focused on improving students' learning (Section 5.3.3), yet I observed that their activities frequently did not support this claim and were contrary to the stipulations of the official assessment documents. Instead, their practices were directed towards awarding their students high marks; in other words, they applied AOL techniques to ensure the progression of their students to the next grade. This subsection discusses these practices from the perspective of the credibility of policy enactment and factors affecting it.

McCroskey and Teven (1999) and Teven and McCroskey (1997) analyse teacher credibility in the context of Western culture (specifically the USA) as comprising three dimensions: competence (expertise) trustworthiness (honesty) and caring (concern). In contrast, teachers in Eastern cultural contexts such as Oman and China have been described as playing the threefold roles of qualified teacher, role model and parent (Biggs; Heyman, 1992; Pratt, 1991; Wenzhong & Grove, 1999; Zhang, 2009). Practitioners participating in the present study specified some factors affecting the credibility of teachers' practices in NAS policy enactment (Section 5.3.3). More specifically, this study has examined the following personal and contextual factors, beginning with those related to teacher competence.

Binkley et al. (2012), the European Commission (2018), Fitzpatrick (1994), Nousiainen et al. (2018) and Schmidt et al. (2009) state that teacher competence includes experience, qualifications, practical skills, knowledge, attitudes and values. Similarly, in the Omani context the study found that teacher competence was affected by several factors such as the inexperience

of novice teachers, the inadequacy of pre-service and in-service training and the absence of a CPD framework, all of which prevented teachers from fulfilling the intentions of the MOE in NAS policy enactment (Sections 5.3.1, 6.2.2, 6.3.1 and 6.3.2). What is more, I found that even well-qualified teachers needed at least three to five years for change to become part of their daily practice (Section 5.3.2). This finding is in agreement with the assertion of Binkley et al. (2012), Bjarnadóttir (2005), Caena (2014), Nousiainen et al. (2018) and Tigelaar et al. (2004) that teacher competence depends on contextual factors such as professional development.

Furthermore, as previously mentioned, the study has shown MOE training to employ a traditional focus on preparing teachers to spread knowledge, rather than the adoption of competence-based training, which would enable teachers to effect changes in students' modes of learning (Section 5.3). This conflicts with the observation of Biemans et al. (2004), Cameron-Jones and O'Hara (1995), Huntly (2004), Popham (1986), Spencer and Spencer (1993), Struyven and De Meyst (2010), van Dongen (2003), Weinert (2001) and Whitty and Willmott (1991) that competence-based training of teachers, focusing on performance skills rather than merely emphasizing the ability to reveal knowledge (Houston & Howsam, 1972), has become more widespread in recent years in Western countries such as the UK and the USA. This approach regards competence as a development of skills, knowledge and experience in order to support teachers in fulfilling their roles properly, such as in new initiative enactment (Korthagen & Vasalos, 2005; McNamara, 1992; Popham, 1986; Struyven & De Meyst, 2010).

Competence-based training can also instil in teachers the skills required for other aspects of teaching such as classroom management (Bootzin & Ruggill, 1988; Hakim, 2015; Martin et al., 1998), thereby supporting teachers in policy enactment by ensuring that their classes run smoothly and without disruption (Emmer & Stough, 2001). Furthermore, developing such skills may help them to avoid using assessment tools to intimidate students (Kagan, 1992; Martin et al., 1998; Martin et al., 2006). This is consistent with the MOE's (2015a) emphasis on considering context as a cornerstone of policy enactment. However, teachers' interview responses revealed the widespread use of NAS

tools to control students' behaviour (Sections 5.2.1, 5.3.3 and 5.3.4), which can be seen as evidence of insufficient training of teachers in this area.

My experience of more than fourteen years in the Assessment Department in Oman allows me to confirm the finding of a lack of competence-based teacher training. Furthermore, as a former science teacher, I recognize the significance of such training in inculcating specific competences such as those related to practical work, which are fundamental for improving practice, especially during the enactment of a change in science education such as the introduction of NAS (Mulcahy & James, 2000; Naumescu, 2008).

Some authors, however, argue that many teachers prefer not to rely exclusively on the competence-based approach to teacher training, under the pretext that its focus on skills excludes other aspects of teacher training such as pure knowledge (Mulcahy & James, 2000; Whitty & Willmott, 1991). It seems logical that teachers must be trained in various components of teaching in order that their practice will support the achievement of teaching and learning goals (Birman et al., 2000; Brookhart, 2011; Hoyle & John, 1995; Liakopoulou, 2011).

Equally importantly, the findings reported in Sections 5.2.8, 5.3.2, 5.3.3 and 5.3.4 are in line with the arguments of Al Sawafi (2014), Albert Jonglai (2017), Fang (1996) and Rios (1996) regarding the influence that certain personal and contextual factors such as teachers' values and beliefs and the pressure of authority will have on their enactment of a new policy and on the credibility of their practices. In detail, according to Holliday (1994), there are factors at the central, local and school levels that influence classroom teachers' practices, such as authority intervention. The findings of the present study confirm that policy enactment was affected by these factors, leading practitioners to enact NAS in ways that sometimes differed from what the MOE had decided, while in other respects following official guidelines for two distinct reasons: either as a strategic compliance because, as MOE employees, they wished to avoid the risk that officials would criticize them or impose penalties, or because of a genuine desire to use the components of change to improve students' learning (Sections 5.3.1 and 5.3.4). This is consistent with assertions in the international literature that in some situations the compliance strategy is

conducive to enhancing the classroom environment, which in turn contributes to improving learning, while in others it may not (Harvey & Newton, 2007; Kleijnen et al., 2013; Newton, 2000; Priestley, 2010; Priestley et al., 2015a; Priestley et al., 2014; Sellnow et al., 2006; Shoaib, 2012). In conclusion, there is significant agreement between the Western and Omani literature regarding the personal and contextual factors that may influence the credibility of teachers' practices.

6.4 The influence of cultural context on enactment

Based on the analysis of this study's findings (Chapter 5), the NAS initiative seems to have created a set of challenges arising from partial conflict with the prevailing culture of the Omani education system, as well as with the usual practices of teachers. This has weakened teachers' commitment to enacting the NAS policy in their practice (Sections 5.2.1 and 5.3.3). In other words, teachers' policy enactment practices are affected by the local context (Ball et al., 2012; Biggs; Cornbleth, 2008; Crossley & Jarvis, 2001; Darling-Hammond, 1990; Englund et al., 2018; Leibowitz et al., 2015; Phillips & Ochs, 2003; Singh et al., 2014; Van Schalkwyk et al., 2015; Yang, 2011). This section examines this cultural influence, comprising several contextual dimensions, such as the material, situated, professional and external contexts (Anand & Daft, 2007; Braun et al., 2011; Harris et al., 2019; Higham, 2003; Leithwood, 2018; Maguire et al., 2019; Sheikh & Bagley, 2018; Wedell, 2009). The findings of this study indicate clearly that these dimensions are related to each other and subject to interaction (Chapter 5), making it inappropriate to seek to isolate one from another, consistent with the argument of Braun et al. (2011), Braun et al. (2010), Cleland et al. (2015) and Phillips and Ochs (2003) that all dimensions of cultural context are interrelated. For example, the situational dimension of rural schools influences the professional dimension in terms of teacher type, in that teachers tend to be novices or to have relatively little experience. It also has an effect on the material dimension; for example, I observed that average class sizes were low in rural schools, which means that unlike more crowded urban schools, laboratory provision was adequate for the students' needs (Sections 5.2.7 and 5.3.2).

