The University Of Sheffield.

School of Architecture

Sustainable schools as the 'third teacher'

Creating a design framework for sustainable schools in Serbia, learning from practices in England, Germany, and Spain

Thesis submitted for the
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By **Marta Brković**

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ABSTRACT

Since 2009, when Serbia applied for candidacy in the European Union, the debate about educational reform geared up. Along the way important aspects of education have been modernized such as: educational goals, regulations, teaching and learning methods, curriculum, etc. Additionally, the Ministry of Education obtained funding for "School Modernisation Programme" aiming to improve the quality of learning environments. However, the debate about what kind of schools Serbia should aim to build in the 21st century has not started yet. Close examination of the newly proposed educational goals set by the Serbian Ministry of Education suggests that education should be reformed with sustainability in mind. Therefore, by implication school design also. The problem is that the majority of relevant professionals are approaching school design from a less than critical position.

The situation is quite different in Western Europe. Some architects here have realised that sustainable schools could reduce the impact on the environment and contribute toward a more sustainable life. They have also discovered that the school environment impacts on the learning process, and can incite and even provoke learning. These architects believe that the school space and design can be a "third teacher". A small number have ventured a step further and used school design to raise awareness about sustainability issues, and stimulate children to explore them. Under these circumstances a question that emerges for an architect from Serbia is how should we, in Serbia, develop architectural design for schools to be more sustainable and pedagogically valuable?

The main aim of this thesis is the development of a series of design ideas so that one exemplar school in Serbia could be transformed in this way. This thesis explored three sustainable schools and their pedagogical potential with architects, teachers, and pupils. One of the schools was in Germany, one in Spain, and one in England. Triangulation of their experience with the existing literature from the field of architecture, pedagogy, developmental and environmental psychology, led to development of key messages useful for developing design ideas. Additionally, the most important messages were theoretically framed so that a better and improved framework for analysing and designing pedagogically valuable sustainable schools could be proposed. These insights are then translated and implemented in Serbia through the design of one school. A school from Serbia, wishing to act as an exemplar, embarked this journey. Through participatory action research I encouraged them to critically reflect on their current learning environment, and later on, through a participatory design process developed a series of ideas for the school. Finally, rendered through an array of contextual challenges and potentials, and inspired by this wealth of teachers and pupils ideas, my research developed a set of design proposals for transforming this exemplar school in Serbia into a more sustainable one, potentially able to act as the "third teacher".

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Preface

Preface

As an architect and before this a school pupil coming from Serbia, I believe there are many reasons why we should seriously reconsider the way we design schools in Serbia. Reminiscing on my experience as a pupil in kindergarten, primary and secondary school I concluded that I could not single out one learning space that inspired me as a child, and left a lasting positive impact. This impression was coloured by not just the physical space of the schools, but also by the way teachers thought, their relationship with us pupils, the content of our classes, and the type of activities during them. Later on, as an architecture student I discovered that in Western Europe there is vivid and alive debate about how school design should respond to ever-growing number of social, environmental and economic challenges. Various professionals, such as architects, pedagogues, psychologists, educationalists, debated how these challenges impact on the development of school design. Interestingly, some of them suggested that the physical learning environment should be transformed taking into consideration the aspects I believed impacted my experience in school. They explained that if we desire a new type of schools, able to prepare learners to readily meet the challenges in the contemporary world, the relationships among teachers and pupils, teaching methods, curriculum and learning activities should be examined holistically, together with the design of a school. It was clear to me that the learning environment should not be seen as just a physical entity; instead, it is a broad and all encompassing concept that requires a multidisciplinary perspective. Therefore, researching how Serbia should transform school design, taking into account the contemporary developments in the field of both sustainability and pedagogy, was a challenge worth exploring through a PhD.

I believe that architecture can be a catalyst of change when it arises from local communal situations, serves the local people, and allows itself to be educated by them. In order to create such architecture, architects should be able to isolate problems, analyse possible solutions, and the best ones interpret through design. Looked through this perspective the role of an architect is inextricable from the role of a researcher. Additionally, such a participatory approach to architectural design rests on a democratic premise that everyone concerned by a design should be involved in its creation and the evaluation of its quality. My position is that both the design process and school buildings, through the way occupants interact with them, have a significant educational potential. If we want to design schools to support, provoke, and even incite learning, we should strive to understand the learning process as well. In this way we will be able to reinvent both school design and the learning that goes on in a school. With these beliefs and questions I started my PhD, taking the 'Research by Design' route offered at Sheffield School of Architecture. I believe that this route enables researchers and architects to value and incorporate both empirical evidence and implicit knowledge, synthesize it and interpret through design solutions.

My aim was to develop a set of design ideas for transforming one school in Serbia into a more sustainable and pedagogically valuable one. Hopefully, this could be useful, informative, and inspiring for all the participants in the process. I applied in 2009 for the state`s scholarship from the Fund for Young Talents, Ministry of Youth and Sports, and secured partial funding for the first year of my PhD studies. Yet, the road towards my goal has not been an easy one. In my case it was full of financial, political and administrative challenges, both due to funding and a lack of political understanding on what I was trying to change.

At the very beginning of my second year, my scholarship was terminated. This meant that additional source of finances had to be found. Seeing this as a challenge, rather than as an obstacle, I applied for research grants in countries where school building and modernization programmes had commenced, and where an interest in evaluating the quality of the progress so far, existed. In this way, I was able to partly finance my studies, and more importantly spend time in schools in England, Germany, and Spain, and discussing their sustainable aspects, strengths and weaknesses with architects, teachers and pupils, and use insights to develop a set of design ideas for a school in Serbia.

Implementing the insights from the successful European practice in Serbia was not a task that could be achieved by a single architect. As changes could not be forced, but should be desired, I teamed up with a primary school from Serbia wishing to be transformed into a more sustainable and pedagogically valuable one. However, after two years of phoning, e-mailing and meeting with representatives from various ministries, agencies, and departments our venture was not supported. So as to be able to secure the funds necessary for organizing and carrying out participatory workshops I have founded an NGO ARQubator. In this way several socially responsible companies financially supported our project. I have based the NGO at the Architecture School, at the Union University – Nikola Tesla in Belgrade, so that, with the help of architecture students, the largest possible number of teachers and pupils from the primary school in Serbia could take part in critical and creative participatory workshops discussing the transformation of their school. Using my experience from the schools in England, Germany, and Spain, being challenged by the local circumstances in Serbia, and inspired by the wealth of ideas from teachers and pupils I developed a set of design ideas for transforming the school into a more sustainable and pedagogically valuable one.

This approach has shaped the trajectory of my PhD, and beliefs coloured the decisions made along the way. The text that follows will elaborate on the detailed process of this project.

01

INTRODUCTION

Two great English architects and theoreticians, John Ruskin and William Morris, in the 19th century said that architecture represents the state of society in a certain moment. Today, two centuries later, one could not agree more. The talk about sustainability, as a leading concept for solving an ever-growing number of environmental, economic and social challenges, is rare in Serbia, as well as in the whole Balkans region. When architects occasionally describe their buildings as sustainable, they usually focus on the environmental impact only. This "shallow" [1] approach implies that through recycling, saving resources, and reducing carbon dioxide emission, architecture can reduce its impact on the environment. Despite all the constraints architects meet in their everyday practice, some authors believe that they have the potential to do much more; they can affect our choices, preferences and human behaviour in general.[2] It seems that the efforts of all professionals, including architects, are needed for transforming our life on the planet into a more sustainable one.

During the last fifteen to twenty years, in countries such as England and Germany, many school buildings and modernisation programs have commenced. School buildings following the previously mentioned "shallow" approach could be found also. Yet the difference is that in these countries some architects realised how schools designed with sustainability in mind could reduce their impact on the environment, and contribute towards a more sustainable life. They also discovered that the school environment has a great influence on learning about sustainable development. A small number of them went even a step further, and used school design to raise awareness about sustainabillity issues, and stimulate children to explore the same. These architects believe that the school space and design are "the third teacher"[3]. Unfortunately, these and similar ideas have still not penetrated Serbian academic and architectural circles.

For these reasons I believe that researching how Serbia should transform school design, taking into account the contemporary developments in the field of both sustainability and pedagogy, is a challenge worth exploring through a PhD. The aim of this research is to develop a set of design ideas for transforming one school in Serbia into a more sustainable and pedagogically valuable one. As no similar research exploring the issues of school design could be found in Serbia, I as an architect wondered:
- how should we develop architectural design for schools to be more socially, environmentally and economically sustainable, and
- how could such schools, designed with sustainability in mind, impact learning process, incite and even provoke learning, and raise awareness about sustainability issues?

Being guided by these questions I developed a series of research steps in order to develop deep as possible understanding of the matter, synthesise the knowledge and interpret it through the number of design ideas for transforming a school in Serbia at the end. The most important steps were as follows (Fig.1.1):
-Comparative analysis of educational reform in England, Germany and Serbia as a way of understanding challenges to which contemporary school design should respond to, presented in chapter 2;

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1 Harding, S. P. (1997) 'What is Deep Ecology?', Resurgence, 185, p. 14–17.

2 Ledoux, L., Mertens, R. and Wolff, P. (2005) EU sustainable development indicators: An overview. Natural Resources Forum, 29 (4), p.392-403.

3 For a full discussion see Chapter 4

- Comparative analysis and critical appraisal of school building modernization programs and school design in England, Germany, and Serbia, presented in chapter 3;
- Literature review of sustainable schools as the “third teacher“ presented in chapter 4;
- Discussion on research methodology, design, theoretical approaches and tools used for tackling the research questions posed at the beginning, presented in chapter 5;
- Description of case studies from England, Germany, and Spain, analysis of the case study results and development of key messaged, presented in chapter 6;
- Designing a better and improved theoretical framework for analyzing and designing sustainable schools able to act as the “third teacher“, presented in chapter 7;
- Developing design ideas for transforming primary school Simeon Aranicki from Serbia, presented in chapter 8;
- Drawing the main conclusions from the research and suggesting recommendations for further development, presented in chapter 9.

Fig.1.1. An outline of the thesis structure

6	7	8	9
ANALYSIS	DISCUSSION AND IMPLICATIONS	PRACTICAL APPLICATION	CONCLUSIONS AND RECOMMENDATIONS
Description of case studies from England, Germany, and Spain, analysis of the case study results and development of key messaged	Designing a better and improved theoretical framework for analyzing and designing sustainable schools able to act as the "third teacher",	Developing design ideas for transforming primary school Simeon Aranicki from Serbia	Drawing the main conclusions from the research and suggesting recommendations for further development

02

"Nothing is stronger than an idea whose time has come"

- Victor Hugo

ESTABLISHING THE RESEARCH BACKGROUND

Today we as a global society are facing many problems: social, environmental, and economic ones. These issues force us to reconsider all the aspects of our life on the planet. The United Nations has stressed that education has a central role in transforming our life on the planet into a more sustainable one.[4] Therefore, a decade of Education for Sustainable Development (ESD) (2005- 2014) was announced.[5] It seems that in our knowledge-based society one of the greatest challenges is the renovation of our educational systems, so that we can respond to contemporary challenges, and as much as possible, prepare future learners to face the challenges of life in the 21st century.

These factors are among the very important ones that have sparked educational reform in countries across the world, including England, Germany and Serbia. On that way the three countries have not travelled the same distance, but they have tried to tackle some similar challenges in the field of educational goals, regulations, teachers education and teaching/learning methods, curriculum, governance and school equipment. Understanding the challenges related to these fields of educational reform is important because they should be addressed through school design. Therefore, this chapter will analyse and compare the progress in previously mentioned spheres of educational reform in England, Germany and Serbia, as it is a good way to establish the challenges to which school design should respond to. Deeper understanding of the challenges could enable architects in Serbia to develop better school designs and potentially contribute to the quality and tempo of educational reform.

Global challenges

Scientists claim with confidence that "the global average net effect of human activities since 1750 has been one of warming".[6] They suggest that if we want to bring to a halt this galloping climate change the biggest industrialised countries should reduce CO_2 emission by 80-95% by 2050.[7] Unfortunately, this is not the only negative effect humans have on the environment. Goudie explains that since the industrial revolution unprecedented technological, industrial and scientific growth has led to increased consumption of resources, increased wealth, better health, and population explosion.[8]

4 Wade, R. and Parker, J. (2008) EFA-ESD Dialogue: Educating for a sustainable world. In Education for Sustainable Development Policy Dialogue No. 1, UNESCO. Online: www.unesdoc.unesco.org/images/0017/001780/178044e.pdf

5 Ibid.

6 Solomon, S., Qin, M., Manning, Z., Chen, M., Marquis, K.B., Averyt, M. Tignor and H.L. Miller, (eds.) (2007) IPCC: Climate Change 2007: The Physical Science Basis, Report to the Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge and New York, p. 3.

7 Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., and Hanson, C.E. (eds.) (2007) IPCC: Climate Change 2007: Impacts, Adaptation and Vulnerability, Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge and New York.

8 Goudie, A. (2005) The Human Impact on the Natural Environment, 6th ed., Blackwell Publishing: Oxford

Today many authors believe that this translates into serious problems, such as:
- 38% of Earth`s surface area is already appropriated for cultivated land[9], 47% of world`s forests are lost and 50% of the Earth`s wetlands has vanished.[10] This seriously impact on the climate, biodiversity, global water cycle, and the quality of air, soil, and water[11].
- Population growth is tightly related to consumption. The Western world consumption levels are so high that there is not enough biologically productive land to provide all the resources needed and absorb the waste produced by an average global citizen.[12] Moreover, most of the growth is predicted to happen in booming economies like those of India and China, where people aspire to live according to the Western world standards.
- Cities take up 3-4% of the Earth`s surface area, and use 80% of its resources.[13] The problem is that cities, especially in the Western world, are top energy and resource consumers. They are highly dependent on unsustainable fossil fuels. As global supplies are diminishing, many countries are forced to import resources from other nations.[14] This potentially leads to political instability, social tensions, disruptions and even wars.
- 47% of all people live in urbanised areas, and it is expected that this percent should increase to 60% by 2030.[15] As cities are seen as places where dreams of a better life, salvation, and social empowerment come true, people are constantly migrating there. According to Davis, migration in cities of people with a totally different cultural backgrounds, could result in exclusion, lack of participation and ghettoisation of newcomers.[16] He adds that poorly planned integration programmes are not giving any significant results.
- After the 1950s the population of the planet doubled, food production tripled, energy consumption quadrupled, and global economic activity quintupled.[17] Bookchin argues that due to these changes the Earth is treated as a commodity,a mere resource for exploitation, and suggests that capitalism must be seriously reconsidered.[18]
- Additionally, he claims that contemporary problems are also the result of dysfunctional social arrangements.[19] According to Bookchin the solutions should not be sought only in technical, biological, physical and economic studies, but a better understanding of the essential social processes must be incorporated.
All of these evidence suggest that people are not living sustainably on the planet Earth.

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9 Food and Agriculture Organization (FAO) (2009) The State of Food and Agriculture: Livestock in the balance. FAO Communication Division: Rome.

10 World Resource Institute (WRI) (2010) Forest Landscape Initiative. Online: www.wri.org/project/global-forest-watch

11 Clarke, R. and King, J. (2006) The Atlas of Water. London, Earthscan.

12 World Wide Fund for Nature (WWFN) (2008) Living Planet Report. Online: www.assets.panda.org/downloads/lpr2010.pdf

13 Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., and Hanson, C.E. (eds.) (2007) IPCC: Climate Change 2007: Impacts, Adaptation and Vulnerability, Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge and New York.

14 World Wide Fund for Nature (WWFN) (2008) Living Planet Report. Online: www.assets.panda.org/downloads/lpr2010.pdf

15 Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J., and Hanson, C.E. (eds.) (2007) IPCC: Climate Change 2007: Impacts, Adaptation and Vulnerability, Intergovernmental Panel on Climate Change. Cambridge University Press: Cambridge and New York.

16 Davis, M. (2006) Planet of Slums, Verso: London and New York

17 National Research Council (NRC) (1999) Our Common Journey: A transition towards Sustainability, National Academic Press: Washington

18 Bookchin, M. (2004) Post-Scarcity Anarchism. AK Press: Edinburgh, Oakland

19 Ibid.

If **CO2** concentration continous to grow with the current trend by the year **2050** it will reach **500** parts per million. - Hansen, 2006

By the year **2010** world **population** will reach **7** billion with trend to exceed **9** billion by the year **2050**. -UNDESA, 2009

This will result in:
-**2.5 C** global average temperature raise;
-exposure to greater risk of extinction for **20-30%** of animal and plant species;
-incerase of global average **see level** of **20cm**;
-schrincking of arctice **ice cover** from **3-8%** per decade. -Parry et al., 2007

Economic growth is in close relationship with degradation of environment - when communities grows the environment declines. -Diamond, 2005a

Longing for better life many people **migrated** to developed countries. Comming from totaly different cultural background, this clash of cultures resulted in exclusion, lack of participation and ghettoization of newcommers.

Today **30%** of Earth`s surface area is appropriated for cultivated land and **47%** of world`s forestd have been lost. -FAO, 2006b; WRI, 1998

Contemporary ecological problems are result of our **disfunctional social arrangements**. -Bookchin, 2004

Consumption levels are so high that there is not enough bilogically productive land to provide all the resources needed and to absorb the waste produced by average global citizen. - WWFN, 2008

Paradox is that cities that take **3-4%** of Earth`s surface area and use **80%** of its resources. -Perry et al., 2007

Fig.2.1. Global challenges that await future learners.
Sources used to compile the diagram: www.seppo.net/cartoons/displayimage.php?album=lastup&cat=0&pos=42

Sustainable development

In 1987 the Brundtland Commission proposed sustainable development as a possible strategy for solving a myriad of the previously mentioned problems.[20] This paradigm has usually been defined by stressing that the "three pillars of sustainability" – environmental, social and economics should be reconciled, cannot be mutually exclusive, and should be mutually reinforcing. As Vos puts it, people, economic systems, and habitats are interrelated.[21] Some other authors, such as Hawken, stress culture as an additional pillar. From that perspective he explains that sustainable development "is about stabilising the currently disruptive relationship between Earth`s two most complex systems – human culture and the living world".[22] However, what sustainability is and what it means has not been met with unanimous agreement. As a concept it is very broad, differently interpreted by many authors with various educational backgrounds, thus it lacks consensus. Additionally, it is not always understood that sustainability is not a destination that can be reached, but a constant work towards a better future. All of these facts make the implementation of sustainable development arduous.

Due to all of these reasons some experts stress that at the local level challenges must be discovered, actors mobilized and problems solved.[23] McKenzie explains that when sustainability is defined and indicators determined at local level they are the most useful, because definitions derived at global level are sometimes too broad for use in specific situations.[24] He adds that when a problem or a situation at a local scale is approached with a preexisting set of themes and indicators, there is a danger of overlooking the main challenges.