As indicated in Chapter 5 and discussed in Section 6.2.1, there was no evidence that policymakers considered the views of stakeholders at the various levels of the education system, including teachers, before starting the implementation of NAS. It appears that the role of contextual reality in affecting the development and enactment of the policy was not a priority for the MOE, resulting in a lack of clarity, which in turn generated a gap between policy intentions and enactment. This aligns with the evidence provided by Wedell (2009) that policymakers often disregard contextual realities in policy development and therefore plan without considering practitioners' needs. This may then reflect on teachers' practices, which can be observed through the analysis of the study's findings in Chapters 4 and 5, regarding the reasons behind teachers' limited uptake of some NAS practices, such as the ability to apply some of its tools, organizing students' portfolios and controlling students by allocating marks for behaviour. From my point of view, this limitation in teachers' practice can be attributed to the policymakers' assumption that teachers would realize the advantages of NAS and they would therefore easily enact it in practice. This is in line with the view of Braun et al. (2011) that policymakers tend to assume the best possible environment for enactment, such as ideal teachers. This could be seen as confirmation that culture has a significant impact on the ways that both policymakers and practitioners perceive the issues affecting them, because people in different cultures tend to think rather differently. For instance, in Western cultures, such as those of the United Kingdom, Australia and the United States, people tend to be mostly oriented towards individualism, seeing individuals as different from each other in their own environment and therefore believing that each should make their own decisions and accept responsibility for their actions, whereas in Eastern countries such as China, India and Oman, people tend to be mostly oriented towards collectivism, focusing on relationships between individuals and their environment. In other words, people in individualistic cultures tend to centre their attention on the individual, while for those in collectivistic cultures the tendency is rather to focus on the situation (Buda & Elsayed-Elkhouly, 1998; Ji et al., 2000; Joshanloo, 2014; Lewis et al., 2008; Stangor et al., 2017).

By the same token, the Omani MOE's conduct in policy development and enactment is in my view impacted by its external context, in that it appears to

reflect the culture of the Omani political system, which is based on centralization and the assumption that the government knows what is best for the people. In detail, going back to the modern history of Oman before 1970, prior to the assumption of power by Sultan Qaboos bin Said, Oman was a fragmented state. Sharp political differences had led to its separation into three parts, namely the maritime areas, controlled by the Sultan, the interior, under the Imamate system of independent tribes, and the southern Dhofar region, dominated by nationalist and Marxist insurgencies with the support of foreign communist governments. Having taken power in July 1970, Sultan Qaboos sought to unite all of these areas under a centralized system of government (Al Shuaili et al., 2017; Allen, 2016; Ghubash, 2014; Jones & Ridout, 2015; Owtram, 2004; Wilkinson, 1987). Since then, the Sultanate has been centrally administered, with some very limited powers granted to local authorities from time to time, and this type of administration has become part of the culture, reflected in policymakers' practices in all public services, including the education sector.

Furthermore, it appears that the NAS policymakers did not consider the fact that the heart of the initiative, namely AFL, implied changes in pedagogy, curriculum content and assessment tools, which would require teachers to have an advanced awareness of the components of the change, as well as the qualifications and experience to deal with them (Section 6.3.1). However, as reported in Section 5.2.6, the necessary awareness-raising programmes have been lacking, as has a shared understanding of the potential of NAS among practitioners. Again, it can be seen that the consideration of the local cultural context has an influence on policy enactment, which is in line with the emphasis in the works of McLaughlin and Mitra (2001), Waters and Vilches (2001) and Wedell and Malderez (2013) that awareness raising and a shared understanding of policy intentions are critical to avoid superficiality in policy enactment.

By the same token, as seen in Chapter 5 (Section 5.3.1), it can be deduced that in Oman, as an Arab country, there were no clear plans to reinforce enactment of the NAS and Global Chains policies that took the local context into account. In the case of NAS, this led to a partial obstruction of enactment,

as reported in Section 5.3. This study's findings are consistent with the assertion that the reform projects adopted by the MOE have usually lacked clear plans for reinforcing these reforms (Al-Kindy, 2009; Al-Shukaili, 2007; Al Sawafi, 2014). In more detail, there has been no consultation, discussion or debate about what the change actually is, or what it is intended to achieve, nor the engagement of stakeholders in policy development at all levels needed for them to feel that they own the change. Moreover, there was a failure to reinforce the change message by providing adequate training and CPD; facilities and resources such as laboratories were insufficient; and there were too few inspectors to check that the policy was enacted properly and to provide support for teachers in schools. I believe that there was some reinforcement, but that it was somewhat scattered and not presented as a clear plan that was available to all concerned, while the effectiveness of these efforts may have been impaired by such decisions as delivering training through a cascade programme, as discussed in Section 6.3.2.

By contrast, when a new policy is adopted in the West, it is likely to be reinforced by various procedures and actions that take into consideration the reality and nature of the local cultural context (Braun et al., 2011; Hammer et al., 2005; Hardy & Melville, 2018; Lane, 2007). For example, in England, the adoption of any new curriculum is reinforced by carrying out various actions, such as enabling public debate and discussion, giving the policy statutory force, making it part of the Ofsted inspection framework, allocating budgets for schools and putting plans in place for them to follow up the policy's enactment (Braun et al., 2011; Braun et al., 2010; Higham et al., 2002; Sin, 2014).

It can be concluded that whether in the Arab or Western worlds, it is equally the case that all dimensions of the cultural context exert a collective effect on policy enactment and that ignoring the local cultural environment in policy development and implementation can produce a gap between intentions and enactment. Moreover, it is possible to identify three crucial measures to make policy enactment more appropriate and to avoid superficiality, which are to raise awareness of the significance of change, to foster a shared understanding of policy intentions and to ensure robust policy reinforcement.

6.5 Summary

In summary, the responses of participating practitioners confirm the significance of NAS policymakers' intention to support the improvement of science education in Oman, but this does not mean that practitioners enacted it fully as planned, partly because they were excluded from participating in the policy development process by the absence of a consultation stage. Here, it is clear that contextual factors had an effect on the development and enactment of NAS policy and that ignoring these factors can produce a gap between intentions and enactment, which in turn can result in a superficial enactment. I have identified parallels between the Arab and Western contexts on several points, for example that policy enactment is relative, in that it depends on the prevailing circumstances, that the context is not always fixed, but is often dynamic and shifting, influenced by policy, and that the various dimensions of cultural context exert a collective effect on policy enactment, rather than acting independently. Sources in the Arab world also agreed with those in the West on the advantages and disadvantages of using cascade training to prepare for policy enactment, as well as their favouring of soft measures of accountability over hard ones. However, the study has found Eastern culture to differ from Western culture in that the latter is individualistic and the former collectivistic, tending to centre attention on the situation rather than the individual; and they differ in their view of the purpose of the moderation system and its application procedures. Moreover, teacher agency in the context of Oman as an Arab country is influenced by the culture of policy development, as well as individuals' professional background, experience and values. Additionally, the administrative and financial regulations of the MOE may have a negative effect on policy enactment, such as in the absence of a fair allocation mechanism for school laboratories. Finally, successful enactment may be impeded by misinterpretation, inaccuracy, blurring or overlapping in the use of terminology; for example, a single word in Arabic can sometimes express two very different meanings, with a deleterious effect on policy borrowing and enactment.

Chapter 7
Conclusions

7.1 Introduction

This study's findings regarding NAS policy enactment have strong implications for continuing research on teachers' actual practices of NAS, within a range of contextual factors. This concluding chapter begins with a succinct statement of the key findings of the research, and then a presentation of the contributions of this study to current knowledge. Despite these contributions, there are some limitations of the research, which are outlined next. The implications to be drawn from the study are then set out and the chapter concludes by suggesting further avenues of research with regard to the enactment of NAS.

7.2 A succinct statement of the research key findings

In the terms of the research questions:

RQ1: What are the policy intentions regarding the purposes of the New Assessment System in Basic Education in Oman, its enactment in science teaching and accountability for this?

RQ2: How do science teachers enact the New Assessment System in Basic Education classrooms?

RQ3: What are the factors that influence the New Assessment System practices and thus its functioning as Assessment For Learning?