These facts suggest that the global imperative today is to work towards a more socially, environmentally, and economically sustainable future, and that local organizations, institutions, individuals and professionals have a crucial role to play. What has greater power than education to bring the necessary change to the way the organizations, institutions, individuals, and professionals think, act and behave? I believe that using a participatory school design process constitutes a good educational opportunity for exploring and addressing sustainability issues at the local level, both for architects, teachers and their pupils.

20 In 1987 sustainable development was first defined by Brundtland Commission as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs", adding that „sustainability requires meeting the basic needs of all and extending to all the opportunity to fulfil their aspirations for a better life." The definition provided by Brundtland Commission, though until today stays the most quoted one, is not globally accepted and has been reinterpreted in various ways. For more detail see World Commission on Environment and Development (WCED) (1987). Our Common Future. Oxford University Press, Oxford

21 Vos, R. O. (2007). Perspective-Defining sustainability: a conceptual orientation. Journal of Chemical Technology and Biotechnology. Vol.82, p. 334-339

22 Hawken, P. (2007) Blessed Unrest: How the Largest Movement in the World Came into Being and Why No One Saw It Coming, Viking: New York, p. 172.

23 Camagni, R. (2002). On the concept of Territorial Competitiveness: Sound or Misleading? Urban Studies. Vol.39, No.13, p.2395-2411.

24 McKenzie, S. (2004). Social Sustainability: towards some definitions. Hawke Research Institute, Working Paper Series No. 27. University of South Australia, Magill, South Australia

Education for sustainable development

Without education, development is dream - Diebedo Francis Kere

Stanners believes that in order to understand sustainability, its main components, and the way they should be implemented on local level what might help is education.[25] The United Nations has stressed that education has a central role in transforming our life on the planet into a more sustainable one, and announced a decade of Education for Sustainable Development (ESD), 2005- 2014.[26]

The UN ESD declaration states that education has the power to affect behaviour and provide pupils with key competencies for the journey towards a more resilient future. This emerging, but dynamic concept, encompasses a new vision of education, and seeks to empower people of all ages to assume responsibility for creating a sustainable future. High-quality education, which tackles the questions of sustainable use of energy and resources, sustainable transportation, consumption, health and responsible citizenship, at all levels[27], seems to be the key that will determine whether or not we will succeed in revising unsustainable living trends.

If we desire to readily tackle the challenges ahead we should develop an array of skills and abilities, needed for sustainable living, through education. According to the OECD and the Partnership for 21st Century Skills these skills are: creativity, flexibility and responsiveness [28], the development of communication and research skills, thinking and problem solving skills, interpersonal and self-direction skills, and information technology skills [29]. Additionally, Clark stresses that the ability to find a solution and apply knowledge locally seems crucial.[30] According to Orr the built and natural environment are important contexts where these abilities could be developed, where local problems could be explored, and appropriate solutions researched and applied.[31] Although the list of the trends shaping education is a long one[32], the previously mentioned challenges are among the important ones that demand the education paradigm to shift, as well as school planning and design approaches, as a part of that shift.

Many professionals have tried to address these challenges from their field of expertise. Among them architects also. Some experts believe that a “sustainable school is the most appropriate strategy for renovating educational processes and achieving quality education”.[33] However, due to the different social, economical, political and cultural conditions, architects from countries around the world have responded differently, and at different paces.

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25 Stanners, D. et al (2007). Framework for Policy Integration Indicators for Sustainable Development and for Evaluation Complex Scientific Evidence. EEA GEAR-SD framework in Hak, T. et al (2007) Sustainability Indicators: A Scientific Assessment. Washington, Island Press

26 Wade, R. and Parker, J. (2008) EFA-ESD Dialogue: Educating for a sustainable world. In Education for Sustainable Development Policy Dialogue No. 1, UNESCO. Online: www.unesdoc.unesco.org/images/0017/001780/178044e.pdf

27 European Commission (EU) (2009). Sustainable Development Indicators: Overview of relevant FP-funded research and identification of further needs. Brussels, European Commission

28 Office for Economic Co-operation and Development (OECD) 2007 Moving up the value chain: Staying competitive in the Global Economy.

29 Partnership for 21st Century Skills, (2002) A report and Mile guide for 21st century skills

30 Clark, H. (2002). Building Education: The role of the physical environment in enhancing teaching and research, London: Institute of Education, University of London

31 Orr, D. (2004) Earth in Mind: On education, environment and the human prospect. 10th ed., Washington: Island Press

32 For a more comprehensive review of the trends changing education refer to Stevenson, K.R. (2002) Ten educational trends shaping school planning and design. Washington, DC: National Clearinghouse for educational facilities, and Kenneth R. Stevenson September 2010 Educational Trends Shaping School Planning, Design, Construction, Funding and Operation

33 Gough, A. “Sustainable Schools: Renovating Educational Processes”. Applied Environmental Education and Communication, Vol. 4, 2005, p. 339

EDUCATIONAL REFORM IN SERBIA, ENGLAND AND GERMANY

Concern for our planet translated into the UN ESD declaration was one of the factors that sparked off contemplation about how education should be reformed to meet emerging problems. When this wave of restructuring education hit in Serbia, England and Germany different social, economic, political and cultural conditions prevailed, thus making these three countries respond differently and at different paces.[34] For all of these reasons restructuring education cannot be discussed separately and should be seen as a part of a complex set of circumstances. On the way to restructuring education, Serbia, England and Germany have not travelled the same distance. Yet, along the way they tried to tackle some similar problems: the change of educational goals, regulations, curriculum, teacher education, and school design. Architects in all three countries still have to respond to these challenges.

Marx explains that "identifying, monitoring, and considering the implications of trends is one of the most basic processes for creating the future".[35] Analysing and comparing educational trends in Serbia, England and Germany is important if our goal is to learn and build on existing knowledge from the countries where educational reform is much further developed. Before a set of ideas for improving a school design in Serbia could be developed, the position of school design in the wider context of educational reform should be seen. This could lead to better understanding of the challenges architects are facing.

The legacy of history in Serbia

In the last fifteen to twenty years Serbia has had a turbulent history. An examination of the educational system in Serbia shows that the legacy of the socialist period (1945-2000) is still present. During that time much of the current educational system was created. Though, the system was largely successful (primary education was obligatory, enrolment rates were rather high, it was free of charge and very accessible), problems existed, such as extensive, rigid and ideologically coloured curricula. Centrally determined content and teaching methods led to lack of diversity and relevance. Some of these problems still exist today. In the 1990s military, political and economic conflicts between republics in Socialistic Federal Republic Yugoslavia (SFRY) shook the system to its core. The conflict resulted in the formation of five new countries: Slovenia, Croatia, Serbia and Montenegro, Macedonia and Bosnia and Herzegovina. Severe war between 1990- 1994 was followed by the bombing of Serbia and Montenegro in 1999, destroying much of the school infrastructure. In 2006, due to irreconcilable political differences, Serbia and Montenegro separated and created two new countries.

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34 Although, in the later stages of this research a case study from Spain will be explored, the various aspects of educational reform in Spain, in comparison to the three other countries under the study, will not be discussed here. The reason for this is that Spain, as well, as Serbia is still struggling to address the contemporary challenges through educational reform, and especially through school design. The case that will be explored under study is not a product and a representation of changes made during the educational reform, but a sporadic case of non-standard practice, where architects, teachers, pupils and the whole community wanted to take a leap forward. For more information see Brkovic, M. and Pons, O. (2012) How sustainable is your school? Primary school case study from Spain. Under review in Journal of Architectural Planning and Research.

35 Marx. G. (2006). Sixteen trends: Their profound impact on our future: Implications for students, education, communities, and the whole of society. Alexandria, Va.: Educational Research Service, p. 326

In 2000 the socialist regime ended, and a new democratic era for Serbia began. The newly formed government started major reforms in the economics, politics and social domains aiming to liberalise, decentralise, and democratise the country. At that time the first post-socialistic wave of reforms commenced. Improvement of education was said to be one of the priorities. The Government and the Ministry of Education tried to modernise regulations, curriculum and teacher education, repair very old and dilapidated school buildings, improve school infrastructure, and purchase new equipment.

One of the most important events that marked the year 2009 in Serbia was candidacy for European Union (EU) membership. On the way to becoming a full and equal partner in the EU, the application is just the first step. What follows is thorough reform of all sectors in the country. The reform must develop all segments of Serbian society and ensure EU assessors that Serbia can be an equal partner in the EU. This decision has brought the second wave of reforms in the educational sector. Though pursuing to work on previously mentioned tasks, preparation for joining the EU meant new challenges for Serbian education – meeting the EU educational standards, trends and quality.

Educational reform in England and Germany

In the last fifteen to twenty years, the political, social and economic climate in England and Germany was significantly different. Greater stability in all spheres in West Europe allowed these countries to thrive and concentrate on prosperity and further development of all domains. Education was one of them. The high Gross Domestic Product (GDP) (Fig. 2.2.) of these European economic engines, enabled these countries to invest large amounts of money in educational reform. They strived to set up high standards in education, and develop advanced and innovative approaches for translating these standards into practice. They were among the first countries to respond to the UN ESD declaration, implementation of information and communication technologies (ICT) in education, an adoption of active learning approaches. Additionally, they were among the first to start designing schools according to these changes.

The factors that sparked off reform of education in England and Germany were not completely the same as in Serbia. For example in Germany in 2000 the results of the first Programme for International Assessment (PISA) test done by the OECD showed that the German educational system was in the lower midfield.[36] This was one of the most important factors stirring fierce debate on what caused this underperformance, and acting as a sign that education must be seriously examined. During the past decade educational reform in England was rapid and ambitious. In the year 1997 the Labour Government newly elected at the time, started a series of major educational reforms aiming to improve student literacy and math learning, educate a distinctively diverse population, improve failing schools, and teacher training.[37]

36 Stanat, P. and Baumert, J. (2002). PISA-Studie – Deutschland nur im Mittelfeld. Basiskompetenzen von Schülerinnen und Schülern im internationalen Vergleich. Wirtschaft & Wissenschaft, 10 (2), p. 42–51.

37 Mead, S. (2006). Education Reform Lessons from England: An Interview with Sir Michael Barber. Education Sector Interviews. Education Sector Independent Analyses, Innovative Ideas. Online: www.educationsector.org/publications/education-reform-lessons-england. For a comprehensive list of reform see O`Donnell et al (2009). INCA Comparative Tables. International Review of Curriculum Assessment (INCA). Online: www.inca.org.uk/INCA_comparative_tables_September_2009.pdf

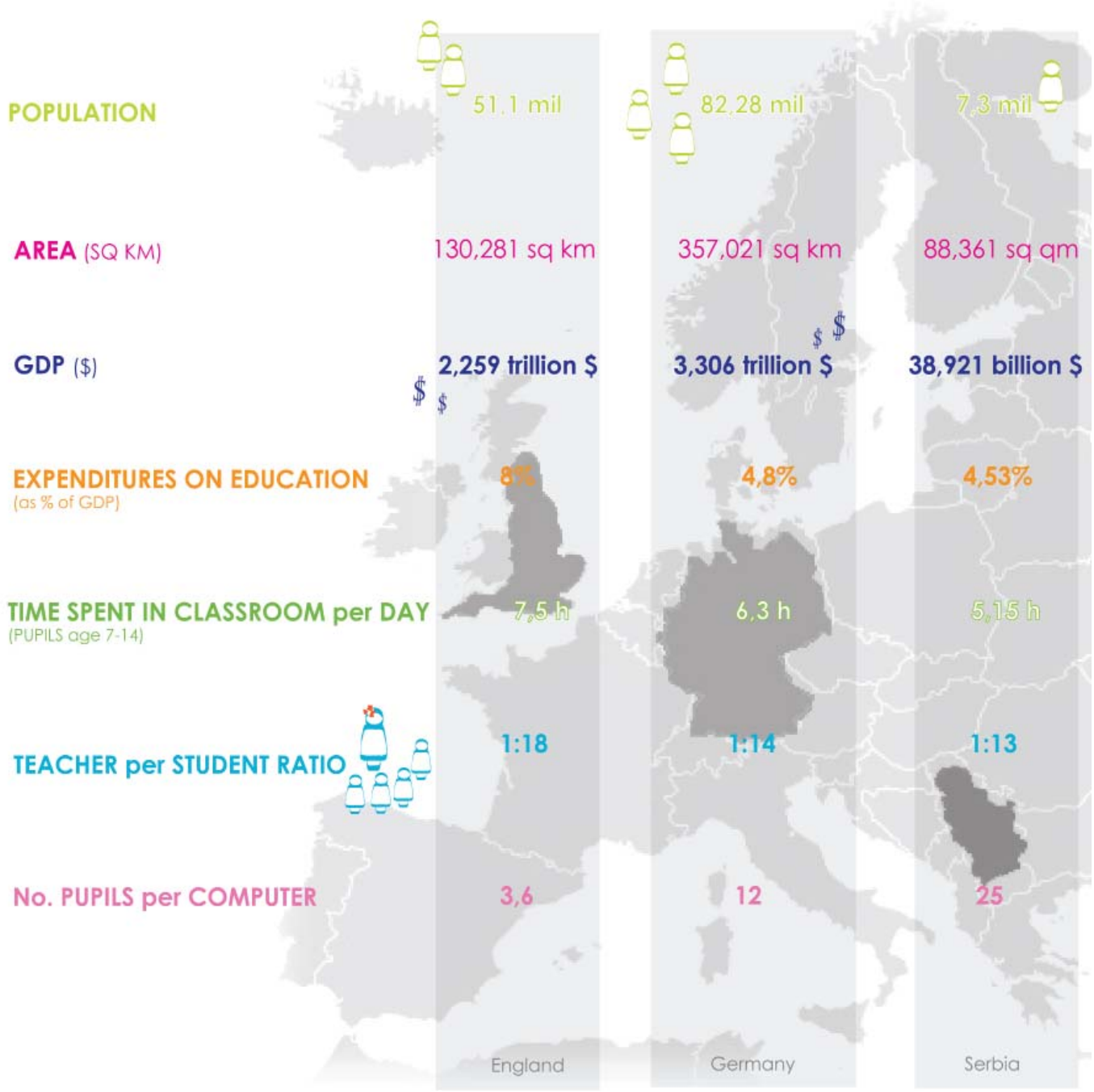

Fig. 2.2. A comparison of general statistical and educational data in England, Germany, and Serbia in 2010 in order to emphasise the difference in scale and resources

Sources used to compile the diagram:
Bolton, P. (2010). Education Spending in the UK. Online: www.parliament.uk/briefingpapers/commons/lib/research/briefings/snsg-01078.pdf; Organisation for Economic Co-operation and Development (OECD) (2010). Education at a Glance 2010: OECD Indicators. OECD, Paris; Department for Children, Schools and Families (DfCSF) (2008). Use of Information and Communication Technology: Trends in Education and Skills. Online: www.dcsf.gov.uk/trends/index.cfm?fuseaction=home.showIndicator&cid=3&iid=14; Office for National Statistics (2010). Population estimates for UK, England and Wales, Scotland and Northern Ireland current datasets. Online: www.statistics.gov.uk/statbase/Product.asp?vlnk=15106; Global Finance (2010a). Serbia Country Report. Online: www.gfmag.com/gdp-data-country-reports/184-serbiagdp-country-report.html; Global Finance (2010b) Germany Country Report. Online: www.gfmag.com/gdp-data-country-reports/268-germany-gdp-country-report.html; Global Finance (2010c). UK Country Report. Online: www.gfmag.com/gdp-data-country-reports/152-the-united-kingdomgdp-country-report.html; Obrenovic, M. (2010). Sve vise casova, sve manje znanja. Forum Beogradskih Gimnazija. Online: www.fbg.org.rs/svevise-casova-sve-manje-znanja; Statistische Bundesamt Deutschland. (n.d. a). Germany: Data from selected international sources. Online: www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/EN/Content/StatisticsInternationales/InternationalStatistics/Country/Europe/Germany,templateId=renderPrint.psml

The results of these reforms today are impressive. For example, in England the reform paid off by the year 2000, as the lowest performing school outperformed the average one from 1997.[38] Pupils at age 15 in the United Kingdom and Germany are among the top EU performers in science, reading and mathematics. The United Kingdom has 4.6%, Germany 5.5% and Serbia only 0.1% of top performers in these areas.[39] Moreover, pupils from the UK and Germany performed above the OECD average in relation to environmental science and geoscience. Unfortunately, students from Serbia were once again among the underperformers.[40] Looking through this perspective, various reforms and massive investments in education in the UK and Germany have paid off. If Serbia desires to be an equal partner in the EU there is much to be learned from the educational reform of these countries.

Educational reform in Serbia

Educational goals

One of the first steps at the beginning of the educational reform in Serbia was the adoption of the worldwide significant conventions, such as: Millennium Developmental Goals, The Convention on the Rights of the Child, Education for All - declarations from Jomtien and Dakar, Learn to live with others, and Schools without violence.

Consequently, the educational goals were changed and adjusted. Comparative analysis of the educational goals set by Serbia, England and Germany shows that Serbia successfully identified the large majority of the contemporary educational goals (Fig. 2.3.). It was hoped that in this way the trajectory of educational reform could be directed towards the same educational quality and efficacy as in other European countries.

If we consider the educational goals as signs showing the main directions of educational reform in a country, then all aspects of education, including school design, should be changed and adjusted according to them. Spencer and Blades, as well as Clark, explain that school design and spatial and furniture arrangements in schools are important factors in implementing educational goals.[41] This implies that the development of design ideas for transforming a school in Serbia, should build on existing educational goals, so as to contribute to the quality and the paste of educational reform.

38 The Sutton Thrust (2004). Tony Blair's Fabian Lecture on education at the Institute of Education. Online: www.suttontrust. com/research/tony-blairs-fabian-lecture/

39 Organization for Economic Cooperation and Development (OECD) (2006). PISA 2006 Database, Table A4.1a. Online: www.dx.doi.org/10.1787/664076271473

40 Organization for Economic Cooperation and Development (OECD) (2009). Program for International Student Assessment`s (PISA). Education at a glance 2009: OECD Indicators. OECD, Paris

41 Spencer, C. and Blades, M (eds.) (2006) Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press., and Clark, H. (2002) Building education: The role of the physical environment in enhancing teaching and and research. London: Institute of Education, p. 13

EDUCATIONAL GOALS FROM ENGLAND AND GERMANY in 2009	EDUCATIONAL GOALS FROM SERBIA in 2009
Excellence/ raising standards	similar aim not found
Individual development	to develope self-awareness, personal initiative, the ability for self-evaluation and expression of one`s oppinion
Knowledge/ skills/ understanding	to enable persons to solve problems, establish links and apply knowledge and skills in their further education, professional work and everyday life
Social develpment	to develop communication and dialogue skills, the sense of solidarity, quality and efficient cooperation with others, team-building skills and foster friendship and camaradie
Special learning needs including gifted Emotional/spiritual development Personal qualities	to achieve full intellectual, emotional, social and physical development of every child and pupil in keeping with their developmental needs, abilities and interests
Environment/ sustainable development	to create awareness about the importance of sustainable develpment, protection and preservation of nature and the environment, ecological ethics, and animal protection;
Basic skills- literacy/ numeracy	to acquire quality knowledge and skills, and valuse, language, mathematical,scientific, artictic, cultural, technical and information literacy, enabling children and young people to live and work in modern society
Lifelong learning	to develop motivation for learning, enable persons to learn independently, engage in life-long learningand take part in international educational and professional processes
Scientific/technological skills	to develop the abilities to find, analyze, utilize and communicate information, while skillfully and effectively using information and communication technologies
Preparation for work	to develop key competences necessary for life in modern society, enable them to work and pursue their profession by developing vocational competences, in accordance with the given profession, through the development of modern science, economy and technology
Foundation for future education	to enable persons to make adequate decisions about their future education and profession, their development and future life
Health/ physical/ leisure	to develop and practice healthy life styles, raise awareness about the importance of one's own healthand safety, and the need to develop and foster physical abilities
Creativity	to develop creative abilities, foster creativeness, esthetic perception and good taste
Citizenship/ community/ democarcy	to develop the ability to become a responsible citizen, capable of living in a democratic and humane society based on the respect as the basic principles of justice, truth, freedom, honesty and personal responsibility; of human and civil rights, right to be different and care for others, as well as the basic principles of justice, truth, freedom, honesty and personal responsibility
Cultural heritage, cultural literacy	to form opinions, convictions and a value system, developing personal and national identity, creating theawareness and sense of belonging to the Republic of Serbia, respecting and language and one's language, the tradition and culture of the Serbian people, the tradition and culture offostering the Serbian language and one's language, the tradition and culture of the Serbian people, the tradition and culture of ethnic minorities and communities, other peoples', developing multiculturalism, and respecting and preserving national and world heritage;
Values/ ethics/ morals Equal opportunity/ multi-culturalism	to develop and respect racial, national, cultural, language, religious, gender and age equality, tolerance,and respect for differences.
National economy	similar aim not found
Parental participation	similar aim not found

Fig. 2.3. Comparative analysis of educational goals in England, Germany and Serbia in 2009

Sources used for compiling the mapping: Ministry of Education, Republic of Serbia (MERS). Objectives of Education. Online: www.mp.gov.rs/page.php?page=101
O`Donell, S. et al. (2009). INCA Comparative Tables, International Review of Curriculum and Assessment Framework Internet Archive, November 2010 edition, p.9

Regulations

In 2000, when the socialistic regime collapsed, Serbia inherited an outdated educational system. Stiff and restrictive regulations were among the biggest problems as they could not address real situations in schools.[42] The whole system was centralised, overregulated and schools were delineated as entities isolated from their cultural and social context. Until today some rules and regulations have been modernised according to the EU standards. One of the most important documents is the Education Development Strategy in Serbia, developed for the period from 2010 until 2020.[43] This strategic document maps the challenges and proposes development goals for all levels of education and all segments (curriculum, teacher education, lifelong education, and standards).

In this document for the first time it was stated that school building standards and regulations must be revised, because the quality of the school environment has an impact on teaching and learning. Additionally, new standards for energy efficient buildings have been published.[44] They entail a special section about school buildings and legally bind all schools, among other buildings, to have an energy certificate.

However, the most important document for school building design 'Regulations of the norms of school spaces, equipment and teaching aids for primary schools' from 1990 are still in force.[45] The biggest problem is that rules and regulations about lowering the environmental impact of schools are not developed in synchrony with the changed educational goals and proposals for modernising teaching and learning.[46]

In England the situation is quite different. Though the standards proposed by DfES, such as 'Building Bulletin 98: Briefing Framework for Secondary School Projects'[47], and 'Bulletin 99: Briefing Framework for Primary School Projects'[48], were criticised as inflexible and formulaic [49], they set the objectives for the forthcoming capital investment at the time - Building Schools for the Future. They describe how schools should be developed according to many sustainability themes (flexibility and adaptability, safety, access and inclusion, use of new technologies and ICT, environmental impact). More importantly, they state that school design should be linked to the curriculum and provide teaching opportunities.

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42 United Nations Children`s Fund (UNICEF) (2001). Primary Education in the Federal Republic of Yugoslavia: Analysis and Recommendations. UNICEF, Belgrade office

43 Ministry of the Education and Science (MES) (2012) Education development strategy for Serbia till 2020. Online: www.kg.ac.rs/doc/strategija_obrazovanja_do_2020.pdf

44 Regulations of the norms about energy efficient buildings. Official Gazette of the Republic of Serbia, No.61/2011. Online:www.ingkomora.org.rs/vesti/download/PravilnikOEnergetskojEfikasnostiZgrada.pdf

45 Regulations of the norms of school spaces, equipment and teaching aids for primary schools. Educational gazette of the Socialist Republic of Serbia, No. 4/90. Online:www.scribd.com/doc/51698430/PRAVILNIK-%D0%9E-NORMATIVIMA-SKOLSKOG-PROSTORA

46 Brkovic, M. (2013) Savremene obrazovne ustanove – koraci ka ekološkoj održivosti / Contemporary educational institutions – steps towards environmental sustainability, Izgradnja, 67, p. 564-573

47 DfES (2002) Building Bulletin 98: Briefing Framework for Secondary School Projects. London: DfES

48 DfES (2002) Building Bulletin 99: Briefing Framework for Primary School Projects. London: DfES

49 It is reported that the previously mentioned standards are very inflexible and formulaic. Interviews with teachers revealed that even when architects were willing to adapt to schools needs and desires, the standards,which look like they are from the 1950s, based on "box ticking" principles, were what pushed everyone into corners. See Commission for Architecture and the Built Environment (CABE) (2006). Assessing secondary school design quality: Research Report. London, CABE

This thesis argues that if Serbia fails to see the improvement of school design and school building quality as an integral part of educational reform, the tempo and the quality of the reform could be jeopardised. Therefore, the most important document for school design 'Regulations of the norms of school spaces, equipment and teaching aids for primary schools' from 1990 should be modernised. It should be updated in synchrony with the educational aims and the changes in the curriculum and teaching and learning methods advocated by the Education Development Strategy in Serbia, developed for the period from 2010 until 2020.

Teachers and teaching/learning methods

According to the UNICEF assessment from 2001 in Yugoslavia (at the time consisting of Serbia and Montenegro, which today are two separated and independent countries) formal teaching training was poor, teachers were educated to lecture, and their knowledge about new teaching/learning methods was not good enough.[50] Teachers` tasks and rewards were not differentiated, the professional knowledge was unsatisfactory and there was no exchange of experience with colleagues. Teachers` knowledge was abstract, theoretical and hard to apply to everyday teaching. Lastly, they were not accountable enough for schools, parents, communities and government.[51] All of this affected pupils` learning process.

The UNICEF assessment also criticised teachers for not following educational trends[52], appearing in other countries, including England and Germany. Some of them are:
- as children learn with different tempo, the learning must be personalised[53];
- schools must be connected with the real world because then children learn with "head, heart and hands";[54]
- classes should not be inflexible and programmed to last 45 minutes. Interdisciplinary work, learning through experience and play should be encouraged.[55]

As teachers are responsible for creating a learning process that is meaningful and full of challenges and opportunities, it was clear that teachers education should be changed. Due to this situation, in 2000, a few years later than in England and Germany [56], Serbia tried to say farewell to teacher centred teaching. For this reason a series of reforms were initiated, similar to the ones in England in Germany.

50 United Nations Children`s Fund (UNICEF) (2001). Primary Education in the Federal Republic of Yugoslavia: Analysis and Recommendations. UNICEF, Belgrade office

51 The same claim has been made for the situation in England. See Furlong, J. (2008). Making teaching a 21st century profession: Tony Blair`s prize. Oxford Review of Education. Vol. 34, No.6, p.727-739

52 United Nations Children`s Fund (UNICEF) (2001). Primary Education in the Federal Republic of Yugoslavia: Analysis and Recommendations. UNICEF, Belgrade office

53 Beyer, A. (2007). Schule muss sich aendern jetzt! Schule veraendern! Psychologie Heute Compact. Heft 16. p.8-13

54 Ibid.

55 Freericks, R. (2009). What Does Education Mean Here? in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH

56 Sittig, F. (2009). Abschied vom Frontalunterricht. Archiv der Zukunft. Online: www.adz-netzwerk.de/Abschied-vom-Frontalunterricht.php

Some of them were: reform of continual professional development; improvement of the quality of initial teacher training (which later resulted in improved teacher quality)[57]; clear definition of standards for the teacher qualification[58]; and support for teachers to develop their leadership skills.[59] At the time, the UNESCO, with the Ministry of Education of the Republic of Serbia and the NGO Education Forum, started a program for educating teachers about active teaching/learning methods. Until 2012 nearly 30000 from a total of 49233 teachers in primary school finished the course.[60]

However, discussions with some teachers during this research suggest that they were not applying these methods in the classrooms. As the rise in teachers' salaries was not significant, they lack motivation. More importantly for this research, classroom furniture is one of the factors making application of active teaching/learning in classrooms arduous. The classrooms are small, the tables are made for two pupils, and both tables and chairs are very heavy, thus difficult to arrange and rearrange.

The important factor for developing a high performing education system is the management of the teachers` profession. [61] Torres warns that "without the reform of teacher education there will be no reform of education".[62] Yet, improving the way a teacher teaches is not connected solely to the teaching methods they were trained to apply. They should also have appropriate learning environments that can accommodate active teaching/learning, personalised learning, single and group work, flexible learning through experience and play. Teachers, together with architects should discover what spatial arrangements support which kind of pedagogy, so as to understand that the learning environment is an active medium contributing to the quality of learning.

Curriculum

During the socialist period the curriculum in Serbia was too extensive, it lacked meaningful structure, and it was connected neither horizontally nor vertically. Because of its academic character, children were failing to connect it to everyday life. The curriculum was the same through the country, and there were no opportunities for adaptation to the local context. It was created by the Ministry of Education without any consultation with teachers, educationalists, pedagogues, psychologists, parents and pupils. According to the UNICEF assessment from 2001 it lacked many important topics, such as the use of ICT and media, religious and civic education, education about democracy, tolerance, peace and human rights, and education about the environment and ecology.[63]

57 Bell, D. (2005). Annual report of Her Majesty's Chief Inspector for schools, 2003–5. London, Ofsted

58 Training and Development Agency (TDA) (2006). Professional standards: why sit still in your career? London, TDA

59 Clarke, C. (2003). Speech to National College of School Leadership conference for new headteachers, QE2 Conference Centre, 13 November

60 Educational Forum (EF) (2009). Teachers and active teaching/learning methods. Unpublished report. Courtesy of Educational Forum

61 McKinsey (2007). How the world's best performing school systems come out on top, McKinsey Report. Online: www.mckinsey.com/clientservice/socialsector/resources/pdf/Worlds_School_Systems_Final.pdf.

62 Torres, R.M. (1996). Without the reform of teacher education there will be no reform of education. Prospects. Vol. XXVI, No.3

63 United Nations Children`s Fund (UNICEF) (2001). Primary Education in the Federal Republic of Yugoslavia: Analysis and Recommendations. UNICEF, Belgrade office

Since the 2009, when Serbia applied for the EU candidacy, changes were made, and the curriculum today is recommended on a national level. The Law on Primary Education empowers schools to adapt the curriculum to reflect local needs, use local sources, distinguishing features (historical, geographical or botanical features) to teach [64], and in that way introduce the country's economic, ethical, social and geographic diversity. What is more, a tool kit for learning about the topics from the UN ESD declaration is piloted in some schools.[65] Similarly to England and Germany there is a centrally-determined framework, but within that framework schools have the autonomy to adapt the curriculum to some extent to suit local conditions. The New Law on Textbooks and Other Teaching Material, supports teachers to work more independently, and enables them to have more responsibility when it comes to textbook selection, class organization, and adoption of various curriculum delivery methods.[66]

Yet, the difference is that in schools in England and Germany there are numerous cross-curricular activities concerning environmental learning, ICT, social health and education, and the culture of a country or a region. This enables pupils to relate and apply their knowledge outside the classroom. More importantly for this research, various spatial responses to the curriculum have been developed. Some of them are ICT workstations, spaces for individual and group work in a library or mediatheque, and school gardens. Blackmore et al provides some evidence suggesting that spaces supporting the learning needs seem to be an important factor affecting pupils' ability to comprehend curriculum.[67] This could partly explain why the pupils from England and Germany are in the last ten years among top performers in maths, science, and reading.

However, as changes in the curriculum are relatively new in Serbia the teachers still struggle to transfer from very restrictive regulation to new possible approaches. Additionally, they usually lack the appropriate facilities (libraries, computer rooms, gardens, and similar). A large majority of schools still fails to connect curricula to everyday life experience, and motivate pupils to use knowledge outside the classroom. Using the textbooks as the only source of knowledge, pupils are not educated to recognise problems and potentials of their local environments and contribute to them.

For this reason the curriculum should be linked to a real life, and numerous cross-curricular activities should be introduced. This implies that architects should start to research how school design in Western countries has been successfully connected to the curriculum. In this way they could begin to develop appropriate spatial responses to curriculum, support and even invite learning.

64 Ministry of Education Republic of Serbia (MERS). Law on Primary Education. Online: www.mp.gov.rs/propisi/kategorija.php?id=11

65 Carpathian Convention - Environment and School Initiatives (CC - ENSI) (2009). Carpathian Mountains ESD Training Tool Kit, English Version. Online: www.carpathianconvention.org/NR/rdonlyres/ACDB85E0-8B26-4417-A364-254135894F20/0/CarpathianMountainsESDToolKitEnglishVersion.pdf

66 Ministry of Education Republic of Serbia (MERS). New Law on Textbooks and Other Teaching Materials . Online: www.mp.gov.rs/propisi/

67 Blackmore, J., Bateman, D., Loughlin, J., O'Mara, J. and Aranda, G. (2011) Research into the connection between built learning spaces and student outcomes. Literature review Paper No. 22 Melbourne: Department of Education and Early Childhood Development

Governance

In Serbia there is still not enough power at the local and institutional level. So far the educational goals and framework have been updated, and determined at the national level, as in England and Germany. Additionally, the system was decentralised, and there is more power and responsibility for the local authorities, schools and head teachers. Although, there is no research confirming this, my experience from working with schools, institutions, and ministries suggests that the difference between what is written on the paper and what is happening in practice exists.

Similar to the claims made in the Education Development Strategy in Serbia, developed for the period from 2010 until 2020 [68], my impression was that the biggest problem is the politicization of all the positions in the process, from the position of the minister to the position of the teacher, and the lack of inclusion of acclaimed experts in the reform. The chain of responsibility is not working and the procedures for initiating various projects by schools, teachers or any other interested and relevant parties is not clear. This results in long procedures, slow or no response from institutions, and ultimately poor quality of learning environments.

Equipment

In the 2001 the UNICEF assessment suggested that the lack of contemporary teaching methods is what forces teachers to use very old "chalk, blackboard and talk" methods. The scarcity of pedagogical equipment (audiovisual, maps, art, sports) at the time was obvious: libraries were poorly stocked, there were 13,5 books per pupil[69] and there was one computer per 230 children on average.[70] These factors contributed significantly to poor quality of learning environments.

New data on the number of computers or the condition of libraries is scarce. Donations and programs such as "Partners in Education" sponsored by Microsoft, and "Education Innovation Program" (donation of $10 million for buying ICT) sponsored by the World Bank [71] suggest that the current conditions are improving. For example, Microsoft`s report on pupils use of ICT from 2006 suggests that in 57.89% cases 2 pupils use 1 computer [72], which shows that ICT is more present in schools. Yet the problem is that the necessary changes in school design were not made. Old classrooms were just filled with 20 to 30 computers. This is causing the space to overheat, makes the air stuffy, and taints the teaching/learning atmosphere.

68 Ministry of the Education and Science (MES) (2012) Education development strategy for Serbia till 2020. Online: www.kg.ac.rs/doc/strategija_obrazovanja_do_2020.pdf

69 Mitric, M. and Vukotic, B. (2007). Osnovni pokazatelji stanja u školskim bibliotekama u Republici Srbiji. Nastava i vaspitanje, 56(3), p. 283-295.

70 United Nations Children`s Fund (UNICEF) (2001). Primary Education in the Federal Republic of Yugoslavia: Analysis and Recommendations. Belgrade: UNICEF Belgrade office

71 World Bank. Bringing computer literacy and innovative teaching to Serbia. Online: www.go.worldbank.org/847NL6JAT0

72 Milanovic, K. and Milosavljevic, V. (2004). Istraživanje o stavovima učenika u Srbiji o primeni IKT sredstava u nastavi i učenju. Online: www.mp.gov.rs/resursi/dokumenti/dok179-srp-CNTI_stavovi_ucenika_o_ikt.pdf

Summary

The evidence presented in this chapter suggests that we as a global society are facing many problems. For this reason many strategies, such as sustainable development, have been developed so as to suggest how could we live our lives more sustainably. One of the factors impacting on whether we will succeed in doing so is the transformation our educational systems so that the future learners could be prepared for the life in contemporary world. Educational reform in one country is a vast and a complex problem which requires the involvement and contribution of all professionals – among them architects. Analysing and comparing educational trends and aspects in countries where the progress of educational reform is much further away is a good way of establishing what school design should respond to. Taking conclusions from such an analysis into consideration could enable architects from Serbia to develop school designs, and in this way contribute to the tempo and the quality of educational reform.

Until today Serbia has updated the educational goals, and synchronized them with the important declarations in this area. Some of the rules and regulation have also been modernised. The teachers have been offered additional courses about the contemporary teaching methods, and the curriculum has been prescribed on the national level, with the ability to be adapted to suit local circumstances. Yet, comparing the progress with England and Germany suggests that the area for future development is vast.

My experience from working intensively with one school, and collaborating with some others, negotiating support for this project with numerous ministries, agencies, departments and other government bodies in charge suggest that two major problems are the politicization of all positions, and the lack of inclusion of acclaimed experts in the reform. Additionally, all the pillars of educational reform have not been developed in a synchronized fashion. The majority of changes exist on paper, and are not translated into everyday life. I believe that developing a school design for Serbia, which takes into consideration the progress in various areas of educational reform could be a step forward. In order to do so, the critical appraisal of school design in Serbia should be made. Therefore, the next chapter will discuss contemporary school design approaches and practices in Serbia.

03

"For a society searching for ways to address the educational needs of the future, the building itself is a good start"

- Maureen M. Berner

SCHOOL BUILDINGS IN SERBIA NOW AND THEN: THE CRITICAL APPRAISAL

In Serbia, as well as in many other countries, much more attention is paid to the curriculum, methods, assessment procedures, and teacher education. Yet, the challenges of educational reform are related to the way school buildings are designed. For this reason a closer look at the school building modernisation programm, school design, and work and engagement of architects in Serbia in comparison to the developments in these fields in England and Germany are needed. The discussion on these matters will be developed in the lines that follow, as it could help us better understand the past and present of school design in Serbia, the challenges architects are facing when designing contemporary schools, and the ways architects could respond in order to contribute to the quality of school design, thus the quality of educational reform.