RQ4: To what extent do the Ministry of Education's policy intentions regarding the New Assessment System align with science teachers' practices in respect of the Assessment For Learning approach?,

Overall, the research undertaken in relation to the first research question has offered a perspective on the New Assessment System in Basic Education policy intention in Oman. This appears to be an ambitious and coherent policy aligned with the global trend of development of educational systems, whose main purpose of NAS is assessment for learning (AFL), which seeks to

improve the teaching and learning of science. The findings have illustrated an alignment between the school staff members' interview responses and the declared policy intentions that one clear function of NAS should be assessment for learning. However, the findings that relate to research questions two and four indicate that the reality of NAS policy enactment was not entirely consistent with the NAS policy intentions, and that the extent of alignment depends on the contextual factors. The findings that relate to the third research question explain in detail that the contextual factors have had an effect on NAS's policy development and its enactment, and that ignoring these factors can produce a gap between intentions and enactment, which in turn can result in a superficial or partial enactment.

In detail, the study shows that this gap between NAS intentions and teachers' actual assessment practices can be attributed to several contextual reasons, foremost of which is the absence of a consultation stage in policy development process in the Omani context, which is an Eastern, and specifically Islamic, cultural context, as well as the weakness of policy enactment reinforcement. The consultation stage is perceived to be crucial, as it is the initial period of presenting the initiative to practitioners and stakeholders in general and engaging with them to gain their insights, influence over, and then their informed commitment to, the particular policy initiative. Consultation helps to identify and define needs, and understand the idea behind the change, as well as understanding where we are now, why we want change, and in what direction, as well as how we can begin to do so. This step was clearly absent in the policy development stage and contributed to a limited understanding of the policy initiative and limited commitment to the implementation of the policy.

With regard to the weakness of policy enactment reinforcement, the study shows that the absence of consultation combined with the inadequacy of the professional development of practitioners has had a negative influence on policy enactment. This is in line with the literature which states that professional development initially seeks to involve people in understanding and diagnosing the status quo. Thus, it encourages people to express their need to change something, that is it enables them to provide some diagnoses, and thus solutions, and this is an essential stage of professional development

and the policy enactment's reinforcement in general. Moreover, the research demonstrates some findings associated with critical aspects of the enactment of a new initiative in the assessment system. For instance, it clarifies that there is no specific framework for reform enactment accountability, nor a particular body that enforces accountability, as well the absence of self-accountability. Additionally, teacher agency was not designed into the system (NAS), and had no specific framework, nor was it reinforced by officials, but it depends primarily on practitioners' values. The study's findings finally indicate that adaptation of borrowed policy from other contexts and cultures is influenced by local contextual and cultural factors, to the extent that its core purpose may be distorted.

7.3 Contributions to current knowledge

As discussed in Chapters 2, 4 and 5, assessment for learning (AFL), which is at the heart of the NAS initiative, plays a crucial role in the process of science teaching and learning, in line with worldwide attention to AFL, as reported in international literature. On the other hand, to the best of my knowledge, this study breaks new ground by being the first to investigate the enactment of a policy intervention in the science curriculum, involving a large-scale, government-funded AFL initiative in an Eastern country. In particular, as far as I know, no previous studies in Oman have investigated a change in the system of assessing science teaching so widely and deeply. As aforementioned in Section 7.2, this study covers some crucial aspects, such as the Islamic perspective and its relation to policy development in the field of education, moderation systems, accountability for science education in Oman, and teacher agency. Thus, it is novel in addressing several significant points that have not been covered by previous studies.

Only three works have been published in the Omani context in this regard. One is a small-scale study by Al-Kindy (2009) of Grade 12 English teachers' attitudes towards continuous assessment (CA). Al Sawafi (2014) investigated the relationship between the beliefs and practices of secondary school English teachers regarding CA reform, while the study of Al Kharusi (2007) was limited to ninth-grade science teachers in Oman, examining the possible effects of

their assessment practices on students' perceptions of the classroom assessment environment, and the achievement of goal orientations. Importantly, the population of the present study includes all classes of stakeholders that have a direct relationship with NAS, whether by enacting it or supervising the enactment process, such as decision makers, supervision specialists, curriculum and assessment specialists, and practitioners (school principals, heads of department and science teachers). The study also covers both urban and rural schools and both single-sex and co-educational schools.. This broad scope (as detailed in Chapter 3) offers a more in-depth understanding of teachers' practices and the factors that influence NAS enactment.

As illustrated in Chapters 2 and 6, there is currently extensive literature on the enactment of AFL policy at classroom level. However, AFL was discussed by Omani teachers in their interview responses in a way that was quite different to the current knowledge found in existing world literature. This brings me to a wider point about the importance of the Omani cultural context, as policy enactment was found to have been affected by many local contextual and cultural factors. Therefore, this study has made a number of contributions to addressing the gap in existing knowledge. It may also be of value to education authorities and practitioners in Oman, as well as other countries where similar disparities between policy intentions and enactment have been reported, offering implications for policymakers, those leading the development of policy initiatives, supervision specialists, assessment specialists, curriculum specialists, and subject teachers. The most prominent of these contributions, can be succinctly expressed as follows. Initially, the present study contributes to filling a gap in the literature regarding the lack of data on AFL policy enactment in science education in Oman as an Eastern and Islamic context, whereas the current literature focuses predominantly on the Western context. Furthermore, the topic of consultation, as one of the key stages in policy development, has a broad area of research in political science and public policy, but has been explored to a lesser extent in educational studies, particularly in the context of Islamic culture. This study highlights the importance of the consultation stage in educational policy development in Oman as part of the Islamic world, as well as investigating the effect of the

cultural context on policy enactment, which is considered as one of this study's contributions to the literature. Equally importantly, as explained earlier (Chapter 2, Section 2.13.1), a considerable number of researchers argue that contextual factors affect the professional development of teachers, which in turn is viewed as a crucial factor in the policy enactment process. This study examines Omani teachers' professional development as one of the main aspects of the reinforcement of policy enactment, and the extent to which it is influenced by contextual factors. This is, therefore, considered as extending the current literature with further examples of the influence of contextual factors on the professional development process. Another concern arose through this study, which is that while some of the certain critical aspects that are associated with the enactment of a new initiative in the assessment system, (such as policy borrowing, teacher agency, moderation, accountability in general, and self-accountability for enactment) are fully taken into consideration in the Western context literature, in contrast very little published research exists about this in Eastern and Islamic cultural contexts (including in relation to Oman). This study has contributed to filling this, which constitutes an important gap in the literature in this regard. I discuss these contributions further below.

At the heart of this thesis is a discussion of continuous assessment, which is one of the most important types of assessment underpinning the New Assessment System. Teachers typically use CA to enable them to gain insight into how well students are progressing during a short period of time, thus informing both teaching and learning. In this case, CA serves as an assessment for learning. Accordingly, many studies of professional development and CA are discussed in the literature review (Chapter 2), focusing on the formative function of continuous assessment. Specifically in relation to the Omani assessment system, policymakers' intentions are to use CA as a vehicle for formative assessment. However, this study provides evidence that Omani science teachers are using CA tools, such as short quizzes, classroom observation, projects, classwork, homework, group work, presentations and examinations, primarily for reporting purposes rather than to inform teaching and learning. In other words, by awarding marks to students continuously throughout the length of the term, they are essentially serving

summative rather than formative purposes. On the other hand, as explained in Chapter 2, it should be borne in mind that the terms ‘continuous assessment’ and ‘formative assessment’ are not interchangeable, because any assessment activity falling into one of these categories may or may not also fall into the other.