School building modernisation programmes in Serbia, England and Germany

The UNICEF assessment from 2001 explained that the school infrastructure in Serbia is very old-on average 42 years. It is known that
- 4.2% of schools were built in nineteen century,
- 22% before Second World War,
- 28.3% from 1946 to 1960,
- 46.7% from 1960 to 1999, and
- 1.7% after 1990.[1]

At that point of time there was an insufficient number of school libraries (62% of schools have libraries), laboratories (55% of schools do not have specialised classrooms), yards, gymnasiums, canteens (80% of schools have canteens of which 20% are operational) and similar facilities.[2]

Additionally, two thirds of schools provided less than $3m_2$ of school space per student which is the regulatory minimum. There was no reading space, space for individual study or group work, which prevented children to work independently, and to do research in the library. Lack of space forced schools to work in two and some times even three shifts. Though, working in shifts presents an efficient use of school infrastructure, students do not have the chance to use the facilities throughout the whole day. These facts helps us to understand how serious the situation in Serbia was, and how urgent actions were needed to prevent further erosion of education.

Since 2000, large sums of money have been invested in repairing and expanding school infrastructure. Only in the capital of Serbia, Belgrade, around 26 million Euros has been invested in reconstructing and building 8 new primary and secondary schools.[3] Additionally, in 2010 Serbia received 50 million Euros from European Investment Bank (EUI), and additional 50 million Euros will be provided from the Serbian government for the 2010-2014 School Modernisation Project. [4]

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1 United Nations Children`s Fund (UNICEF) (2001). Primary Education in the Federal Republic of Yugoslavia: Analysis and Recommendations. Belgrade: UNICEF

2 Ibid.

3 Department of Education, City of Belgrade (DECB) Online: www.beograd.org.yu/cms/view.php?id=2002

4 European Investment Bank (EUI) (2010). Serbia: 50 Million Euros for school modernization. Online: www. eib.org/projects/press/2010/2010-092-serbia-eur-50-m-for-schoolmodernisation.html

In England and Germany there have been similar investment programs for school building. Led by the notion that investing in children is investing in the future of the country, and that investing in education can result in sustainability of a society[5], England started Building Schools for the Future (BSF) programme in 2004 [6], and in 2003 German federal government started Zukunft Bildung und Betreuung/ The Future of Education and Care programme. [7]

BSF is said to be England`s biggest school building program since the Victorian times. According to Department for Education and Skills it was not about refurbishing schools, repairing leaking roofs and replacing old windows, it was about initiating radical transformation of schools so they can accommodate 21st century learning.[8] The greatest challenge was a transformation of the very standardised educational system.[9] This was tackled through introducing state of the art technology, replacing front-of-the class teaching classrooms with workshops suitable for group and individual learning, creating sustainable and flexible spaces that will be able to adapt to learning and teaching process that unpredictable future might bring. Due to a change of government, the process has been brought to a halt. While investments continue, they are not at the same scale and have different aims.[10]

In Germany, the investment program aimed to address some of the biggest problems of German education – better support for underachievers, especially for those with migrant background, the lack of all-day schools, extend existing schools and improve school quality. From 2003-2009 four billion Euros were invested in approximately 16.000 measurers in 6918 schools throughout the country. The program is extended till the end of 2014 under the name Ideen für mehr! Ganztägig lernen / More ideas! All-day learning, supported with 4,3 million Euros annually. [11] According to Hamm the result of the first round of the investment program is a number of new school buildings of high quality. [12]

However, between the three school building programmes there are some significant differences. The BSF in England and ZBB in Germany were based on a specific programme. Before any investments were made manifestos of the programmes were written, explicitly stating the goals, and the ways schools should be designed to meet them. According to these aims school building standards were updated. Architects actively contributed to the process. For example in England, a group of 11 architect teams designed exemplar schools that were to serve as a stimulus and inspiration for the design of new sustainable schools.[13] Also, the application procedures for funding were delineated.

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5 Zickgraf, P. (2007). “Zukunftschulen” und “Bauen als sozialer Prozess” in Deutschland, Europa und Amerika. Ganztagsschulen, 16.02.2007. Online: www.ganztagsschulen.org/7064.php

6 Department for Education and Skills DfES (2003) Building schools for the future: Consultation on a new approach to capital investment Annesley: DfES. Online: www.education.gov.uk/publications/eOrderingDownload/DfES%200134%20200MIG469.pdf

7 Bundesministerium fuer Bildung und Forschung (BBF) (2010). Ganztagsschulen - IZBB das “Investitionsprogramm Zukunft Bildung und Betreuung“. Bundesministerium fuer Bildung und Forschung, 2.12.2010. Online: www.bmbf.de/de/1125.php

8 Department for Education and Skills DfES (2002) Schools for the Future: Design for Learning communities, Building Bulletin 95. London: The Stationery Office. Online: www.archive2.official-documents.co.uk/document/reps/bulletin95/bulletin95.pdf

9 Ibid.

10 Pearman, H. (2010). Back to School. RIBA Journal. September 2010

11 Bundesministerium für Bildung und Forschung BMBF (2013) All day schools- The investment programme „The Future of Education and Care“. Online: www.bmbf.de/en/1125.php

12 Hamm, G. O. (2009). School Architecture Folowing the PISA Schock in Germany: Tenative Steps towards a New Building Culture in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH

13 Power , M. (2003) Schools for the future: inner city secondary education exemplar. Architectural Research Quarterly 7, 3-4, p. 262-279

Later on, when the programmes started studies were carried out to examine the quality of refurbished and newly built schools. In the middle of the BSF programme it was noted that 4% of schools built and refurbished under the programme in England were rated as excellent, 15% as good, 29% as partially good, 21% as mediocre, and 31% as poor. [14] Additionally, some evaluations in both countries have been carried out in order to assess whether and how the capital investments in school buildings relate to better performance. In England they were carried out by PricewaterhouseCoopers [15], and in Germany by a team of experts from the Freiburg School of Pedagogy [16]. Though, it could not be claimed that BSF and IZBB were a golden age [17], some good ideas were proposed and inspiring schools built.

The situation in Serbia is very different. Although, the new EUI investment aims to improve the quality of learning conditions, there is no written programme, no clear vision of what school building quality means, and what kind of schools Serbia is aiming to build in the future. Additionally, the tool or criteria for evaluating the quality for newly built schools has not been developed. The School Modernisation Programme is not connected to the new reforms in the area of educational goals, the curriculum, or the teaching methods. Until today, many schools that came out of the programme have been announced as the contemporary ones, following all the latest European standards. This is paradoxical, because the school design standards, legally binding for all architects designing schools, have not been updated since the 1990.

Two years after the programme started, with quite a few schools built in the meantime, the applications for schools were made possible through the Ministry of Education and Science web site. [18] Review of the criteria for application reveals that only urgent repairs or the extensions for extremely overcrowded schools will be financed.

The problem is that the architects, as well as all the other relevant professionals, are approaching this issue from a less than critical position. There is apparently no critique, no interdisciplinary collaboration, no exchange of experience, or academic debate on this matter.

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14 Commission for Architecture and the Built Environment (CABE) (2006). Assessing secondary school design quality: Research Report. London, CABE

15 About the evaluations of BSF see more Price Waterhouse 2003, Building better performance: An empirical assessment of the learning and other impacts of schools capital investment, Department for Education and Skills, UK. See also PricewaterhouseCoopers 2007, Evaluation of building schools for the future: 1st Annual Report, Department for Children, Schools and Families, UK.
- 2008, Evaluation of building schools for the future: 2nd Annual Report, Department for Children, Schools and Families, UK.
- 2010, Evaluation of building schools for the future (bsf): 3rd Annual Report, Department for Children, Schools and Families, UK.

16 About the evaluation of IZBB see more Fischer, N./Holtappels, H. G./Klieme, E./Rauschenbach, T./Stecher, L./Züchner, I. (Hrsg.) (2011): Ganztagsschule: Entwicklung, Qualität, Wirkungen. Längsschnittbefunde der Studie zur Entwicklung von Ganztagsschulen. [The All-Day School: Development and Impact - Results of the Study on the Development of All-Day Schools 2005-2010]. Weinheim: Juventa.

17 In England very long bidding procedures that favoured larger practices were criticised. See Fulcher, M. (2010) Prefab schools debate heats up. RIBA Journal. September 2010. Additionally, "as the complex process of competitive tendering, consortia-building, efficiency planning through large, single purchasing deals, design participation and consultation, cost-cutting and various site management deals take their course and result in variety of relatively uncontrollable outcomes and unintended consequences". See more in Boys, J (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 174. In Germany the competitions for school design are organized by municipalities where bodies in charge allow standardized programs with traditional conception. If architects want to participate they have to respect standards and regulations. By this they are forced to use outdated standards and build "antiquated". See more in IBA_Hamburg (ed.) (2009). Regimented Planning Obstructs Good Schools: A Discussion Between Peter Huebner and Arno Lederer in IBA_Hamburg (ed.) (2009) Metropolis: Education Berlin, Jovis Verlag GmbH

18 Ministry of Education and Science. Online: http://www.mpn.gov.rs/prosveta/page.php?page=315

Today, only four scientific articles relating to the design and quality of contemporary schools could be found in Serbia, which discuss childrens` relation to educational spaces. [19] Another article discussing the creation of a positive atmosphere in schools does not recognise the school space as an important factor.[20] These publications are descriptive, they do not address the contemporary problems with school design, and the findings do not provide any recommendations for future development of educational spaces in Serbia.

Newly built schools in Serbia

Observing some recently built schools it is clear that architects use "copy-paste" methods, relying on old socialist standardised school concepts. Though the three schools presented here (Fig. 3.1.) were built in different parts of Serbia, they look almost the same, with a very similar arrangement of different groups of spaces. The design pattern could be easily distinguished. The main entrance opens towards a central, two story high, main hall. From the main hall, along the two corridors two types of classrooms are organised. The first block entails classrooms for younger pupils (age 7-11), while the other entail specialised classrooms for chemistry, biology, or technical education, for the older pupils (age 11-14). One of the corridors usually leads to the changing rooms and the gym.

These schools do not epitomise local territory, biography, population, socioeconomic, national, ethnical features. They do not reflect the specificities of their students and environments. Aesthetically unpleasing, and more importantly functionally not satisfying, these schools cannot withstand either global challenges such sustainable development or meet emerging new goals proposed by MERS.

The primary catalyst for construction was providing the necessary space in neighbourhoods with overcrowded facilities. The main goal was not to create inspiring learning environments, or environments that tackle social, environmental or economic sustainability issues; although the newly set educational goals propose the both.[21] Many discussions with authorities on various levels (Ministries, local authorities, educational departments) during this research, revealed that the authorities see innovative school designs as more costly. Improving the quality of the learning environment for them meant repairing leaking roofs, refurbishing old and unhygienic toilets, or extending overcrowded schools. They did not fully comprehend that newly built schools at the time do not correspond to the educational goals proposed, and that they are not taking into the consideration the changes in the other relevant spheres of educational reform: the curriculum, the teaching/learning methods, and resources.

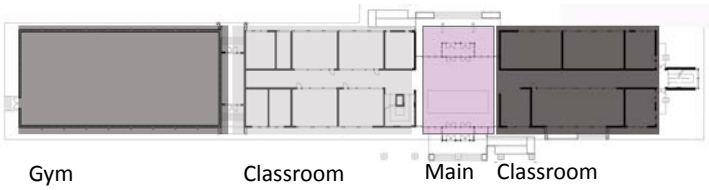
19 For example see Stankovic, D. (2008a). Space in the function of psychological stability of a child. Facta Universitas, Series: Architecture and Civil Engineering, (6) 2, pp.229-233

20 Vujacic, M. and Stanisic, J. (2007). Kreiranje pozitivne klime u skoli. Institut za pedagoška istraživanja Beograd PEDAGOGIJA. Vol. LXII, No. 3

21 For more information on educational goals and how they correspond to contemporary pedagogical ideas see chapter 2 p. 14, and to sustainability themes chapter 4 p. 41

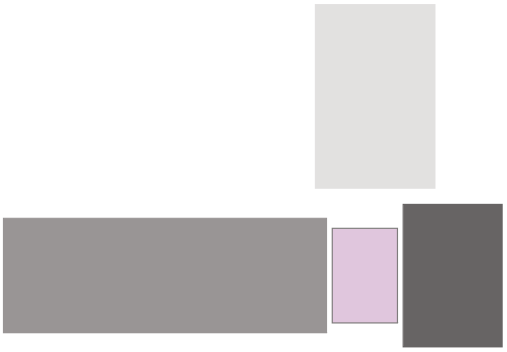
Fig. 3.1. Newly built schools in Serbia

Primary School Simeon Aranicki, Stara Pazova, Serbia, built in 2009

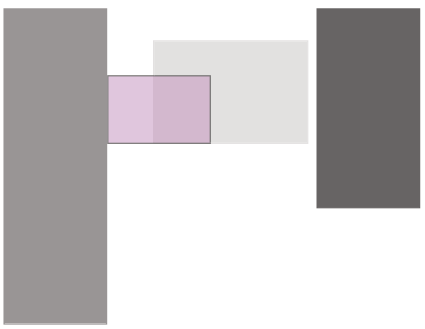


Gym | Classroom block | Main hall | Classroom block

Primary School Marija Trandafil, Veternik, Serbia, built in 2009



Primary School Sava Sumanovic, Altina, Serbia, built in 2009



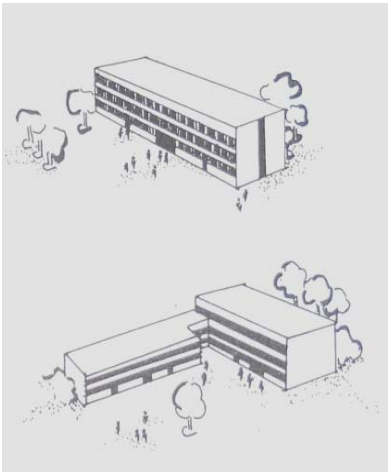


Fig. 3.2. Typical post-war school in Serbia.
Source: Bajbutovic (1983), p.122

According to Wernik thorough and systematic cost-benefit analyses have not been carried out to demonstrate that the standardised schools cost less.[22] Such cost benefit analyses can not be found in Serbia as well. Wernick explains that if the standardised school buildings are not a `good fit` the short-term gains of standardisation, if any, are lost in the long-term.[23] This implies that rather than constantly repeating poor quality standardiesed school building plans that allegedly cost less, we in Serbia should maximise the quality of the learning spaces for the money available.

To illustrate, it could be found that a 3.600 m^2 sustainable school in Kirchheim Unter Teck, Germany costs 850.000 thousand Euros.[24] The Primary school in Serbia "Sava Sumanovic" (Fig. 3.1.) with the total of 3800 m^2 cost approximately 2.550.000 Euros.[25] The building elements used in Germany, such as light weight timber on insulated foundation, zinc roof, and photovoltaic panels, are also available in Serbia and do not cost significantly more. Additionally, the workforce is much cheaper in Serbia. Therefore the question is whether for 2.550.000 Euros a more sustainable, child-friendly, supportive of contemporary learning styles, and aesthetically appealing solution could have been possible?

The influences on school design in Serbia

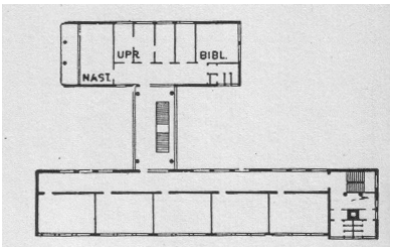


Fig. 3.3. Primary School Marija Bursac, first floor.
Source: Baylon (1958), p.45

"*Using our understanding of history to reflect critically on our experience in institutional settings, we have the possibility of creating alternatives that foster the healthy development of children. Without such reflection, we can only continue the status quo*".[26]

Observing the newly built schools in Serbia the influence of modernist school design is apparent. Schools under this influence have been built in Serbia since the end of the Second World War. For economic and efficiency reasons, the connection of form and function in modern architecture was particularly compelling.
Architectural expression was derived primarily from practical considerations (functional planning of the space, safety, health, etc.).[27] In these schools order, discipline and hygiene were demanded.

Fig. 3.4. Primary School Marija Bursac
Source: Baylon (1958), p.45

After the Second World War the country was devastated, poor and torn by the war. It urgently needed to repair dilapidated structures, and more importantly build new schools. Modular schemes that could be easily replicated became extensively exploited (Fig. 3.2). What was until the war monarchy, after the war became a communist and socialist country. With the change of ideology, the idea of what education is and what purpose should it serve changed. Schools were firmly integrated into the political apparatus, used as machines for preserving social order and preaching new communist ideals.

22 Wernik, L. (2007) Prototype Schools Designs: Can prototypes be used successfully? A report prepared for Council for Educational Facility Planners International. Online: www.aia.org/aiaucmp/groups/aia/documents/pdf/aiab097926.pdf

23 Ibid.

24 Gaia Architects (2005)Design and Construction of Sustainable Schools. Vol 01 Lessons formSchool Buildings in Norway and Germany. The Lighthouse, p.59

25 B92, New School in Zemun, Tuseday, 8.09.2009. Online: www.b92.net/info/vesti/index.php?yyyy=2009&mm=09&dd=08&nav_id=380341

26 Wolfe, M. and Rivlin, L.G. (1987) The institutions in children`s lives. In Weinstein, C.S. and David, T.G. (eds.) Spaces for children: The built environment and the child development. New York: Plenum, p. 89-114, p.112

27 For a comprehensive review of the architecture of modernist schools see Hille, R.T. (2011) Modern School: A century of Design for Education. Hoboken: John Wiley & Sons, Inc.

Under these circumstances the first disposition of school spaces was created by simply arranging the classrooms along the corridors, or around the central communication hub-the hall, with or without floors.[28] This would remain the prevailing type of school or scheme and the most repeated one. A typical example for that time is the Primary School "Marija Bursac", built in Belgrade in 1956 (Fig. 3.3., 3.4.). In key ways the schools built in the recent years resemble this one.

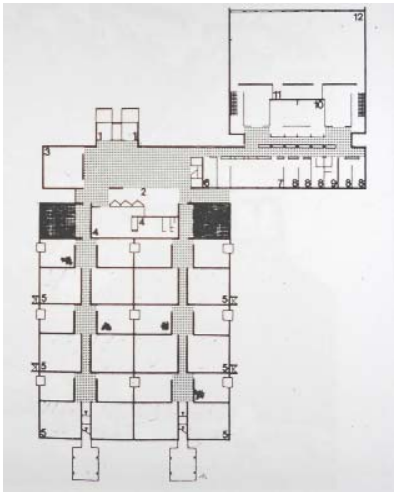


Fig. 3.5. Primary School Ratko Mitrovic, ground floor
source: Bajbutovic (1983), p.198

During the 60s and 70s, when Yugoslavia was more politically stabile and economically stronger, the biggest census of schools took place. At the time the industry in big cities was booming and a great number of people from the villages flocked into the big centres. The previous period of standardisation in Serbia, was followed by prefabrication [29], just as in the rest of the world. During the 50s and 60s architects accepted Ford`s production line with delight, believing that producing prefabricated construction elements in factories, and only assembling them at the site, was revolutionary and economically more cost-effective.[30] Due to the proliferation of new ideas, some characteristic features of the schools across the world at the time, such as outdoor classrooms in the form of gardens, patios, terraces [31], could be observed in the newly built schools in Serbia. In Europe the `open-air ` schools started to be built, with an underlying idea that the school classrooms should be connected to surrounding nature, so that the health and hygienic condition of the school spaces are improved. The typical example of school from this period is the primary school "Ratko Mitrovic", built in Belgrade in 1971. It is a pavilion type school partly built from prefabricated components (Fig. 3.5., 3.6.). However, this change in school space was not thoughtfully adopted. Although this type of schools had a little garden attached to every classroom, they were not used. As a pupil in this school I remember the concrete covered patios were dusty, filthy, and rarely used. It seems that in the past, as well as today, the reason for this was that the appropriate changes in teacher education were not made, and they were not educated how to use them constructively.

Fig. 3.6. Primary School Ratko Mitrovic
source: Bajbutovic (1983), p.198

In Serbia, as in the rest of the world post Second World War, schools did not try to reinvent the important relationships between the architecture of school building and education. They were "a trend follower instead of trendsetter".[32] The prevailing driving force behind school design in Serbia, was the urgency to solve the lack of school spaces and rapid advancements in building technology. Although, at the time the progressive movement (1890-1945), led by John Dewey, was in full swing, his pedagogical ideas, and those of his contemporaries, were explained in the school design literature [33], but never thoroughly influenced school design in Serbia.

28 Bajbutovic, Z. (1983) Arhitektura sklske zgrade/School building architecture. Sarajevo: Svjetlost

29 PB. Jones observes that the standardisation in the world was followed by prefabrication. See more in Jones, P.B. (2000) Guenter Benisch. Bassel/Boston/ Berlin :Birkhauser P.10-11. The situation was the same in Serbia.

30 Ibid.

31 Hille, R.T. (2011) Modern School: A century of Design for Education. Hoboken: John Wiley & Sons, Inc.

32 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

33 For example see Bajbutovic, Z. (1983) Arhitektura sklske zgrade/School building architecture. Sarajevo: Svjetlost, p. 260; and Baylon, M. (1958) Školske zgrade/School buildings. Beograd: Građevinska knjiga

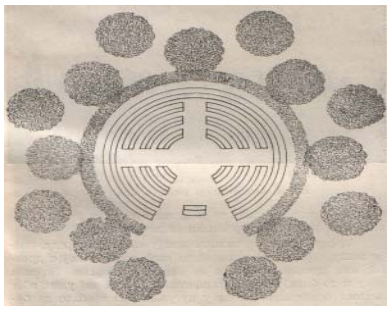


Fig. 3.7. Field classroom plan
source: Adzic, p. 33

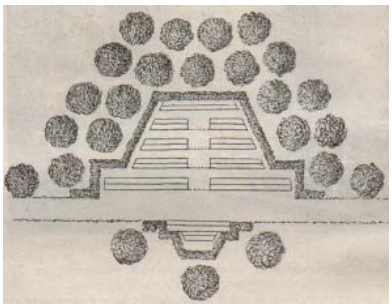


Fig. 3.8. Field classroom plan
source: Adzic, p. 32

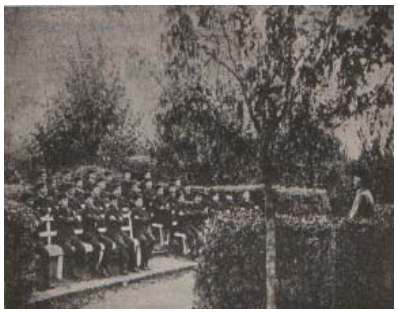


Fig. 3.9. Uncovered classroom
source: Adzic, p. 31

Fig. 3.10. Uncovered classroom
source: Adzic, p. 29

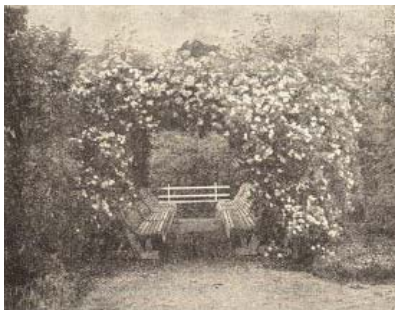


Fig. 3.11. Covered classroom
source: Adzic, p. 22

Fig. 3.12. Covered classroom
source: Adzic, p. 23

Fig. 3.13. Hidden classroom
source: Adzic, p. 40

Fig. 3.14. Hidden classroom
source: Adzic, p. 38

However, one particular case in Serbia could be found where the design of the learning environment was driven by pedagogical ideas, and understanding how children learn. The design idea, as well as the time when the outdoor classrooms in the yard of the School for Male Teachers in Jagodina, Serbia were built, is particularly surprising (Fig. 3.7. - 3.14.). In 1903, at only 22 years old Sreten Adzic was appointed as the head teacher of the previously mentioned school. After finishing pedagogy and philosophy studies in Vienna and Leipzig, and after study and research trips in Norway and Sweden, he acquired from the municipality 10 hectares of the surrounding land for the yard of his school.[34] In 1903 the classrooms were constructed, and in 1908 all of them were being regularly used.

Fig. 3.15. Classroom in Primary School Vuk Karadzic in 1932,
source: courtesy of Belgrade`s Pedagogy Museum

For that time his ideas were revolutionary because he:
- explained the hygienic, pedagogical, moral, aesthetic, and social significance of these spaces;
- classified the types of outdoor classrooms;
- explained how each configuration and types of plants impact learning;
- and what type of trees and plants are the most appropriate for each configuration.

Fig. 3.16. The classroom in my primary school in 1991

All of this work was based on his constant observation of pupils, discussion with them and modifications of the classrooms. Unfortunately, during the Second World War the school, together with the school yard, was completely devastated, and until today remains in the same ruined condition. This example became forgotten, together with the innovative ideas behind the design, and the practice of school design went in a completely different direction. [35]

Fig. 3.17. The classroom in Primary School Simeon Aranicki in 2013

The critique of the school design in Serbia

The critique of school design is vivid and alive in England and Germany. The protagonists in the debate are both architects academics, researchers and practitioners, but pedagogists, psychologists, educationalists. Unfortunately, in Serbia such discussion does not exist. Therefore, some of the most important observations will be presented as they are highly relevant to the situation in Serbia.

Standardised schools, as the ones built in Serbia, called the 'egg-cart', 'cell-and-bell', 'factory', or 'military barrack' has been severely criticised. The arrangement of spaces in them has always been the same – classroom boxes arranged along a dark corridor, used solely for circulation. According to Kahl such school character is the product of space and time arrangements that have never changed.[36] The way one place is connected to the other is always the same, thus leaving no opportunity for something interesting and unexpected to happen. Today such 60 m^2 classrooms in Serbia are still being built, just as they were a hundred years ago (Fig. 3.15.- 3.17.).

34 Adzic, S. (1924) Poljska ucionica/Field classroom. Belgrade: Stampa grafickog zavoda "Makarije"

35 These are just two, the most prevailing directions of school design and building in Serbia, and by no means constitute a comprehensive review. Until today, only two books written in Serbia and dealing with the issue of school could be found. However, they were conceived as textbooks for the school design course at the architecture schools at the time. They concentrate on presenting examples from countries around the world, and just a few examples from the Yugoslavia at the time could be found. A thorough review, classification and explanation of all the influences impacting the school design in Serbia through recent history is a theme worth exploring through another PhD research.

36 Kahl, R. (2009a). The Third Teacher: The Discovery of Space and Time in Schools in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH

Walden argues that these squares, filled with chairs and desks one behind the other, with activities broken into 45 minute segments of prescribed activities, emphasise repetition, sameness, and standardisation, just like the products on an assembly line in a factory.[37] These classrooms are small, they do not support individual learning styles, group work, flexibility, and do not correspond to modern pedagogy.[38] In standardised schools across the world a striking routinisation of daily activities could be observed. A series of similar events, in always the same time frames is constantly repeating in identical places. Therefore, "little time or space belongs to the child".[39] Apart from the teacher, the only active agent, both the pupils and the environment are passive.

As the environment is not organised around the idea that pupils learn in a multitude of ways, it directly diminishes the opportunities for learning.[40] In such schools, resembling industrial buildings or even penitentiaries, unfriendly arrangements of rectangles - classrooms, and straight lines - corridors, makes it clear that this disposition is a product of mass education ideas. These spaces build on the idea that the learning is a "product of ritualised performances rather than integrated understandings" [41] and assume that people operate just like machines [42].

Previous arguments imply that physical fabric of schools following standardised plans depict the curriculum and the teaching approaches inside. Pupils spend hours in classrooms exposed to very extensive curriculum, to a series of complex academic facts, abstract concepts, far away from everyday life and away from applicable knowledge. The measure of success is the amount of encyclopedic fact and figures that can be crammed. In such situation they are rewarded for competitiveness, individualism and conformity, instead of individuality and community. Wolfe and Rivlin warn that such practice makes children compliant and not challenge authority. It sends them just one message – that is it ok to lead a life structured by others, to be a passive observer rather than active creator of your own life and experiences. [43] These practices and the messages are in contradiction to sustainable development principles, and contemporary learning approaches, both present in Serbian educational goals.

Additionally, Hertzberger believes that standardised school space arrangements contribute to social segregation [44] and alienate students from themselves, their friends and teachers, as well as their environment. Grunewald agrees with this adding that "a spatial analysis of schooling reveals that its most striking structural characteristic is the enforced isolation of children and youth from culture and ecosystem". [45]

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37 Walden, R. (ed) (2009) Schools for the Future: Design proposals from Architectural Psychology. Goettingen: Hogrefe

38 Brauns, M. (2007). Auf dem Weg zu einer Paedagogischen Architecture – Dokumentation des Schulbaukongress 2007 in Duesseldorf. Online: www.adz-netzwerk.de/files/docs/brauns_paedagogische_architektur.pdf

39 Wolfe, M. and Rivlin, L.G. (1987) The institutions in children`s lives. In Weinstein, C.S. and David, T.G. (eds.) Spaces for children: The built environment and the child development. p.89-114, New York: Plenum, p. 102

40 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons

41 Cousin, G. (2006) An introduction to threshold concept. Planet 17, December. Online: www.neillthew.typepad.com/files/threshold-concepts-1.pdf

42 Kahl, R. (2009b). Trainingskamp oder Zukunftwerkstatt – Was woollen wir von der Schulbildung? Arhiv der Zukunft. Online: www.adz-netzwerk.de/Trainingscamp-oder-Zukunftswerkstatt.php

43 Wolfe, M. and Rivlin, L.G. (1987) The institutions in children`s lives. In Weinstein, C.S. and David, T.G. (eds.) Spaces for children: The built environment and the child development. New York: Plenum, p.107-108

44 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij, p.13

45 Gruenewald, D. (2003) Foundations of Place: A multidisciplinary framework for place-conscious education. American Educational Research Journal, 40(3), p.62

Confined in classrooms, children are isolated from the social and cultural context where their understanding about the environment and themselves is developed. [46] Children have to know local places, because local knowledge will stimulate them to care more about the places they share with each other.[47] Observing school design in Serbia it could be concluded that the way they are designed seems to do quite the opposite.

Spatial schemes of standardised schools are visual representations of the authority and discipline. Linear corridors are there to control the movement of pupils, desks and chairs in rows that enable the pupils to be easily observed, high windows prevent seated children to look to the surrounding areas, and the teacher is always in front of them, usually with a table on a pedestal. Markus explains that the way schools and classrooms are occupied and inhabited clearly represents the power relationships.[48] To whom the territory belongs is clear – to the teachers. According to Gruenewald the material forms have the power to simultaneously represent and reproduce social relationships.[49] Applying and repeating such standardised school schemes enables the domination of teachers to be constantly maintained. This is very problematic because unbalanced teacher-pupils relationships can prevent pupils to develop feeling and attachments for their environment, both physical and social, and as a result rebellion and vandalism might occur.[50]

According to Mommen-Henneberger without being developed around the myriad of pedagogical ideas, and without the fine intertwining between architecture and pedagogy, school spaces are reduced to being a mere building envelope without meaning.[51] Kahl believes that learning happens in schools that are turned into places for living.[52] For this reason Serbia should say farewell to the `school machines` and start designing school spaces worthy of its pupils and teachers. Otherwise, the standardised and uniform schools will continue to transmit just one message "you are not to be individual, try to be the most perfect copy possible". [53]

In countries across the world the standardised schools has been severely criticised due to the research in the field of pedagogy and psychology that explain how children learn. However, the architecture of schools in Serbia is not keeping the pace with these developments. The schools in Serbia continue to embody the transmission model of learning. In relation to this there are several paradoxes:
- The educational goals suggest the development of a child as a whole. Yet, the pupils are educated using the same methods and in the same spaces as a hundred years ago.

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46 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Son, p.94

47 Casey, E. (1996). How to get from space to place in a fairly short stretch of time. In K. Basso & S. Feld (Eds.), Senses of place (pp. 13–52). Sante Fe, NM: School of American Research Press.

48 Markus, T.A. (1996) Early Nineteenth Century School Space and Ideology. Pedagogica Historia, 32 (1), p. 9-50, Markus, T. A. (1993). Buildings and power: Freedom and control in the origin of modern building types. London: Routledge

49 Gruenewald, D. (2003) Foundations of Place: A multidisciplinary framework for place-conscious education. American Educational Research Journal, 40(3), p.631

50 Erwin, J. C. (2004) The Classroom of Choice: Giving Students what They Need and Getting what You Want. Alexandria, VA: ASCD,.p. 100

51 Mommen-Henneberger, U. (2010). Schulen sind pädagogisch wenig wertvoll. Tagesspiegel, 27/01/2010. Online: www.tagesspiegel.de/berlin/schule/schulen-sind-paedagogisch-wenigwertvoll/1671256.html

52 Kahl, R. (2009a). The Third Teacher: The Discovery of Space and Time in Schools in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH

53 Ibid.

- The teachers are trained and expected to employ active learning principles and practice good pedagogy in school spaces that were not designed considering constantly progressing understanding of how children learn.
- Even at the tendering stage of building projects pedagogical issues are overrun by state standards. Outdated school design standards in Serbia result in schools not designed with sustainability and pedagogy in mind. This implies that the sustainable and the pedagogical dimension of school spaces has still not found its place on education policy agenda.

The data presented in this section suggest that in Serbia the gap between newly proposed educational goals, innovations in the teacher education, curriculum, and school design is great. Outdated and stiff regulations, regimented planning, standardised programs and bodies in charge allowing conventional planning are what slows school reform and prevents schools from being sustainable, and pedagogically valuable places for living and learning. Therefore, all relevant professionals should start to raise awareness about these issues, and contribute to a solution to the problem from the field of their expertise. Otherwise, as Malone believes, the children in Serbia will continue to live in "cognitively limited environment".[54] "The price they pay is what they do not become, what they cannot enjoy, what they fail to comprehend". [55]

I believe that school capital projects have the potential to bring change. It is paradoxical for a country to invest such large amounts of money just to recreate the status quo. In this situation a question that arises to an architects is: Can architects through their work of designing schools contribute to the tempo and quality of educational reform?

Architects and architecture as catalysts of change

Papanek claims that all design is education.[56] Yet, many would ask what does architecture have to do with education? Interestingly, analysing the origin of these two words, and making parallels can help us to understand that. The word "building" means making, creating and giving something shape. If education is defined as shaping human beings, it is obvious that these two terms are not that different. Etymologically the origin of build means – "to grow", "to become", "to thrive", "to live", and "to be".[57] At the time of its creation the word "build" had less to do with the technical aspect from which it is derived Latin "aedificare" meaning "to build" and more with Latin "colere", from which the word culture originated, meaning "to improve", "to plant", "to cultivate", "to care".[58] This deep meaning of the word building is similar to education and suggests the common social task of these two fields of action - architecture and education.

Helweg explains that "as buildings must not be reduced to the purely technical and craft aspect of production, education must not be limited to the simple teaching of formal knowledge. If you say education and mean only the level of the knowledge that can be tested, you will fall short, just like the person who says architecture, and means no more that the construction of building."[59]

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54 Malone, K. (2007) Child Space: An anthropological exploration of young people`s use of space. New Delhi: Concept Publishing, p. 191

55 Ibid.

56 Papanek, V. (1992). Design for the real world: Human ecology and social change.2nd ed. London, Themes and Hudson

57 Online Etymology Dictionary-Etymonline. Online: www.etymonline.com/index.php?allowed_in_frame=0&search=build&searchmode=none

58 Ibid.

59 Hellweg, U. (2009). Metropolis – Education: Prologue in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH, p.13

The problem is that not all architects comprehend the broader context and the implications of their work, and take greater responsibility. When faced with the concern for the current condition in which our planet is, they all do not respond the same. The work of some architects is perceived sometimes as a part of the problem, and sometimes as a part of the solution. The work of some architects in Serbia demonstrates the lack of awareness that school design has urgently to respond to an ever growing number of social, environmental and economic challenges, as well as to an improved understanding of how children learn.

On the other hand, observing the situation in England and Germany architects who are contributing to the solution to the problem can be found. They are trying to turn themselves to nature, its postulates, and base their design on that. In this way they seek to enable their buildings to live in synergy with the environment. They believe that the architecture is a powerful profession which can positively affect the change towards a more sustainable future. The previous sections showed that the number and complexity of challenges is constantly growing. Therefore, we need better solutions. Despite the constraints, Bell and Wakepord believe that the architectural design in this process should have a crucial role, because architects are the ones giving new form to the various needs of the future.[60]

School building design should truly reflect the ongoing search for expressing our solution to the ever-growing number of global and local challenges. I believe that a building`s design can have a direct effect on how we assimilate, learn and integrate with other people, and how we as a society integrate sustainability into our lives. According to Papanek the way buildings operate can convey important messages.[61] Goldberger adds that buildings can make us feel, they can make us think, and the whole building can be a lesson.[62] This implies that a building could have the potential to teach and convey new ways in which sustainable principles materialize. Schools as institutions have a crucial impact on character shaping and developing of pupils` skills and abilities. They are places where the youngest members of our society are being educated. Hence, they should make a significant contribution to ensure sustainability at all levels, from local to global.[63]

Looked at from this perspective, architects and architecture can have a role of educators. Architectural design can stimulate users to explore sustainable school space in the best possible way and learn from those engagements. By implementing sustainable concepts, using alternative energy sources, respecting the environment, creating social hubs in schools, and collaborating with pupils and teachers on school design, architects provide a positive example for young people. They can help pupils become conscious people who respect each other and appreciate the planet Earth with all its resources. In this way architects and buildings can be actively involved in shaping someone`s awareness about the global challenges that we face today.