By the same token, it is interesting to note that there is a firm belief amongst most teachers in Oman that the continuous use of a variety of assessment tools directly constitutes formative assessment or AFL. In other words, they mistakenly believe that the various assessment tools specified in the assessment document, except for exams, are intended for AFL purposes, whereas exams are intended as assessment of learning (AOL), regardless of whether or not these purposes are achieved. In my view, this mainly focuses on AOL, which could lead both teachers and students to carry out various non-credible practices, or even act dishonestly when applying these tools.

One of the most significant contributions of this study is that it has investigated various features of Islamic culture and its relationship with the enactment of a new educational initiative. It has emphasized, in accord with the international literature, that the consultation stage in policy development, known as the Alshura approach, is fundamental to Islamic culture. However, in spite of its Islamic culture, Oman’s policy development process does not include a consultation stage. In other words, the Omani context predominates over the Islamic context in this regard, in that custom and tradition have greater weight than religious principles.

As to the nature of Omani culture, the study found it to be collectivistic rather than individualistic, tending to centre attention on the situation rather than the individual. Thus, it is not overly concerned with the affairs of individuals and how they differ in values, skills and experience, preferring to see them all through the same lens. This is reflected in several aspects of education policymaking, such as the belief that what works for specific individuals is fit for all; hence the apparently autocratic approach to policymaking, illustrated by the exclusion from policy development of any consultation stage, as was the case when NAS was approved, by the introduction of the Global Chains of Science Curriculum, by the absence of competency-based training, which

would take account of the differing needs of individuals, and by the writing of assessment documents in a style better understood by the policymakers themselves than by the practitioners to whom they are supposedly addressed. Equally important is that fact that even major political events in the Arab region, such as the 2011 Arab Spring and the Omani teachers' strike of the same year, both of which called for popular participation in decision making, had no real impact on Omani culture in the field of education, being more concerned with individuals and their requirements than with centralized and authoritarian decision-making.

By the same token, this study has contributed to the discovery of ways in which Omani cultural values coincide with or differ from those of other cultures in areas such as policy development and enactment, assessment purposes and accountability systems. For instance, I found Omani culture to closely resemble that of the West in matters such as policy enactment, in its dependence on local circumstances, in the dynamic and shifting nature of the context and the influence of policy. The cultural context dimensions were also seen to affect policy enactment collectively rather than individually, ignoring the local cultural context and leading to some kind of superficial enactment, with a preference for soft measures of accountability over hard ones. Conversely, areas in which distinct Omani cultural values are reflected in differing practices include the exclusion of consultation from the policy development process, assigning specific assessment tools to each assessment type (AFL vs AOL) and adapting policy borrowing with certain methods, such as applying moderation with different aims and procedures. Additionally, Omani culture allows the intervention of administrative and financial regulations to influence policy enactment in the classroom, even though this influence can occasionally be negative, a rather surprising example being the absence of a fair mechanism for allocating school laboratories, where the share of each school's resources is based on the grades covered by the school, rather the size of its student population.

Equally importantly, in terms of the mechanisms of accountability for NAS enactment, this study identified an ambiguity regarding the responsibilities of practitioners and supervisors for all components of the Omani education

system, including NAS. The result is the absence of any accountability framework and the existence of only some simple mechanisms, such as supervision (inspection) and moderation, which are considered soft in that they do not exceed monitoring and explanation. In other words, there is no particular body enforcing accountability for the enactment of educational policies by rewarding success and penalizing negligence. It is also notable that teachers are not accountable for science education outside the scope of school. In all of these ways, Oman stands in clear contrast to Western countries, which have robust accountability mechanisms through bodies such as the Office for Standards in Education, Children's Services and Skills (Ofsted) in England.

When investigating Omani science teachers' practices during NAS enactment, this study found that their agency was manifested through these practices, although this was not designed in the system, it had no specific framework and was not reinforced by officials. It follows that the manifestation of agency depends primarily on practitioners' values, a finding which can be considered one of the significant contributions of this study. Therefore, teachers' values control their practices; for example, some have partly resisted the NAS policy, some have enacted it only as a compliance strategy and others have done so as they consider appropriate for their students.

Equally importantly, the NAS system adopted in Oman originated in Western countries such as Scotland and Canada, where the education settings differ to some extent from those in Oman. In the process, some elements of the system have been curtailed or incompletely implemented. For instance, the moderation system has been adapted in the Omani context for the purpose of verifying teachers' honesty and fairness in awarding marks for students' performance on CA tools. Thus, its role has been limited to a particular purpose (auditing), in a particular context (Grade 12), in particular procedures (formal) and at a certain time (end of each term). In contrast, the system was intended to be used continuously for all grades and both formally and informally, for the purpose of professional auditing and development. Here, the study makes a contribution by revealing that the adaptation of borrowed

policy is influenced by contextual factors, to the extent that its core purpose may be distorted.

In summary, investigation of curriculum change and the enactment of the NAS policy in the Omani context has not only addressed the status of that policy, but has also identified lessons to be learned and points of interest for researchers, policymakers and practitioners. In other words, it adds to the existing literature and can be viewed as a template against which the implementation of any other project can be measured in terms of contextual factors and their impact on curriculum change.

7.4 Limitations of the research

The previous section has demonstrated the value of this study in making some significant findings about teachers' enactment of a policy initiative in assessment and the contextual factors that influence their practices. However, the study does have some limitations, as follows. While the use of qualitative methods, namely observation and interviews, has provided in-depth data, the size of the study population was restricted in that I was able to secure the participation of only nine teachers from three schools, due to distance and time constraints. In mitigation, engaging with this number of participants has enabled me to invest more time with each of them and to build an atmosphere of trust. Despite the participants having been drawn from both urban and rural areas of the governorate and from male, female and mixed gender schools, however, I have less confidence in the data than I would have had if I had been able to cover more schools and more participants with a greater number of observations and interviews.

An important limitation concerning the main focus of the study, namely NAS enactment, is that although it involved stakeholders of many types, with differing roles in this process, it excluded the participation of students and parents, whose views on policy intentions and enactment might well have yielded further valuable insights. For example, as teachers commented on students' activities through NAS, interviewing students would have provided further explanatory data on teachers' credibility and competence in NAS enactment.

Another limitation arises from the fact that most of the interviewees either did not speak English or preferred to use Arabic, their first language, because doing so gave them confidence to express themselves more clearly. Having therefore been conducted in Arabic, the transcripts of the interviews—or at least parts of them—had to be translated into English, which took up much time and risked inappropriate interpretation and mistranslation, thus limiting my ability to use direct quotations to support my arguments with confidence in their accuracy.

While this study identifies a range of factors affecting NAS enactment, there may be others that have not been identified because of incomplete data. Firstly, during the interviews I felt that some participants were evasive and some overly compliant, perhaps because they knew me personally through my previous role at the MOE as Manager of the Assessment Department, despite my best efforts to minimize this effect. Similarly, the teachers may not have carried out their usual assessment practices while I, as a researcher, was observing them.

In addition, data collection took place between January and June 2016, after which time the NAS enactment process may have experienced some change. For example, curriculum changes in 2018/2019 (the introduction of the Global Chains of Science Curriculum in Cycle 2) may have had both direct and indirect effects on the way that NAS was enacted. Therefore, some of the findings of this study may be valid only before the school year 2018/2019. Another example is the TIMSS 2019 results, which may indicate some changes in student achievement, in turn pointing to new issues related to NAS enactment.

Despite these limitations, it is my personal belief that the study has generated rich data, thus contributing to the body of knowledge on policy development and enactment in general, and particularly on the introduction of an AFL initiative. Its results, therefore, will be of relevance and interest to researchers and practitioners in other contexts whose circumstances are similar.

7.5 Implications of the study

7.5.1 Personal and general implications

In addition to my professional identity as an expert in the Assessment Department of the Omani MOE, this study has helped me to develop both personally and academically. I have learned and understood more about AFL and how assessment tools are employed by teachers during their classroom practice in order to achieve this, as well as the cultural factors that influence it. I also understand that policy enactment needs stakeholders at all levels to work together and commit to the process of enactment. This research experience has brought me very close to the reality of the teaching process, allowing me to see at first hand the efforts of teachers in the classroom, to discover exactly what they do and to appreciate the challenges and difficulties they face in teaching and in enacting new policies. All of this has made me more familiar, analytically and critically, with the Omani education system. Accordingly, based on my role in the MOE, I believe that some issues that relate to the way in which this assessment system is practised will be informed in order to change them.

More broadly, the inconsistencies that this study has identified between NAS policy intentions and science teachers' enactment of the policy—that is, their actual assessment practices—have implications for all stakeholders, especially policymakers, the MOE's specialists in assessment, supervision and curriculum, teacher educators and science teachers. Although there is evidence of the effectiveness of AFL if properly implemented, schools do not usually enact it as intended. Here, policymakers should take into account that NAS implies a paradigm shift in the way teachers think, plan and behave. They should also pay close attention to the requirements of this system compared with the previous one, recognizing the need for reinforcement if it is to fulfil its aims, with consideration of the effects of contextual factors on policy enactment. Therefore, this study makes several suggestions for improving AFL policy enactment in Oman, with potentially useful implications for any similar AFL change elsewhere. These concern what should have been done before introducing NAS, what is now necessary to improve it and what needs to be done to optimize any future change in the assessment system. The next

two subsections outline these implications of my study, with particular reference to the management of change and to the professional development of teachers.

7.5.2 Implications for managing NAS change

I believe that the MOE needs to improve the policy development process by introducing a fundamentally important stage, consistent with both Islamic and Western culture, namely consultation with all relevant stakeholders, beginning with practitioners. In my view, this improvement will help to inform policymakers with feedback that takes into account the local contextual factors during the adoption of a new policy. It would also be useful in sharing accountability for policy enactment between policymakers and practitioners, thus making enactment more effective.

The policymakers should also create a clear plan of policy enactment reinforcement, again taking local context into account. This plan needs to include a variety of actions, such as setting out the statutory basis of the policy, facilitating public debate and discussion, providing the required professional development programmes, developing administrative and financial regulations in order to provide sufficient facilities and resources such as budgets and laboratories, directing supervision and assessment activities to follow up policy enactment, providing support for teachers in schools and putting plans in place for the inspection of enactment.

It is equally essential for the MOE to design a national programme to raise awareness of the rationale for the implementation of NAS among all classes of stakeholder, including teachers, department heads, school principals, teacher educators and specialists of assessment, curriculum and supervision. In detail, this would serve to convey—to stakeholders in general and to teachers in particular—the objectives, principles, benefits, advantages and disadvantages of the system. This programme could communicate its message to the targeted people through a variety of channels, such as assessment advisors' visits to schools, where meetings are held with teachers and discussions take place about the enactment of the NAS policy. Group meetings could also be held in public places, such as community centres, as well as all concerned being granted clear access to learn more about NAS

through leaflets, educational newsletters, teachers' forums, educational portals, TV programmes and social media.

The MOE should ensure that implementation of any new educational policy is gradual and sequential. I believe that it should begin with a piloting step, where the change is carried out on a sample of grades in specific schools. Real implementation should then take place in a limited number of schools, which should be expanded in carefully planned steps until it eventually covered all grades in all schools. This would give policymakers, practitioners and other stakeholders the opportunity to experience the early versions of the change and so to determine the modifications needed for policy enactment to fit with the reality of teachers' experience and the Omani cultural context, thus supporting ongoing improvements to the process.

A crucial implication of the study related to teachers' effective enactment of change is that the MOE should seek to instil in practitioners a sense that they have ownership of the change, that it serves their interests and that they are key players in its enactment. This can be achieved in several ways, such as enabling their participation in policy development and providing them with qualitative training in aspects of assessment aligned with their individual experience and competencies. Policymakers should also grant teachers more freedom by reinforcing the framework within which they are able to exercise agency within the education system, while simultaneously ensuring that accountability is robustly administered by means of both soft and hard mechanisms, thus rewarding success and penalizing negligence. All of these and other measures would encourage teachers to feel a sense of ownership of the change.

An implication of the study concerning the practical implementation stage is that the MOE should monitor teachers' enactment of the change and support them in it. In other words, the supervision and assessment departments should be more active in facilitating and supporting teachers' enactment of NAS. Thus, educational supervision should focus on assisting teachers' enactment of NAS as intended, rather than on their evaluation and performance reports as at present. For instance, teachers need to be supported in designing and evaluating NAS assessment tools. Furthermore,

school principals, supervisors, heads of department and teachers should all collaborate in order to overcome the difficulties of NAS enactment, through the development of some of the principles and techniques recognized among themselves.

The implication of this study's identification of contextual factors affecting teachers' enactment of NAS is that it is essential for the Omani MOE to carry out a critical review of some aspects of NAS raised by interviewees, such as the use of assessment tools that are inappropriate in the Omani context, the discrepancy in results between exams and other NAS tools, the writing of assessment documents in a style more suited to policymakers than to practitioners and the exaggerated and artificial conditions under which TIMSS has been conducted. This critical review should take into account the vital need for the elements of NAS to align with the reality of the Omani context in terms of settings, circumstances, culture, politics and society. The MOE would then be better placed to design plans and strategies in collaboration with schools that would effectively support NAS enactment.

7.5.3 Implications for preparing and developing teachers

The results of this study reveal the reality of NAS enactment as seen by the practitioners themselves and reflected in their actual practices, giving policymakers and designers of teacher education and training programmes in Oman a valuable opportunity to use its findings to update these programmes to cover aspects of NAS. This subsection therefore outlines some of the implications for preparing and developing teachers.

This study has shown contextual factors to have a key effect on teachers' practices in enacting NAS. To go beyond this finding by investigating these factors more thoroughly and accurately, I suggest that the MOE design specific in-service exploratory workshops where practitioners in all Omani governorates would have the opportunity to share their expertise and judgement and to report the challenges that they have overcome when enacting NAS successfully in their own contexts. Policymakers at the MOE and at teacher preparation institutes would use the feedback from these workshops to update and improve teacher training and preparation programmes so that they more fully responded to practitioners' real needs.

Similarly, policymakers should use the output from the above workshops to design in-service professional development programmes taking account of teachers' experience and beliefs, as well as potential resistance to the NAS system. This would help teachers to accept the NAS changes by addressing the issue of their weak commitment to following NAS instructions and principles in their practices due to incompatibility with their extensive experience of previous assessment systems and with their personal values. Therefore, these workshops would be useful for designing training programmes incorporating activities to reinforce teachers' enthusiasm for NAS enactment. They might also develop practitioners' understanding of the rationale for NAS and make them more aware of the purpose, value and meaning of its enactment in their own practice. Moreover, these programmes could include some real classroom situations.

I would like to emphasize the need for the MOE to advance the professional development of practitioners and improve the assessment tools and curricula, based on the results of studies and reports on the Omani education system, such as moderation reports, TIMSS results, supervisory visit reports and measures of student achievement. Policymakers should also understand that providing practitioners with one-off training, manuals and guidelines will not ensure that they enact change effectively; rather, they need more specialized training programmes in assessment and particularly in AFL. More specifically, Omani science teachers need training that enables them to understand and distinguish between concepts related to assessment, such as formative and summative assessment, AOL and AFL, responsibility and accountability, and teacher agency.

Regarding the following up of teachers' enactment of NAS, I suggest that the MOE should reconsider the roles of the heads of science departments and should develop a plan to raise their professional standards by qualifying, training and equipping them with the necessary skills to deal with NAS. This would enable them to follow up teachers' enactment of NAS and to provide support and assistance during their classroom practice. The provision of such training and support for heads of department would be particularly beneficial for teachers if based on the observation and discussion of their real-world NAS

practices. The MOE should also encourage teachers to design individual CPD plans in collaboration with their supervisors and heads of department.