60 Bell, B. and Wakepord, K. (ed.) (2008). Expanding architecture: Design as activism.New York, Metropolis books

61 Papanek, V. (1992). Design for the real world: Human ecology and social change.2nd ed. London, Themes and Hudson

62 Goldberg, P. (2009). Why architecture matters. New Haven, Connecticut, Yale University Press

63 Reynolds, P. and Cavanagh, R. (2009). Sustainable Education: Principles and practices. Paper presented at 2009 Annual Conference of the Australian Association for Research in Education: Canberra

In order to be able to develop designs that help children comprehend global challenges architects should be able to analyse the past and foreseeable future, they have to recognise, isolate, define and solve problems. In doing so architects should collaborate with schools, determine educational goals and find appropriate resources in the community to fulfill them. Van Den Berg and Rieger-Ladich point out that

"very often it is precisely those schools, existing within location-specific problem situations, as well as with limited opportunities, but featuring cooperation between architects and a user community, that can be seen as particularly successful examples of educational practice".[64]

It seems that knowing local challenges we can contribute to the solution to global social, economic and environmental problems and turn schools into places safeguarding the future.[65]

In England and Germany architects who designed schools together with teachers, pupils, and local community members in order to address location-specific social and environmental problems can be found. Architect Peter Huebner created a school in a struggling neighbourhood by involving teachers, pupils, and parents in both design and construction of the school.[66] Additionally, Prue Chiles Architects designed toilets at Earlham Primary School, Forrest Gate, function as a three-dimensional textbook in order to stimulate children to explore local environmental problems.[67] In these cases architects recognised that well being of all communities is inherently valuable for the heart of their profession. They used their skills to address specific needs of a community and in that way reinvented architecture. Design process educated society, simultaneously being educated by those it served.[68] In this way the architectural design was a catalyst of change.

I believe that the message of those architects is clear - the educational reform will be incomplete and of poor quality if the design of learning environments is not radically reconsidered, together with the current developments in the field of sustainability and pedagogy. Joint Information Systems Committee, known as JISC, a charity supporting innovation in UK education and research, similarly states that "spaces are themselves agents of change. Changed space will change practice".[69] Architects in Serbia approach school design from less than a critical position. They too often act as master assemblers of building elements. They rely on standardized and conventional planning, and seldom explore how their design can contribute to contemporary social, environmental, and economic sustainability problems, and support, stimulate and even provoke the children to explore and learn about these issues. For all of these reasons now more than ever, especially in countries like Serbia "the time is right for an ideological architecture that does good by being good". [70]

64 Van Den Berg, K. and Rieger-Ladich, M. (2009). Conflicting Interests? School Architecture: Image Fabrication and Community Building in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH

65 Walter, J. (2009). Symbols of Intellectual and Cultural Renewal? The role of Architecture and Urban Planning in the Construction of Hamburg`s School Buildings in IBA_Hamburg (ed.) (2009) Metropolis: Education. Berlin, Jovis Verlag GmbH

66 Huebner, P. (2006) Evangelische Gesamtschule Gelsenkirchen-Bismark: Kinder bauen Ihre Schule/ Children make their own school. Fellbach: Edition Axel Menges

67 Prue Chiles Architects. Online: www.pruechilesarchitects.co.uk/projects/earlham.html

68 Bell, B. (2003). Good deeds, Good design: Community service through architecture. New York, Princeton Architectural Press

69 Joint Information Systems Committee JISC (2006) Designing Spaces for Effective Learning: A guide to 21st century learning space design. Online: www.jisc.ac.uk/uploaded_documents/JISClearningspaces.pdf, p. 30

70 Bell, B. and Wakepord, K. (ed.) (2008). Expanding architecture: Design as activism. New York: Metropolis books, p.18

Summary

As a part of ongoing educational reform school building modernization program in Serbia has commenced. Comparing it with the BSF program from England and IZBB program from Germany it could be seen that there are several problems. For the Serbian school building modernization program there is no manifesto written, architect experts are not included, there are no tools developed for the monitoring of the quality of the newly built schools, the changes and developments in the other fields of educational reform are not taken into consideration, and application procedure for building new schools has just recently made available on the Ministry`s web site. Additionally, there is no interdisciplinary collaboration, no critique in both academy and architectural practice, and there is no exchange of experience. Architects of the newly built schools use and repeat old standardized school design concepts from the socialist period. The exploration of this school design concept reveals that it is not in tune with the contemporary ideas from pedagogy and sustainability. Therefore, architects from Serbia should explore a bit further the intertwining of these two important influences on contemporary school design, so at to contribute to the advancement and the quality of booth school design and the ongoing educational reform.

Under these circumstances questions that pose to an architect and a researcher are:
- how should we develop architectural design for a school to be more socially, environmentally, and economically sustainable, and
- how could such school, designed with sustainability in mind, impact on learning process, incite and even provoke learning, and raise awareness about sustainability issues?

The next chapter will explore in detail the existing knowledge on the matter.

04

"The curriculum embedded in any building instructs as fully and powerfully as any course taught in it"

- David Orr

SUSTAINABLE SCHOOLS AS THE "THIRD TEACHER": INSIGHTS FROM THE PAST, CHALLENGES FOR THE FUTURE

Even before this PhD research started it was clear to me that the way majority of architects in Serbia understand sustainability is incomplete. As mentioned at the very beginning, architects designing sustainable buildings usually focused only on environmental dimension. Reading about the architectural practices and approaches from Western countries I concluded that we, as architects, should respond to an array of social and economic sustainability challenges as well. In this discussion many architects designing schools participated. Additionally, some of those architects used sustainable school design to incite and provoke learning. Yet, debate about more broader and holistic understanding of sustainability, and the ways contemporary school design should respond to that, could not be found in Serbia. This understanding is what triggered the literature review presented in this chapter.

Before suggesting how school design in Serbia can be improved, made more sustainable, and pedagogically valuable I explored the literature that brings two perspectives together: the sustainable school and the third teacher. My first step was to review a vast number of studies so as to assemble the broadest possible set of social, environmental, and economic sustainability themes. Later on I used this set to explore the literature explaining how school design should respond to each of the themes discovered, together with the seminal studies describing how the physical fabric of a school could incite and provoke learning about sustainability, that is to say act as the "third teacher". Additionally, I reviewed the existing tools for undertaking such research. At the end I have approached the findings critically, and suggested what the next steps should be on our way to a better understanding of sustainable and pedagogical aspects of schools. The following text will discuss each of these steps in much further detail.

Sustainability themes to which schools should respond to

In the first instance the literature was reviewed in search for social, environmental, and economic sustainability topics (Fig. 4.1.). The studies discovered come from academics and researchers with diverse educational backgrounds. So that the broadest possible framework of themes is assembled various types of literature was included: books, journal articles, checklists, toolkits, assessment tools. In all of those publications a unique and unanimous set of sustainability themes could not be found. Yet, what could be constituted is a set of key sustainability themes that appeared in the majority of studies. The framework illustrates the broadest possible set of sustainability challenges to which every school should respond. Such a broad and comprehensive overview of sustainability themes could not be found elsewhere, especially in Serbia.[1]

Mapping the comprehensive sustainability framework against the educational goals set by the Serbian Ministry of Education in 2009 leads to two conclusions (Fig. 4.2.). First, once again it can be confirmed that Serbia has correctly identified contemporary challenges as other more developed countries such as England and Germany.[2]

1 For a comprehensive overview of the sustainability themes, their description and the explanation why this framework is important and useful for architectural design in Serbia see Brkovic, M. and Milosevic, P. (2012) Architects` perspective on sustainability in Serbia: Establishing key topics. SPATIUM International Review, 28, p.60-66

2 For comparison of educational goals see Chapter 2, p. 14

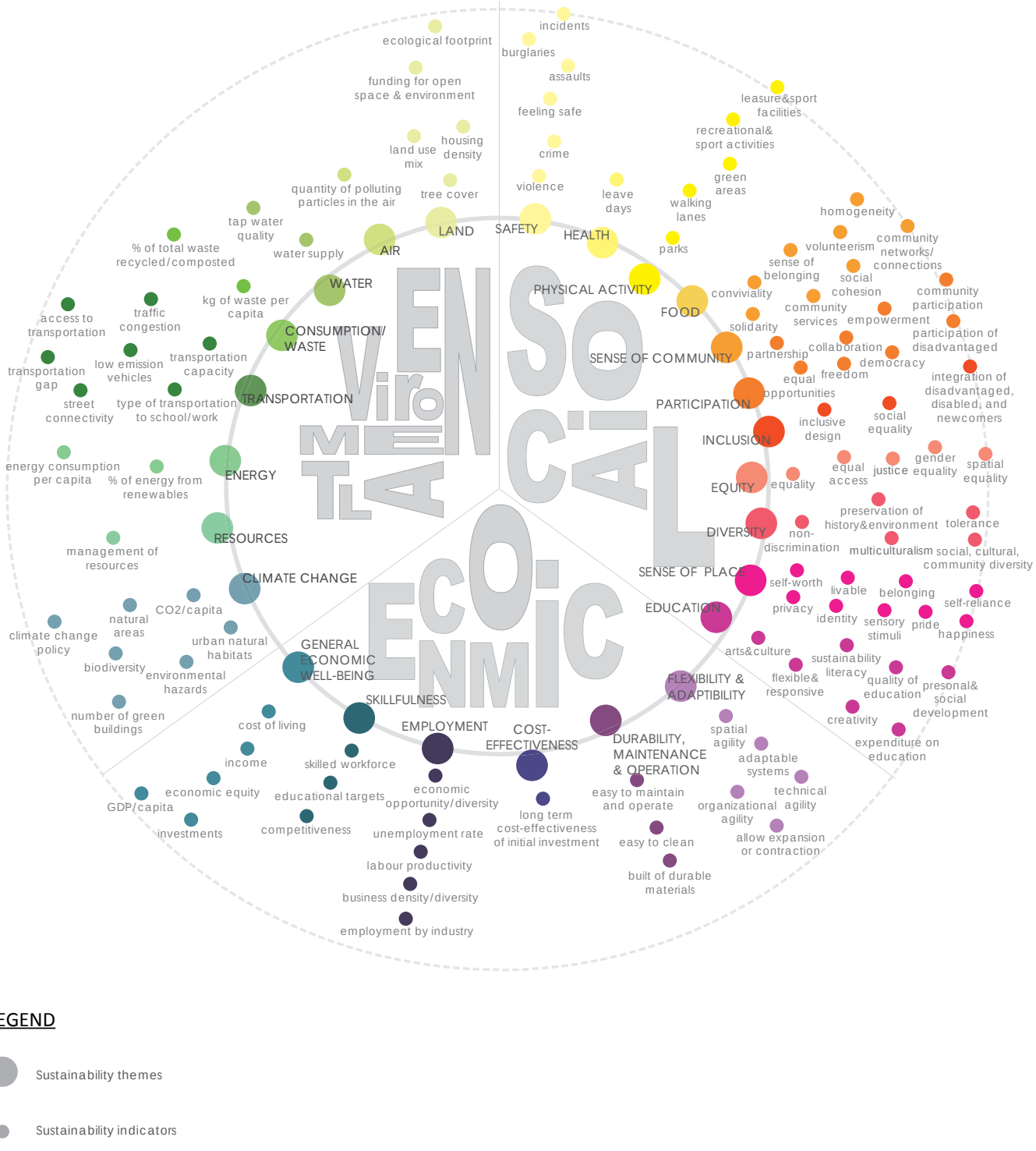

Fig. 4.1. Comprehensive framework of sustainability themes to which contemporary school design should respond to

Sources used to compile the diagram DFID (1990), Hancock (1993), Norwich 21 (1997), Meter-CRC (1999), Sach (1999), Hans-Boeckler-Stiftung (2001), Barron and Gauntlett (2002), Omann and Spangenberg (2002), Spangenberg and Hinterberger (2002), Thin et al. (2002),Tarzia et al. (2003), UNDP (2003), WACOSS (2003), Baines and Morgan (2004), McKenzie (2004), Sinner et al. (2004), Labuschagne (2005), Ledoux, Merten, Wolff (2005), Bramley et al. (2006), Fraser et al. (2006), Murray, Dey and Lenzen (2006), Colantonio (2007), Tomalty et al. (2007), TSM (2008), SYC and SCBCEP (2008), Carraro et al. (2009), FFF (2009), McMihael (2009), BIP (2010), FBC (2010), Tangay et al. (2010), Hancock (online), SECS (online)

EDUCATIONAL GOALS FROM SERBIA in 2009	SUSTAINABILITY THEMES from the graph 4.1.
to develope self-awareness, personal initiative, the ability for self-evaluation and expression of one`s oppinion	EDUCATION
to enable persons to solve problems, establish links and apply knowledge and skills in their further education, professional work and everyday life	
to develop communication and dialogue skills, the sense of solidarity, quality and efficient cooperation with others, team-building skills and foster friendship and camaradie	SENSE OF COMMUNITY
to achieve full intellectual, emotional, social and physical development of every child and pupil in keeping with their developmental needs, abilities and interests	PARTICIPATION INCLUSION & EQUITY
to create awareness about the importance of sustainable develpment, protection and preservation of nature and the environment, ecological ethics, and animal protection;	ENVIRONMENTAL SUSTAINABILITY
to acquire quality knowledge and skills, and valuse, language, mathematical,scientific, artictic, cultural, technical and information literacy, enabling children and young people to live and work in modern society	EDUCATION CULTURAL DIVERSITY
to develop motivation for learning, enable persons to learn independently, engage in life-long learningand take part in international educational and professional processes	EDUCATION
to develop the abilities to find, analyze, utilize and communicate information, while skillfully and effectively using information and communication technologies	NEW TECHNOLOGIES
to develop key competences necessary for life in modern society, enable them to work and pursue their profession by developing vocational competences, in accordance with the given profession, through the development of modern science, economy and technology	NEW TECHNOLOGIES
to enable persons to make adequate decisions about their future education and profession, their development and future life	EDUCATION
to develop and practice healthy life styles, raise awareness about the importance of one's own health and safety, and the need to develop and foster physical abilities	SAFETY& SECURITY HEALTH PHYSICAL ACTIVITY FOOD
to develop creative abilities, foster creativeness, esthetic perception and good taste	
to develop the ability to become a responsible citizen, capable of living in a democratic and humane society based on the respect as the basic principles of justice, truth, freedom, honesty and personal responsibility; of human and civil rights, right to be different and care for others, as well as the basic principles of justice, truth, freedom, honesty and personal responsibility	SENSE OF COMMUNITY PARTICIPATION
to form opinions, convictions and a value system, developing personal and national identity, creating the awareness and sense of belonging to the Republic of Serbia, respecting and language and one's language, the tradition and culture of the Serbian people, the tradition and culture of fostering the Serbian language and one's language, the tradition and culture of the Serbian people, the tradition and culture of ethnic minorities and communities, other peoples', developing multiculturalism, and respecting and preserving national and world heritage;	CULTURAL DIVERSITY
to develop and respect racial, national, cultural, language, religious, gender and age equality, tolerance,and respect for differences.	INCLUSION & EQUITY

Fig. 4.2. Mapping Serbian educational goals set in 2009 against sustainability themes

Sources used to compiling the mapping: Ministry of Education, Republic of Serbia (MERS). Objectives of Education. Online: www.mp.gov.rs/page.php?page=101

Secondly, it can be seen that the educational goals in Serbia, besides recognizing contemporary pedagogical ideas, correspond quite well to sustainability themes. However, taking into consideration the practice of designing and building schools in Serbia explained in chapter 3, it is evident that they do not take into consideration the educational goals, as well as sustainability themes. For this reason the developed framework was used as a guidance for further literature review about how school design in Western countries was developed to respond to sustainability themes.

SUSTAINABLE SCHOOLS: THE THREE GROUPS OF STUDIES

During the second step in the literature review both evidence-based and practice based exploration studies were reviewed. It was discovered that three core groups of literature could be distinguished.

The discussion in the first group of studies mainly revolves around the environmental sustainability issues; the possibility of schools to reduce the environmental impact. Such discussion could be found in school design manuals [3], that can help architects to minimise the negative effect of school buildings on the environment, by applying the principles of energy efficient architecture, alternative energy sources, rainwater harvesting, recycled materials, cross ventilation, adequate combination of natural and electric light. Today, buildings are responsible for 36% of CO_2 emission in Europe. [4] It is known that schools are a substantial proportion of buildings, so considering the environmental impact of schools is crucial. However, school buildings are not able just to sustain a natural position by not harming the environment. Some authors believed that they have the potential to be powerful teaching tools at the disposal of the teachers and pupils.[5]

The second group of studies consists of a number of examples which illustrate how schools around the world were developed in order to be more sustainable. Although, the large majority of the examples presented how school design elements respond to environmental sustainability requirements, some authors went a step further and acknowledged teaching potential of schools. To illustrate:

- DfES observed that a building could be used as a `teaching tool` [6];
- LPA architectural practice explained that a sustainable school is a `living laboratory` where the students and the community can learn about the environment on daily, practical basis [7];
- similarly Ford said that sustainable school can be a `living laboratory` which can engage the pupils in learning about science, building arts, and environmental stewardship [8];
- Gaia architects believed that the role of sustainable school design is crucial in demonstrating and imbuing in the learners the awareness about sustainability issues [9];

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3 For example see following publications: -Collaborative for High-Performance Schools, (CHPS) (2006) Best Practice Manual, Design, Volume II. The Collaborative for High-Performance Schools;
- Targetzero (2010) Guidance on the design and construction of sustainable, low carbon school buildings. Report V1.0, February 2010. Online: www.targetzero.info/news/release/new_sustainable_schools_guidance_published/; and
- ASHARE Organization (2011) Advanced energy design guide for K-12 schools Achieving 50% Energy Savings Toward a Net Zero Energy Building. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

4 Olivier, J., Janssens-Maenhout, G. And Peters, A.H.W. (2012) Trends in global CO_2 emissions. 2012 Report. The Hague: PBL Netherlands Environmental Assessment Agency

5 Martin, S.H. (2006) The classroom environment and children`s performance: Is there a relationship? in Spencer, C. and Blades, M. (Eds.) (2006). Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press. p. 101

6 Department for Education and Skills (DfES) (2006) Design of Sustainable Schools: Case Studies, Schools for the Future series. Annesley: DfES, p.9

7 LPA (2009) Green School Primer: Lessons in Sustainability. Mulgrave: The Image Publishing Group, p.50

8 Ford, A. (2007) Designing the Sustainable School. Mulgrave: The Images Publishing Group Pty Ltd, p.6

9 Gaia Architects (2005) Design and Construction of Sustainable Schools. Vol 01 Lessons form School Buildings in Norway and Germany. The Lighthouse, p.1

- Gelfand and Freed argued that school facilities could be a vehicle for learning, because transparent demonstration of sustainable behaviour has educational potential. According to them environmental sustainability systems should be made visible.[10]

This evidence suggests that discussion about sustainability and school design is a very wide topic. There are many types of articles, books, and studies devoted entirely to the design of sustainable schools. Additionally, Education for Sustainable Development is such a widespread movement, that until today many schools around the world have adjusted their curriculum in order to incorporate its principles. However, not many authors discussed how teaching about sustainability principles should be embodied in the very design of a school building. Despite the great efforts put in the search for such explorations very few authors could be found observing the same thing. Scott from Australia argues that many schools "were built along green principles and had environmental education as part of their program in some form or other, but the interface of the two was much more difficult to uncover".[11]

The third group of studies deals with this question and links the pedagogy and sustainable school space. The majority of these studies are practice based explorations, though some claims in the study done by Taylor were supported with empirical evidence from her research. The studies done by Taylor and an international team of architects and designers: OWP/P Cannon Design, VS Furniture, and Bruce Mau Design, are significant not just for using examples to demonstrate how school design responds to many sustainability aspects, but also for framing these examples with appropriate philosophies. In addition, Nicholson, Hertzberger, and Nair and Fielding, although not solely concentrating on sustainable schools and their pedagogical potential, provide some useful insights. In the text that follows I will look at all three groups of studies through the two perspectives brought together.

SUSTAINABLE SCHOOL AS THE THIRD TEACHER

The idea of a school environment as the "third teacher" has its roots in Maria Montessori`s concept of a 'prepared environment'. In her book "The secret of childhood" she explained that "the first aim of the prepared environment is, as far as it is possible, to render the growing child independent of the adult."[12] She believed that all the material artifacts in a certain environment affect the temperament and the development of a child.[13] According to her in such a conductive environment, children are able to learn although the traditional teaching methods are not employed. The embodiment of this idea could be found in the work of Loris Malaguzzi and the Reggio Emilia schools. [14] They "reconceptualized space as a key source of educational provocation and insight"[15], and established the term 'the third teacher'.[16]

10 Gelfand, L. and Freed, C. E. (2010.) Sustainable School Architecture: Design for Elementary and Secondary Schools. New Jersey: John Wiley and Sons, p.248

11 Scott, S. (2010) Architecture for children. Camberwell, Victoria: Australian Council for Educational Research Ltd., p.91

12 Montessori, M. (1966) The secret of childhood. Notre Dame, Ind: Fides Publishers, p. 267

13 Ibid.

14 Ceppi, G. and Zini, M. (eds) (1998) Children, Spaces, Relations: Metaproject for an Environment for Young Children. Modena: Grafiche Rebecchi Ceccareli

15 Strong-Wilson, T. and Ellis, J. (2007) Children and Place: Reggio Emilia's Environment As Third Teacher. Theory into practice, 46(1), (p.40–47), p. 40

16 Edwards, C., L. Gandini, L. and G. Forman, G. (eds) (1998)The Hundred Languages of Children: The Reggio Emilia Approach Advanced Reflections.2nd ed. London: Ablex Publishing, p. 256

Fig. 4.3. Environment as learning stimulus - from The Third Teacher book
source: OWP/P Architects, VS Furniture and Bruce Mau Design (2010), p. 148-149

Fig. 4.4. Environment as learning stimulus - from The Third Teacher book
source: OWP/P Architects, VS Furniture and Bruce Mau Design (2010), p. 184-185

Nair and Fielding, as well as Hertzberger argue that school buildings can `teach` when they are designed to provide a rich experience for pupils.[17] The physical attributes of learning environments can be prompts or cues provoking learning. Taylor explains that "a cue or prompt in the physical world is a material or concrete object that invites students to learn not only about subject matter areas, but also leads them to an understanding of the underlying ideas, patterns, and the principles of the universe… physical objects that make the three dimensional textbook from which we learn".[18] Nair and Fielding explain that the attributes of school environments can impact the spatial (intimate, open), psychological (soothing, safe, joyful), physiological (warm, cool, cosy.) and behavioural (teamwork, reading, writing) realm of human experience.[19] Taylor stresses that the environment should support the development of pupils in the three realms: body (multisensory perception, gross and fine motor development, wellness), mind (concept development, labeling, language, literacy, and technical literacy, cognition and creative problem solving, ecoliteracy) and spirit (creative self-expression, cultural pluralism, valuing and stewardship, self and social development).[20] She provides a detailed overview, illustrated by a series of sketches, of learning activities, developmental goals, and various design features (light, ceilings, walls, furniture, HVAC) which constitute good learning opportunities.[21]

According to OWP/P Cannon Design, VS Furniture, and Bruce Mau Design such environments, rich in positive stimuli, present scenographies for interactive situations, learning through discovery, investigation, exploration, experimentation and play (Fig. 4.3., 4.4.).[22] Hertzberger explains that they initiate exchange of information, provoke questions and provide pupils with an opportunity to accumulate "interest and love for the richness of the world around us".[23] In this way sustainable school buildings can be the best physical manifestation of good educational practice.[24] According to Taylor in this way the physical environment of a school can be the `silent curriculum`.[25]

Nicholson presents a slightly different perspective. She suggests that the built environment can, not just directly, but also overtly and symbolically transmit to children that they are to be "inspired, trusted, respected, loved, protected and understood"[26]. Iconographic messages inscribed in walls, seats varied in size, handles and light switches at children`s height, colour coded doors, and similar are all physical elements of school buildings that communicate a variety of subtle messages to children.

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17 Both Nair and Fielding, and Hertzberger associate the teaching potential of a school building with its ability to provide rich experience. See Nair, P. and Fielding, R. (2005) The language of school design: Design patterns for 21st century schools. DesignShare.com, and Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

18 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press, p.181

19 Nair, P. and Fielding, R. (2005) The language of school design: Design patterns for 21st century schools. DesignShare.com, p. 8

20 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press, p.103

21 Ibid, p.112-113; p.190-215; p. 217-219

22 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc,p. 14

23 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij, p. 46

24 Nair, P. and Fielding, R. (2005) The language of school design: Design patterns for 21st century schools. DesignShare.com, p. 97

25 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press, p.25

26 Nicholson, E. (2005) The school building as the third teacher in Dudek, M. (ed.) Children`s Spaces. Oxford: Elsevier, p. 64

These pedagogical ideas are not new and recent. Pedagogical and developmental philosophies, shaping the school design in the last fifty years are grounded in a long history of pedagogical approaches of John Amos Comenius[27], Jean-Jacques Rousseau[28], John Dewey [29], Jean Piaget [30], Montessori [31], Erik Ericsson [32], Lev Vygotsky [33]. During the last decades they find resonance with more recent insights from the field of neuroscience and cognitive psychology of Jerome Bruner [34], and ideological perspectives of Paulo Freire [35], Ivan Ilich[36], Ken Robinson [37], and David Orr [38]. From the field of their expertise they discuss the link of physical building fabric and pedagogy. According to Orr "the curriculum embedded in any building instructs as fully and powerfully as any course taught in it".[39]

The third group of the studies discovered is important because the authors link the physical fabric of a school building and pedagogy, and discuss in greater depth how a school building can `teach`. The text that follows will look at these studies by using the framework of sustainabiity themes set at the beginning of this chapter. [40]

27 Comenius, J. A. (1967) Didactica magna - Great didactic of John Amos Comenius. Translation and an introduction by Keatinge, M.W. New York : Russell & Russell

28 Jean-Jacques Rousseau, J. J. (1979) Emile, or On Education. Translated by Allan Bloom. New York: Basic Books

29 Dewey, J. (1897) My Pedagogic Creed. School Journal, 54, pp. 77-80. Online: www.dewey.pragmatism.org/creed.htm

30 Piaget, J. (1952) The Origins of Intelligence in Children. New York: International University Press

31 Montessori, M. (1982) The Secret of Childhood. New York: Ballantine Books

32 Erikson, E.H. (1950) Childhood and Society. Edited by Robert Coles. New York/London: W.W. Norton & Company

33 Vygotsky, L. (1978) Mind in Society: The development of higher psychological processes. Cambridge, MA: Harvard University Press

34 Bruner, J. (1960) The process of education. 2nd ed. Harvard: Harvard University Press

35 Freire, P. (1996) Pedagogy of the oppressed. 2nd ed. London: Penguin

36 Illich, I. (1995) Deschooling society. Marion Boyars Publishers Ltd

37 Robinson, K. (2010) The Element: How finding your passion changes everything. London: Penguin

38 Orr, D. (2004) Earth in Mind: On education, environment and the human prospect. 10th ed., Washington: Island Press

39 Ibid. p. 113

40 For more details about the sustainability themes framework see p. 40

Fig. 4.5. Ergodynamic seating
source:www.vs-furniture.com/56.0.html?L=1&FL=0

How the third teacher teaches: Sustainability themes and links emerging

Both the second and the third group of before mentioned studies build on a wealth of widely available knowledge how factors of physical environments impact occupants. Indoor air quality, temperature and humidity, ventilation, lighting, thermal, visual, and acoustic comfort impact occupants' health [41], academic achievement[42], cognitive development [43], students and teachers' engagement [44], and attendance [28]. First and foremost school design has to cater for these basic needs.[45] Discussing how school building impacts **health** is very important, because it can impede learning.[46]

Beside health, a school has to respond to the other basic need such as **safety**. Safety in a school design is a much larger issue that avoiding slippery surfaces, toxic materials, doors pinching fingers, and similar. Safety through school design should be addressed in a much broader sense. Such environments should be age appropriate, protective, nurturing, fun, and not intimidating.[47]
They should transmit the message that the child is respected. This is crucial because "a society that honours its young is the one that has a chance of creating a humane, peacemaking, sustainable culture".[48]

Furthermore, ever-growing body of literature suggests that **physical activities** in schools are not important just for burning calories, health, and motor development. They are interconnected with mental functions. OWP/P Cannon Design, VS Furniture, and Bruce Mau Design building on Montessori`s work claim that the development of children's brains comes through his/her movement.[49] Contemporary scientists agree with this and explain that if a body is inactive the brain activity is reduced. [50] Due to this understanding there have been some changes in classroom furniture and yard design. `Ergodynamic` desks and chairs, allowing individual rhythmic movement, thus better concentration, have been introduced in some classrooms (Fig. 4.5.).

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41 For the discussion about how various environmental parameters impact occupants please refer ASHARE Organization (2011) Advanced energy design guide for K-12 schools Achieving 50% Energy Savings Toward a Net Zero Energy Building. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., 21st Century School Fund (2009) Research on the impact of school facilities on students and teachers: A summary of studies published since 2000, 21st Century school fund, Washington D.C. Online: www.21csf.org/best-home/docuploads/ pub/210_Lit-Review-LetterSize-Final.pdf, and Heschong-Mahone Group (2003) Windows and Classrooms: A Study of Student Performance and the Indoor Environment. P500-03-082-A-7. Fair Oaks, CA: Heschong-Mahone Group light and impact on student learning

42 For the discussion about how various environmental parameters impact academic achievement see Tanner, C.K. (2009) Effects of school design on student outcomes', Journal of Educational Administration, vol. 47, no. 3, p. 381-399, and Fisher, K. (2000) A Critical Pedagogy of Space. PhD Dissertation, Adelaide, The Flinders University of South Australia: In Progress

43 For the discussion about how various environmental parameters impact cognitive development see Earthman, G. (2004) Prioritization of 31 criteria for school building adequacy, American Civil Liberties Union Foundation of Maryland, Baltimore, MD. Online: www.schoolfunding.info/policy/facilities/ACLUfacilities_report1-04.pdf, and Higgins, S., Hall, E., Wall, K., Woolner, P. & McCaughey, C. (2005) The impact of school environments: A literature review, The Centre for Learning and Teaching, University of Newcastle. Online: www.stakeholderdesign.com/designcouncilreport.pdf

44 For the discussion about how various environmental parameters impact students` and teachers` engagement see PricewaterhouseCoopers (2010) Evaluation of building schools for the future (bBSF: 3rd Annual Report, Department for Children, Schools and Families, UK.

45 For the discussion about how various environmental parameters impact attendance see Gelfand, L. and Freed, C. E. (2010.) Sustainable School Architecture: Design for Elementary and Secondary Schools. New Jersey: John Wiley and Sons, p.5-6

46 Huitt, W. (2007) Maslow's hierarchy of needs. Educational Psychology Interactive. Valdosta, GA: Valdosta State University

47 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press

48 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc,p. 31

49 Ibid.

50 Breithecker, D. (1999) Federal working group on the development of posture and exercise. Online: www.bag-haltungundbewegung.de/fileadmin/bag/binary/ergonomics_children.pdf

Additionally, school yards have become not just spaces for physical activity, but areas where important knowledge and skills could be developed. Learning through play is a concept steadily gaining momentum. Play enhances problem solving abilities, communications, cooperation, responsibility, imagination and supports creativity, in other words, physical social and cognitive development.[51] According to this notion, many school yards have been equipped to support these types of learning through play.

Fig. 4.6. Playground with nature elements
source: www.mayrhofen.at/en/101029/101106/101477/nature_playground.html

Incorporating natural elements and food growing facilities, is also becoming more and more important, as they present valuable learning spaces. Play areas filled with nature elements, plants, trees, flowers, water, animals and bugs present endless opportunities for discovery, play and exploration (Fig. 4.6.).[52] Additionally, it seems that just providing areas for play in nature and **food** growing is not enough. Sustainable schools should be designed in a way to connect the school building, the nature in which the building is embedded, and the children. This is crucial because Orr claims that all education is environmental.[53] Yet , the environment must be understood more holistically – as network of systems embedded one within the other. Sustainable schools should be designed to demonstrate this clearly and support pupils to explore the interrelations. Edible schoolyard is a good example of this where raised beds for growing food during the warm months, greenhouse for growing the food during the colder months, are interlinked with spaces for preparing, consuming and composting food in schools (Fig. 4.7, 4.8.).[54] Energy and heat producing systems, rainwater collector, and off-grid waste sorting system are transparently showing to children that all of these systems are interlinked.

Fig. 4.7. Edible schoolyard, the kitchen
source: www.archdaily.com/47183

Another theme that emerged is establishing the **community** within and around the school. Dewey claimed that education has to fulfill the needs of society and a school should be the place where democratic principles are learned. Accordingly, schools are "miniature communities, an embryonic society" and a real and a vital form of community life.[55] For this reason functional integration of schools and communities is important. Inviting community members to contribute to the learning process constitutes good opportunity for pupils to learn through real life, practical experience. In this way education is a process of living and not a preparation for future life.[56] This implies that schools should be combined with the community welfare services and cultural institutions into multifunctional centres.[57] They should be positioned in the heart of communities within walking distance, with carefully designed transportation and walking routes through the neighbourhood.[58]

Fig. 4.8. Edible schoolyard, the garden
source: www.archdaily.com/47183

51 Malone, K. and Tranter, P. (2003) Children's Environmental Learning and the Use, Design and Management of Schoolgrounds. Children, Youth and Environments 13(2). Online: www.colorado.edu/journals/cye/13_2/Malone_Tranter/ChildrensEnvLearning.htm

52 Burke, C. (2005). Play in Focus: Children Researching Their Own Spaces and Places for Play."Children, Youth and Environments 15(1), p. 27-53.

53 For detailed discussion see Orr, D. (2004) Earth in Mind: On education, environment and the human prospect. 10th ed., Washington: Island Press, and Orr, D. (2002) The Nature of Design: Ecology, culture and human intention. New York: Oxford University press

54 Cilento , K. (2010) Edible Schoolyard / Work AC ArchDaily. Online: www.archdaily.com/47183

55 See Dewey, J. (1915). School and society. Chicago: The University of Chicago Press, p.15, and Dewey, J. (1897) My Pedagogic Creed. School Journal, 54, pp. 77-80. Online: www.dewey.pragmatism.org/creed.htm

56 Dewey, J. (1938) Experience and Education,New York: Collier Books.

57 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

58 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc

Fig. 4.9. Pupils designing their school in Gelsenkirchen-Bismark
source: www.plus-bauplanung.de/dna/1884_EGG%20Gelsenkirchen.html

Fig. 4.10. Oprah Winfrey Leadership Academy for Girls
source: www.visionaryartistrymag.com/2011/03/oprah-winfrey-hearts-for-africa/

Fig. 4.11 Oprah Winfrey Leadership Academy for Girls
source: www.visionaryartistrymag.com/2011/03/oprah-winfrey-hearts-for-africa/

As children learn in social and cultural settings [59] a variety of spaces in school for formal and informal gatherings should be provided. Learning streets with alcoves, benches and seating places enable pupils, teachers, and community members to meet in an informal atmosphere. In this way a sense of belonging, a sense of community and social and interpersonal skills could be developed.[60] Worldwide famous example, and as many claim, an embodiment of previously mentioned principles, is Evangelische Comprehensive School in Gelsenkirchen-Bismark.[61] **Participation** of the pupils and community members in design first, and later on in the construction of the school demonstrated that these involvements have important integration and pedagogical impact (Fig. 4.9.). While the design and the construction constituted a great learning experience, joint use today supports the community to lead better life. In this way school became a tool for social change in a struggling multiethnic community.

Furthermore, the design of sustainable school should celebrate and promote **cultural diversity.** As centres and icons of communities they have to build on local ethnicities and local character. What is more, symbols of local culture provide inspiration and design opportunities. For example, symbols of local Zulu and Tsoto cultures were carved onto the walls and ceilings of the Oprah Winfrey Leadership Academy for Girls (Fig. 4.10., 4.11.). Interpretation through design of the rich cultural traditions of school students "is a mark of respect that tells students that where they come from matters as much as where they`re going".[62] Today, children live in multicultural worlds. They have to develop "sociocultural fluency"[63] in order to understand and tolerate difference. Incorporating the symbols of local culture into the design of schools transparently supports this idea.

Design of a sustainable school should allow a **sense of place** to be developed. Various display and exhibition areas across the school can support expressions of individual or group identity. In this way a smaller group within a school, for example class, can distinguish themselves from the rest of the school and establish their presence. Pupils involved in maintaining and regularly changing the displays could have an opportunity to personalise the environment and develop sense of responsibility.[64] Additionally, if ambient qualities of such spaces incorporate the group`s preferences (colour, light, peaceful places for reflection, sensory stimuli) and can be easily adapted and controlled, they can contribute to the psychological comfort and aesthetic satisfaction of the occupants (Fig. 4.12.).[65] Allowing a sense of place to be developed increases the love and stewardship for the people and the places[66] and is a good way for the occupants to become inhabitants [67].