Finally, the interviews conducted with MOE specialists in this study revealed the absence of any database, whether electronic or manual, of the training history of teachers or of programmes that they had attended since their appointment to the Ministry. The MOE ought to set up such a database, as it would deliver the information needed by the designers of training and professional development programmes to ensure that teachers were enrolled to those most appropriate to their needs.

7.6 Suggestions for further research

This study has provided various insights into the enactment of AFL change, with a focus on the perspectives of key actors and practitioners—i.e. policymakers and specialists who engaged in policy development and monitored its enactment, and school staff members including science teachers—and on what they did to enact NAS and why they did it. However, I suggest that there is room for further research within the Omani context to provide valuable insights about AFL in Oman and in other countries where circumstances are similar.

In light of the small scale of this qualitative study, I suggest conducting new research using mixed methods and covering all Omani governorates, thus ensuring geographical, environmental and social diversity, as well as covering all Basic Education grades from 1 to 10, thus including the lower grades which do not use exams for assessment. This would provide broader data on the contextual factors that affect NAS enactment.

The present study involved multiple classes of stakeholder, but neither students nor parents were consulted, so future research into NAS enactment should include these groups of participants. In detail, considering students' points of view would provide further insight into NAS enactment. For instance, as students receive feedback from teachers on their assessment activities, they can provide insight into the abilities and competencies of teachers to interpret NAS intentions, as well as their credibility and honesty in assessing their students' work. As to the parents, they should be considered real

partners in education whose involvement in such research is essential, particularly as their collaboration with teachers has an effect on NAS enactment. Their views on NAS enactment could therefore deepen understanding of the impact of this change on their children and on themselves, while their preferences for the inclusion in the system of particular assessment tools and activities, as well as their reflections on the teachers' performance, would offer a broader perspective on the change.

Both the implementation of the Global Chains of Science Curriculum in the Omani educational system from 2018/2019 and the participation of Omani students in TIMSS in 2019, whose results will be published in 2020, occurred after I had collected the data for this study. Therefore, I suggest researching the influence of the new curriculum on NAS enactment and on students' TIMSS results.

Finally, notable among the crucial issues which have emerged from the findings of this study are those of teacher agency and accountability. In detail, some scattered manifestations of agency were evident in teachers' enactment of NAS, whereas there was a near total absence of evidence of accountability for NAS enactment. Therefore, I suggest conducting a large-scale study on the existence and nature of teacher agency and accountability in Oman and the extent of their influence on enacting educational policies in general, allowing a framework for their operation in the Omani context to be proposed.

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Appendix A:

Classroom Observation Schedule

School:	Participant:		Date:
Observation no:	Topic:		Time of observation:
Focus area	**Notes**		
Assessment planning			
Using NAS tools/techniques and records	Diagnosing		
	Testing for understanding		
	Providing feedback		
	Checking learning progress		
	Awarding scores		
	Others		
Feedback	Individual		
	All students		
Classroom interaction while using assessment tools			
Teacher's and students' roles	Teacher		
	Student		
Teacher's capacity to act purposefully and constructively			
Resources			
Others			

Appendix B:

Policymakers Interview Schedule (Semi-Structured)

Policymakers' Interview Schedule (Semi-Structured)			
Participant:	**Date:**	**Time:**	
Research Question	**Essential Ideas**	**Further Question**	**Probing Question**
What are the policy intentions regarding the purposes of the New Assessment System in Basic Education in Oman, its enactment in science teaching and accountability for this?	A. Significant effects of science on students' results.	1. How do students' result in science affect their enrolment into higher education institutions? 2. How do students' result in science affect their chances in the labour market nationally and internationally?	What is the connection between…and ….?
	B. The MOE policy intentions regarding the purposes of NAS in Science.	1. Why has the MOE introduced NAS in science to replace the previous assessment system? 2. Was the MOE's decision to implement NAS based on international experience? 3. What are the purposes of NAS? 4. Is NAS implemented to be an assessment of learning or assessment for learning or both? Why? How? 5. In what way can NAS support teaching and learning? 6. Is the NAS used for evaluating schools' performances (ranking) in that way? 7. How would you describe the relation between NAS and learning? 8. What is the relation between NAS and the science curriculum? 9. What standards is NAS based on in science teaching?	Could you give more details?
	C. The MOE policy intentions regarding the structure of NAS in science.	1. What are the most prominent features of NAS structure? 2. How many types of assessment in science are employed through the NAS?	What would have to change in order for…?

Policymakers' Interview Schedule (Semi-Structured)			
Participant:	**Date:**	**Time:**	
Research Question	**Essential Ideas**	**Further Question**	**Probing Question**
		3. What are the characteristics of NAS in relation to science?	Could you explain that? How? How?
	D. The MOE policy intentions regarding the outcomes of NAS in science.	What are the characteristics of NAS intended outcomes?	Could you give more details?
	E. The intended influence of NAS.	1. What is the influence of NAS on the school's performance? 2. What is the influence of NAS on students' performance? 3. What is the influence of NAS on teachers' performance?	Does it corresponds with the intended influence of the MOE? What sort of an influence do you think…?
	F. Preparations and planning for introducing NAS.	1. What were the main planning aspects for implementation of NAS? 2. What was the implementation strategy made by MOE to convince teachers to apply NAS? 3. What efforts were made by MOE to build science teachers' capacity to apply NAS? 4. Were there any special requirements for NAS?	Was it an effective strategy? Were these requirements pedagogical or administrative or financial or all together?

Policymakers' Interview Schedule (Semi-Structured)			
Participant:	**Date:**	**Time:**	
Research Question	**Essential Ideas**	**Further Question**	**Probing Question**
			How did the MOE provide them?
	G. Challenges that may be encountered during the implementation of NAS.	1. Were there any challenges regarding the planning for implementation of NAS? 2. Were there any challenges regarding the changing of previous teachers' convictions and beliefs? 3. Were there any challenges regarding providing pedagogical, administrative and financial requirements of NAS? 4. What about now are these challenges still exists?	In which aspects exactly? How did MOE overcome these challenges? How did MOE overcome these challenges? What are the present challenges in this area that they face in enacting NAS?

Policymakers' Interview Schedule (Semi-Structured)			
Participant:	**Date:**	**Time:**	
Research Question	**Essential Ideas**	**Further Question**	**Probing Question**
	H. Teachers' role and students' role in NAS enactment.	1. What is the actual role played by the science teacher in the classroom through NAS? 2. Do teachers use NAS in classrooms regularly? Is there any evidence or proof? 3. Do teachers use NAS as assessment for learning or assessment of learning or both? How? 4. What is the actual role played by the students in science in the classroom during the use of NAS as AFL? 5. Is the feedback important in this system?	Does it correspond with the intended role of the MOE? If not, what are the factors or reasons for not using NAS in classroom? How you can figure that? Does it correspond with the intended role of the MOE? How?
	I. Teachers' understanding of NAS and learners' progress.	1. After nine cohorts graduated from this system, what do you think is the science teachers understanding of NAS and learners' progress? 2. Do science teachers' practices reflect their understanding of NAS and learners' progress?	How can you prove that?
	J. Shortcomings of NAS enactment.	In your opinion, what are the shortcomings of NAS enactment?	What do you assume to be true about NAS enactment?

Policymakers' Interview Schedule (Semi-Structured)			
Participant:	**Date:**	**Time:**	
Research Question	**Essential Ideas**	**Further Question**	**Probing Question**
	K. The factors that may influence in science teaches NAS practices.	1. What are the factors that influence science teachers' NAS practices? 2. In what ways can TIMSS encourage students to participate during NAS, which can able them to do better in it?	How it can be?
	L. Accountable about NAS enactment	3. Who should be accountable for NAS enactment? 4. What kind of accountability should there be for NAS enactment?	How? When?

Appendix C:
Practitioners Interviews Schedule (Semi-Structured)

Participant: Interview No.: Date: Time:

Part A: School Principal and Head of Department:

1. What is assessment for you?
2. Why has the MOE introduced NAS in science to replace the previous assessment system (intentions)? Was the MOE's decision to implement NAS based on international experience?
3. Do teachers have convictions regarding NAS?
4. What efforts were made by the MOE to build science teachers' capacity to apply NAS?
5. In your opinion are there any special requirements for NAS enactment? Are they available in your school?
6. Are teachers enacting NAS as assessment of learning or assessment for learning or both? In what ways can NAS support teaching and learning?
7. Do science teachers' practices reflect their understanding of NAS and learners' progress?
8. Do teachers face any challenges during NAS enactment? What kind of challenges? Please explain. How did they overcome these challenges? What about now? Do these challenges still exist, or are other challenges present? In your opinion, what are the factors that influence NAS practices?
9. What is the influence of NAS on students, teachers and school performance?
10. How do you investigate your school students' progress?
11. Who do you think is accountable for NAS enactment?
12. After nine cohorts graduated from this system, what do you think is the science teachers' understanding of NAS and learners' progress?
13. In your opinion, what are the shortcomings of NAS enactment?

Part B: Science Teachers:

1. What is assessment for you?
2. What are NAS policy intentions? Does NAS support teaching? How?
3. Could you tell me how you assess your students? Do you have a guide that helps you to assess your students?
4. In your opinion, are there any special requirements for NAS enactment? Are they available in your school?
5. Did you face any challenges when enacting NAS for the first time? What kind of challenges? Please explain. How did you overcome these challenges? What about now? Do these challenges still exist, or are there other present challenges? In your opinion, what are the factors that influence NAS practices?
6. What is the influence of NAS on students, teachers and school performance?
7. What was the purpose of using NAS in the last lesson? Was that related to learning? How?
8. What is the kind of relation between you and your students in the classroom through NAS? You asked students to …… . What was your intention behind that?
9. How do you investigate your students' progress? You mainly focused on …….. . What was your aim behind that? I saw you …… . Why? I noticed you were using some assessment registers during the lesson. What is the point behind that?
10. What other tools do you mostly use to assess your students? Do you think the assessment should be based on a variety of tools and techniques? Why?
11. Who do you think is accountable for NAS enactment?

Appendix D:

Participant Information Sheet

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Participant information sheet for the study: From Policy to Practice: School-Based Assessment of Omani Students' Science Learning in Basic Education Schools

(Policymakers, school principal and the head of department only will be interviewed, but science teachers will participate in observation and post-observation interviews)

Dear Participant,

I am a PhD student in the School of Education at the University of Leeds in the United Kingdom. I am currently carrying out a research project. The main aim of this research is to understand how science teachers enact a national initiative, the New Assessment System, which was initiated by the Ministry of Education and focuses on assessment for learning (AFL). This research is being organized by myself, under the supervision of Professor Jeremy Higham and Professor Jim Ryder, in the School of Education at the University of Leeds.

I am writing to ask if you are able to take part in the study. Please read the following information in order to help you decide if you wish to take part. If you have any questions, please get in touch.

What are the aims of the research?

In this research I seek to:

- understand the MOE's policy intentions regarding the purposes of NAS, its enactment as AFL and accountability for this.
- discover how science teachers enact NAS as AFL through their practices in the classroom.
- explore the contextual factors that influence the classroom practices of science teachers while they enact NAS as AFL.

What would this mean for me and my organization?

You will be providing me with information through an observation/interview in which you will be asked about your professional experiences, opinions, and ideas about the new assessment system and its enactment in state schools. With your permission, I will audiotape the interview so that I have a record of our discussion. This interview will take a maximum of 40 minutes, and will take place in your workplace, at a time convenient to you. The information gathered will be very important to my research and to get feedback about the enactment of new assessment system.

Anonymity
The data you provide will be stored by code number. Any information that identifies you will be stored separately from the data.
Storing and using your data
The data will be stored in secure filing cabinets and on a password-protected computer. The data will be kept for five years, after which time any personally identifiable data will be destroyed. Anonymized data may be kept and used for future analysis and shared for research or training purposes, but participants will not be identified individually. If you do not want your data to be included in any information shared as a result of this research, please do not sign the consent form.
During the audio recording process, if you would like to say something that you don't feel comfortable for me to record, please signal and I will switch off the recorder, then switch it back on again later when you indicate that it is fine to continue recording.
Your involvement in the study is absolutely voluntary. You are free to withdraw from the study at any time during data collection and up to two weeks after the data collection is complete. You will be given the opportunity to comment on a written record of your interview (the transcript), and if you wish to do so, the period in which you may withdraw your data will be extended until two weeks after the date the transcript is sent to you.

Information about confidentiality
The data I collect (audio recordings and transcripts) may be used in *anonymous* format in different ways: reports, presentations, and journal articles.
I hope that you will agree to take part, but if you have any questions about the project that you would like to ask before giving consent or after the data collection, please feel free to contact Ali Al-Shukaili by email (edasas@leeds.ac.uk) or by telephone on 99381628, or the Chair of Ethics Committee via email researchethics@leeds.ac.uk

- **If you are happy to participate, please complete the consent form attached.**
- **Please keep this information sheet for your own records.**
- **Thank you for taking the time to read this information.**

Yours sincerely,

Name: Ali Al-Shukaili
Email: edasas@leeds.ac.uk
Mobile: +96899381628
Position: PhD Student
University: University of Leeds

Appendix E:

Participant Consent Form

The study title: From Policy to Practice: School-Based Assessment of Omani Students' Science Learning in Basic Education Schools

Name of Researcher: Ali Al- Shukaili
Please initial each box if you are happy to take part in this research
(Policymakers, school principal and the head of department only will be interviewed, but science teachers will participate in observation and post-observation interviews)

The statement	✓
I confirm that I have read and understood the information provided to me about the above-named research project, and understand that this will involve me taking part as described above.	
I understand that the purpose of this research is to understand how science teachers enact a national initiative, the New Assessment System, which was introduced by the Ministry of Education and focuses on assessment for learning.	
I understand that I will be providing information through observation/interview in which I will be asked about my personal experiences, opinions, and ideas about the new assessment system. I realize that this observation will take place in two separate lessons of 35- 40 minutes, and the interview will take a maximum of 40 minutes (One interview for each policymaker, school principal and the head of department; the observation and post-observation interview will conducted twice for each science teacher).	
I understand that I may withdraw my agreement to participate at any time during the data collection, or for up to two weeks afterwards. Within that time, I know that I may indicate whether or not the data collected up to that point can be used in the study, and that any information I do not want used will be destroyed immediately.	
I understand that the interview will be audio recorded, and these recordings may later be transcribed. I understand that these data will be handled in a manner which ensures that only the researcher can identify me as his source.	
I understand the data will be stored securely in a locked filing cabinet or on a password-protected computer and only the researcher (Ali Al- Shukaili) and the person assisting with the transcription will have access to any identifiable data. I understand that my identity will be protected by use of a code/anonymity.	
I understand that I am being offered confidentiality in any written report, publication or oral presentation which draws upon data from this research study, and that none of my comments, opinions, or responses will be attributed to me. I understand that my workplace will not be identifiable in any written report.	
I understand that data could be used for future analysis or other purposes, for up to 5 years.	
I understand that data could be shared, for example by submitting it to the University of Leeds Research Data Repository for use in further research.	
I understand that I will be given the opportunity to comment on a written record of my responses.	

Name of participant: _____
Signature: _____ Date: _____

Appendix F:

Ethical Approval

Research and Innovation Service
Level 11, Worsley Building
University of Leeds
Leeds, LS2 9NL
Tel: 0113 343 4873
Email: ResearchEthics@leeds.ac.uk

UNIVERSITY OF LEEDS

Ali Al-Shukaili
School of Education
University of Leeds
Leeds, LS2 9JT

ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee
University of Leeds

21 October 2016

Dear Ali

Title of study: **AREA 16-025**

Ethics reference: **From policy to practice: school-based assessment system of Omani students' science learning in grade 10**

I am pleased to inform you that the above research application has been reviewed by the ESSL, Environment and LUBS (AREA) Faculty Research Ethics Committee and following receipt of your response to the Committee's initial comments, I can confirm a favourable ethical opinion as of the date of this letter. The following documentation was considered:

Document	Version	Date
AREA 16-025 Ethical_Review_Form_V3_Ali_10-10.pdf	3	10/10/16
AREA 16-025 Key Stakeholders Interview guide.pdf	1	22/09/16
AREA 16-025 Teacher Interview.pdf	1	22/09/16
AREA 16-025 Teacher Observation.pdf	1	22/09/16
AREA 16-025 Fieldwork-Assessment risk-ESSL-Ali.pdf	1	22/09/16

Please notify the committee if you intend to make any amendments to the information in your ethics application as submitted at date of this approval as all changes must receive ethical approval prior to implementation. The amendment form is available at http://ris.leeds.ac.uk/EthicsAmendment.

Please note: You are expected to keep a record of all your approved documentation, as well as documents such as sample consent forms, and other documents relating to the study. This should be kept in your study file, which should be readily available for audit purposes. You will be given a two week notice period if your project is to be audited. There is a checklist listing examples of documents to be kept which is available at http://ris.leeds.ac.uk/EthicsAudits.

We welcome feedback on your experience of the ethical review process and suggestions for improvement. Please email any comments to ResearchEthics@leeds.ac.uk.

Yours sincerely

Jennifer Blaikie

Appendix G:

Letter to Data Collection

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8th November 2016

To:

The Technical Office for Development and Studies in the Ministry of Education Oman.

Student: Ali Al-Shukaili **ID:** 200877634

This is to advise that the above named full-time PhD student, will need to conduct observations and interviews for his field work (data collection) at the Headquarters of the Oman Ministry of Education and Schools. This will be starting from the 15th November 2016 until the 30th June 2017. This is an important part of his research, therefore we hope that he will be given full co-operation for him to complete his data collection. It will consist of the following:

Title: From policy to practice: School-based Assessment System of Omani Students' Science Learning in Grade (10).

Research questions

1. What are the MOE's policy intentions regarding the purposes, structure, outcomes and implementation of NAS in Science at Grade 10 according to key stakeholders' viewpoints?
2. How do science teachers implement NAS in the Science classroom for Grade 10?
3. What are the perceptions of Science teachers regarding the implementation of NAS in Science at Grade 10 in Oman?
4. What are the factors that influence NAS practices, which in turn influence on NAS as AFL, according to the Head of the Science Department, and Science teachers' viewpoints?
5. To what extent do the MOE's policy intentions regarding NAS at Grade 10 align with

Sample of study

No.	Occupation/ Department	Total
1	Undersecretary	1
2	Curriculum Department	3
3	Assessment Department	3
4	Human Resources Department (Supervision)	3
5	School principals	3
6	Head of Science Department in School (senior teacher)	3
7	Science teachers	9
Total		25

If any further information is required please contact either myself or our Postgraduate Research Tutor Dr Matthew Homer m.s.homer@education.leeds.ac.uk

Yours faithfully

Louise Greaves (Mrs)
Postgraduate Research Secretary
School of Education
l.e.greaves@education.leeds.ac.uk

Appendix H:

Parents' Information Sheet

UNIVERSITY OF LEEDS

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United Kingdom
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Parents' information sheet for the study: From Policy to Practice: School-Based Assessment of Omani Students' Science Learning in Basic Education Schools

Dear Parent,

As part of my PhD I am conducting a study to understand how science teachers enact a national initiative, the New Assessment System, which was introduced by the Ministry of Education and focuses on assessment for learning (AFL). This study aims to understand the MOE's policy intentions regarding the purposes of this assessment system, its enactment as AFL and accountability for this, to discover how science teachers enact it through their practices in the classroom and to explore the contextual factors that influence these practices. I will be conducting an observation for some lessons of your child's grade. Information gathered will be exclusively used for the study and will be regarded as confidential. No personal details of any participant will be mentioned in the findings, nor will any of the results be related to any particular students or to the school. There will be no dialogue with your child by the researcher, and your child will be in his classroom as on any other day with little difference. Therefore, the observation in this study aims at observing the teachers in real situations of assessing, regarding this assessment system in Science and what actually takes place in the classroom. Please be assured that your child can withdraw from the study at any time during data collection and up to two weeks after the data collection is complete without giving any reasons or having to worry about consequences.

I would ask you to discuss this with your child and if you both agree that your child can participate in the study, please confirm by signing the informed consent form on your child's behalf and return it to the school administration within one week. If the form has not been returned to school within two weeks it will be assumed you do not agree to your child's participation in this study. You can contact the school administration or contact me for further questions about the study through my email below.

Thank you very much for your time and cooperation.

Yours sincerely,

Name: Ali Al-Shukaili
Email: edasas@leeds.ac.uk
Mobile: +96899381628
Position: PhD Student
University: University of Leeds

Appendix I:

Student Consent Form

The study title: From Policy to Practice: School-Based Assessment of Omani Students' Science Learning in Basic Education Schools

Name of Researcher: Ali Al- Shukaili
Please initial each box if you are happy to take part in this research

The statement	✓
I confirm that I have read and understood the information given to me about the above-named research project and I understand that this will involve my children taking part as described in the information sheet.	
I understand that the purpose of this research is to understand how science teachers enact a national initiative, the New Assessment System, which was introduced by the Ministry of Education and focuses on assessment for learning.	
I understand that I may withdraw my child's agreement to participate at any time during the data collection or for up to two weeks afterwards. Within that time, I know that I may indicate whether or not the data collected up to that point can be used in the study, and that any information I do not want used will be destroyed immediately.	
I understand that the observation will not be videotaped or audio recorded.	
I understand that these data will be handled in a manner which ensures that only the researcher can identify my child as his source.	
I understand that my child's identity will be protected by use of a code/ anonymity.	
I understand that my child is being offered confidentiality in any written report, publication or oral presentation which draws upon data from this research study, and that none of his comments, opinions, or responses will be attributed to him.	
I understand that my child's school and classroom will not be identifiable in any written report.	
I understand that data could be used for future analysis or other purposes, for up to 5 years.	

Name of child: _____

Signature (Parent): _____ Date: _____

Appendix J:

Marks Register Form

استمارة متابعة ورصد أداء الطلبة في أدوات التقويم للصفوف (٥–٩) :

م	أداة التقويم	الأعمال الشفوية		الواجبات المنزلية	المشروع	الأنشطة العملية	الاختبارات القصيرة			المجموع	الاختبار النهائي	المجموع الكلي	مستوى الطالب (بالرمز)
		العرض الشفوي	الحوار الشفوي										
	الدرجة / أسماء الطلبة	٥	٥	٥	٥	١٠	١٠	١٠	١٠	٦٠	٤٠	١٠٠	
١													
٢													

استمارة متابعة ورصد أداء الطلبة في أدوات التقويم للصف (١٠) :

م	أداة التقويم	الأعمال الشفوية		الواجبات المنزلية	الأداء العملي		الاختبارات القصيرة		المجموع	الاختبار النهائي	المجموع الكلي	مستوى الطالب (بالرمز)
		العرض الشفوي	الحوار الشفوي		الأنشطة العملية	الإختبار العملي						
	الدرجة / أسماء الطلبة	٣	٢	٥	٥	٥	١٠	١٠	٤٠	٦٠	١٠٠	
١												
٢												