59 Vygotsky, L.S. (1978) Mind in Society: The Development for Higher Psychological Processes. Cambridge, MA: Harvard University Press

60 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij, p. 128

61 Huebner, P. (2006) Evangelische Gesamtschule Gelsenkirchen-Bismark: Kinder bauen Ihre Schule/ Children make their own school. Fellbach: Edition Axel Menges

62 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc, p.127

63 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press, p.33

64 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

65 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press

66 Ibid.

67 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

Additionally, involving teachers and pupils in **operation and maintenance** of various **lighting, HVAC, water, and energy** production systems, is seen as important, so that the operation of those systems is optimized, costs reduced, and the life and work in the school made more comfortable.[68] Besides, when they are revealed, and transparently, but safely, built in the school they present a valuable teaching tool. For example, integrating displays, signs and lighting can improve the learning environment and promote energy and resource saving.[69] Interactive kiosk in the heart of Stoddert Elementary school enables the `Energy Patrol` and their classmates to monitor and analyse the school`s use of energy.[70] The interactive whiteboards are installed in all classrooms where the performance data is also made available. Similarly, toilets of Earlham Primary School have been redesigned by the Prue Chiles Architects to act as three dimensional textbook (Fig.4.13).[71] The diagram at the entrance of the toilets explains water and electricity usage and incorporates readouts so that pupils can constantly monitor consumption of these resources. Engaging with various parts of these installation can supports the development of multiple intelligences.[72] Visual presentation of these systems through diagrams can support the development of visual/spatial intelligence, analysing and calculating the consumption of energy and water, their costs as well as the savings can support the development of mathematical or logical intelligence, reporting and presenting the results to peers supports the verbal or linguistic intelligence. In this way every child can choose a way suitable for him/her to engage with such an installation.

Fig. 4.12. Erika Mann Primary School, die Baupiloten
source: www.baupiloten.com/en/projekte/erika-mann-primary-school-2/

Fig. 4.13. Toilets in Earlham Primary School, Prue Chiles Architects
source: www.pruechilesarchitects.co.uk/projects/earlham.html

In order to be sustainable, schools have to be **flexible** and **adaptable** whenever possible. Today, it is understood that flexibility of a school space does not mean just a **cost-effective** use of space [73], but presents a spatial equivalent of exploratory, self directed, project based, cooperative, problem solving learning.[74] Tasker explains that in order to support the learning of pupils, and construction of knowledge, schools should allow frequent modifications according to their needs.[75] Therefore, spatial and furniture layouts should be designed to allow different arrangement in order to support different pedagogies and various learning styles.[76] These modification can support one of the Piaget`s goals of education which is "creating men and women who are capable of doing new things, not simply repeating what other generations have done".[77]

68 This observation has been made in tree studies LPA, 2009; Taylor, 2009; and O/AWP, VS and BM, 2010

69 Shiver, S. and Boettcher, B. (2011) Real Solutions for Integrating Sustainability as a Learning Tool. Online: www.prezi.com/56fshjqpu07b/real-solutions-for-integrating-sustainability-as-a-learning-tool/?utm_source=share&utm_campaign=shareprezi&utm_medium=email

70 EE&K Architects (2010) Stoddert Elementary School. Online: www.eekarchitects.com/portfolio/5-early-childhood-primary-secondary-schools/88-stoddert-campus

71 Prue Chiles Architects, Earlham Primary School, Online: www.pruechilesarchitects.co.uk/projects/earlham.html

72 Gardner, H. (1983) Frames of Mind: The Theory of Multiple Intelligences. New York: Basic Books Inc. Publishers. Review of how school design features could support the development of various intelligences could be found in Nair and Fielding, 2005, p. 69 and Taylor, 2009, p. 153

73 JISC (2006) Designing Spaces for Effective Learning: A guide to 21st century learning space design. Online: www.jisc.ac.uk/uploaded_documents/JISClearningspaces.pdf

74 This was observed by both Taylor, 2009; and O/AWP, VS and BM, 2010

75 Tasker, M. (2010) The Pedagogy Of Space: A response to Ty Goddard. Human Scale Education. Online: www.hse.org.uk/hse/hexagon/Site_Test/HSO4_files/RSP4%20The%20Pedagogy%20of%20Space%20-%20Response%20to%20Ty%20Goddard.pdf, p. 1

76 For a more detailed discussion about how flexible spatial arrangements support various learning styles see Fischer, K. (2005) Linking pedagogy and space: Proposed planning principles. Online: www. public.merlin.swgfl.org.uk/establishments/878la01/DevonBSF/Document%20Library/linking_pedagogy_and_space.pdf, Wolff, S. (2002) Design Features for Project-Based Learning. Online: www.designshare.com/Research/Wolff/Wolff_DesignShare_3_7_02.pdf, and Lackney, J. A. (2005). New approaches for school design. In F. W. English (Ed.) The SAGE Handbook of Educational Administration. p. 506-537.

77 As reported in Education for Democracy, Proceedings from the Cambridge School Conference on Progressive Education (1988) edited by Kathe Jervis and Arthur Tobier. p. 30 For Piaget`s view of education please refer to Piaget, J. (1952) The Origins of Intelligence in Children. New York: International University Press

Fig. 4.14. 4D classroom in Manchester Communication Academy
source: www.4dcreative.co.uk/wordpress/wp-content/uploads/2013/02/mca-content-project.jpg

Fig. 4.15. 4D classroom in St Kentigern's Primary, Manchester
source: www.4dcreative.co.uk/portfolio/st-kentigerns-primary-manchester/

The creative capacity of children should be nurtured if we want to readily meet the challenges ahead.[78] Through creating and experimenting children can develop skills and knowledge necessary for actively engaging with an array of contemporary problems and contribute to their solution in their communities. This clearly implies that the education should be altered in order to support children to be creative and inventive, and the learning environments should be redesigned to support self-directed, interpretative, reflective and dynamic learning.[79] More importantly, pupils should be allowed to choose both the learning activities and the learning spaces; how they want to learn and where. Learning about the same topic one child might express better what he/she had learned through drawing, the other through writing and the third through performance. In this way the choices of children could illuminate their individual strengths and support multiple intelligences. Similarly, some pupils learn better alone, while the other in groups. Incorporating flexible space in sustainable school could support children to choose the most appropriate learning arrangement for them. The principles of democratic education, advocated by Dewey should be supported through school design. OWP/P Cannon Design, VS Furniture, and Bruce Mau Design argue that when we interpret this statement through design, flexibility of a space becomes the spatial equivalent of freedom.[80]

New technologies should be used to support learning. Computer studios, workshops and laboratories speed up the paste of the discovery and the exchange of information. Introduction of ICT and virtual and online learning provides the pupils and teachers with an opportunity to expand the learning beyond the four walls of classrooms (Fig. 4.14., 4.15.). Yet, ever growing number of experts stress that the technology should be used to simulate the real world situations.[81] In virtual environments kids can have a real chance to solve authentic problems, and test the ideas that can later have practical applications.

An interesting example of the use of new technologies is 4D sensory classrooms. Besides acknowledging the importance of using new technologies for learning, these environments build on another idea – sensory learning. Even back in 1749 Diderot explained that a person should use all of his senses to develop his knowledge.[82] These classrooms allow the light, colours, temperature to be modified and are filled with evocative objects. "An environment rich in sensory experiences helps students retain and retrieve what they learned", while environments with evocative objects support pupils to ask questions, reflect, make judgments, construct and interpret data and formulate their own opinion.[83]

Lastly, the data from some of the studies counters the myth that sustainable schools cost more. Sustainable schools can lower the operating **costs** for the water, electricity and heating.[84] The money saved from the operating costs can be used for modernising the learning environment and improvement of learning equipment.

78 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc, p. 56

79 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij, p. 58

80 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc

81 Ibid.

82 Jourdain, M. (ed) (1916) Diderot`s early philosophical works. Chicago/London: The Open Court Publishing Company. Online: www.ems.umn.edu/pdf/Diderot-Letters-on-the-Blind-and-the-Deaf.pdf

83 AWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc, p. 176

84 Kats, G. (2006.), Greening America's Schools: costs and benefits. Online: http://www.usgbc.org/ShowFile.aspx?DocumentID=2908

The previously mentioned studies are the most comprehensive ones documenting and explaining how schools should be developed in relation to a wide variety of social, environmental and economic sustainability themes in order to act pedagogically. The examples demonstrated the impact of these ideas on the way architects design schools in the Western world. They laid the foundations and contributed to the better understanding of how a sustainable school building can teach. However, the data represented in the studies mainly rests on the author's perception and not on the empirical evidence. Turning our attention now to tools which exist for evaluating schools can explain some of the reasons why the empirical data on this matter is scarce.

EVALUATING THE TEACHING POTENTIAL OF SUSTAINABLE SCHOOLS: THE TOOLS AVAILABLE

The review of tools used for evaluating school buildings suggests that two distinctive types of tools exist: the ones evaluating the environmental impact and the ones evaluating the quality of school building design.

U.S. Green Building Council`s LEED (Leadership in Energy and Environmental Design) [85], and BREEAM (Building Research Establishment Environmental Assessment Method) [86] are tools used for assessing the environmental impact of the school buildings in use. Additionally, a tool developed by DCSF (2006)[87] comprises quite a broad set of sustainable school topics. Although, these tools have developed versions suitable for assessing the educational buildings, "they have not developed appropriate research tools to monitor whether their guidelines actually create better learning environments" [88]. As explained previously, enhanced environmental conditions can impact learning, but the question is: is that the only factor impacting the pedagogical potential of sustainable schools?

85 LEED for Schools. US Green Building Council. Online: www.usgbc.org/ShowFile.aspx?DocumentID=2593

86 BREEAM for Educational institutions. Online: www.breeam.org/page.jsp?id=20

87 Department for Children, Schools and Families (DfCSF) (2009) Sustainable school self evaluation: Driving school improvement through sustainable development. Nottingham: Department for Children, Schools and Families

88 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 54

On the other hand, quite a few tools were developed for evaluating the quality of school design. For example:
- Walsh and Gardner developed a tool for children to evaluate their classrooms, so it could be seen what kind of skills and abilities they can develop [89];
- Design Quality Indicator (DQI)[90], as well as Design Engagement for School Communities Toolkit (DESC)[91] are tools for evaluating the design and construction of school buildings, where all who have an interest in the school building quality can participate;
- Tanner developed a tool to assist architects and educators in planning of developmentally appropriate learning environments [92];
- CABE [93] as well as Sanoff [94] developed a series of indicators for evaluating successful school design;
- Lackney reviewed a post-occupancy tools for schools and presented a list of indicators [95];
- DCSF and CABE produced a list of key issues and qualities for the early years environment [96];
- CABE designed a questionnaire for post-occupancy evaluation of early years environments. [97]

Although the review of the literature in search for a tool developed to assess the teaching potential of a sustainable school was extensive, a tool encompassing both sustainability and pedagogy aspects could not be found. This implies that we need better tools able to marry both aspects: sustainability of schools and their pedagogical potential.

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89 Walsh, G. & Gardner, J. (2005) Assessing the quality of early years learning environments, Early Childhood Research and Practice, 7(1). Available online at: http://ecrp.uiuc.edu/v7n1/ walsh.html

90 Design Quality Indicator (DQI) (n.d.)Online: http://www.dqi.org.uk/website/dqiforschools/default.aspa. See also Department for Education and Skills (DfES) and Commission for Architecture and the Built Environment CABE (2005) Picturing School Design: A Visual guide to secondary school buildings and their surroundings using the Design Quality Indicator for Schools. London: CABE

91 Kent Architecture Centre (n.d.) Design Engagement for School Communities Toolkit (DESC). CABE Regional Funding Programme 2008-10. Online:www.architecturecentre.org/documents/publications/draft_DESC_guidance_notes.pdf

92 Tanner, C.K. (1999) A Design assessment scale for Elementary Schools. Online: http://www.designshare.com/index.php/articles/a-design-assessment-scale-for-elementary-schools/

93 Commission for Architecture and the Built Environment CABE (2009) Successful school design: Questions to ask. London, CABE; Commission for Architecture and the Built Environment (CABE) (2006). Assessing secondary school design quality: Research Report. London, CABE

94 Sanoff, H. (2001) School Buildings Assessment Methods, North Carolina State University and National Clearinghouse for Educational Facilities, Washington,D.C

95 Lackeny, J. (2001) The state of post-occupancy evaluation in the practice of educational design. The Pare presented at the annual meeting of the environmental design research association, Edinburgh, Scotland, July 3-6, 2001
100 Department for Children, Schools and Families (DfCSF) and Commission for Architecture and the Built Environment CABE (2008) Sure Start – Every Building Matter: A visual guide to designing Sure Start Childrens Centres and other early years facilities and spaces. London: DfCSF and CABE

96 Commission for Architecture and the Built Environment CABE (2008) Sure Start children's centres: A post-occupancy evaluation. London. CABE

97 UNESCO Institute for Statistics (UIS) (2012) A place to learn: Lessons from research on learning environments. Montreal: UNESCO Institute for Statistics, p.58

CHALLENGES FOR THE FUTURE

Throughout the literature review **the inconsistency of terminology is apparent**.[98] The term sustainable is a highly contested one and often used interchangeably with the terms green, eco, target zero, high performance; although they do not imply the same. It seems that there is not a common understanding what each of these terms mean. Hackle also observes this and comments: "What is evident is the lack of clarity in the meaning of ... sustainability".[99] Very often sustainability is a term loosely attached at the end of an explanation about what contemporary school design must respond to. The difference is that green schools focus usually on a single issue (for example using recycled materials), while eco schools consider environmental impact at each stage of the design.[100] Reducing the environmental impact is crucial, but it is not the same as striving for sustainability. Designing sustainable school means understanding the system in which contextual social, environmental and economic challenges exist, before addressing them through school design. It means a whole system strategic approach.[101] According to Allacci and Lippman green and eco design could be a subset of sustainable design, but they are not the same.[102] Carefully thinking about naming a school green, eco or sustainable is crucial, as it reveals what kind of approach towards designing school has been taken and contributes to the clarity of the discussion on the matter.

The application of technical and technological systems in order to achieve environmental sustainability is prevailing in the discussion. Although the technology is constantly being developed, the design of sustainable school should not be reduced to integrating appropriate technologies with an interesting facade. Technological solutions have tremendously contributed to reducing the impact of schools on the environment. Yet, concentrating only on them can led to a fragmented approach to designing sustainable schools.[103] Approaching the sustainable school design in this manner means neglecting the crucial human factor in contributing to a more sustainable lifestyle and will not lead to creating effective sustainable learning environments. On the other hand, the discussion on how school design should respond to theories from pedagogy, education, psychology is developed around learning environment generally; it does not encompass all sustainability aspects and does not focus solely on sustainable schools.

The previous statement implies that the focus should be shifted from technology as panacea to understanding how teachers, pupils and the other relevant users of sustainable school spaces are interacting with technical systems, and from these interactions learn.

98 Though the DfES, 2006 publication is titled Sustainable Schools at the very beginning it is stated that the analysys of case studies will focus on environmental aspects of school design. Additionally, Ford (2007) notes the difference between the high-performance and sustainability but, later on use the terms interchangeably. These are not sole examples.

99 Huckle observes that "What is evident is the lack of clarity in the meaning of zero-carbon and even sustainability". See Huckle, J. (2010), Sustainable schools: Teaching beyond sustainable consumption. School Design Futures: Seminar 2, 27th - 28th April 2010 2010, UKERC The Meeting Place. Online : www.ukerc.ac.uk/support/tiki-index.php?page=1004_MP_

100 Bhamra, T. And Lofthouse, V. (2007) Design for Sustainability: A practical approach. Aldershot: Grower Publishing Limited, p.39

101 Stole, L.P. (2010) Defining green and sustainable schools. Green Building Journal (1) 8, August 2010, Online: www.greenbuildingpro.com/index.php?option=com_content&view=article&id=2096:green-schools-august-2010&catid=47:green-building-journal&Itemid=79#6

102 Allacci, M.S. and Lippman, P.C. (2007) Social considerations for green building design: when is green design sustainable? Unpublished manuscript. Online: http://www.dexigner.com/news/4166#ixzz24MIzoVxZ

103 Lippman states that green strategies in school design are fragmented approach. Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 1

More research is needed about the social processes that impact whether and how technical solutions will come to life, and how they are used for learning. Some researchers have observed this and suggested that the relationship between "place and processes" [104], "architecture and occupation" [105], and the "use and the meaning" [106] of sustainable school spaces and their occupants needs further research. In order to understand such relationships, attempts to discover how the occupants define and evaluate sustainable school space should be made.[107]

Furthermore, the majority of studies defined the sustainable **school space as just a physical entity.** For example, Nair and Fielding explain that the environment can impact various spatial, psychological, physiological, and behavioural realms of human experience; Taylor states that the physical environment is the active part in the learning process, and OWP/P Cannon Design, VS Furniture, and Bruce Mau Design building on Montessori ideas, suggest that the physical environment is the conductive element impacting the learning process.[108] Although, one of the contributors to the Taylor`s study states that "the environment consists beside material of non-material things, embodies meanings, aesthetic and emotional qualities" [109], the previously mentioned studies do not discuss whether and how the non-material things, such as meanings and emotions embedded in the physical environment, can incite and provoke learning. For a long time now it is known that just physical space is not the only factor impacting the learning [110], though it has its distinguished place. Therefore, it should be examined whether the physical environment is the only factor, how occupants see the environment, and how the environment defined by them impacts their learning in a sustainable school. Clearly, this implies that the occupants of sustainable schools should be included in this discussion.

The literature review discovered some studies that included **occupants` opinion**. For example, Barr conducted an e-survey, where teachers and pupils were included, on the attributes of green schools to become teaching tools.[111] OWP/P Cannon Design, VS Furniture, and Bruce Mau Design reported pupil's opinion, but mainly about what kind of schools they would like to have, without concentrating on the systematic exploration of their schools.[112] DfES included teacher and pupils, yet, throughout the text it is sometimes unclear how the conclusions were made.[113] The teachers have been quoted in some places, but the opinions of pupils could not be distinguished.

104 Ibid., p. 30

105 Boys, J (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 175

106 Blackmore, J., Bateman, D., Loughlin, J., O'Mara, J. and Aranda, G. (2011) Research into the connection between built learning spaces and student outcomes. Literature review Paper No. 22 Melbourne: Department of Education and Early Childhood Development, p. 19

107 UNESCO Institute for Statistics (UIS) (2012) A place to learn: Lessons from research on learning environments. Montreal: UNESCO Institute for Statistics, p.9

108 See Nair, P. and Fielding, R. (2005), Taylor, A. (2009), and OWP/P Architects, VS Furniture and Bruce Mau Design (2010

109 Tatter, (2009) The meaning is the use: Characteristics for environments for thinking and learning in Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press, p.220

110 Proshansky, H.M., and Fabian, A.K. (1987) The development of place identity in the child. In C.S. Weinstein and T.G. David (Eds.), Spaces for children: The built environment and child development. New York: Plenum Press, p. 21-40

111 Barr, S.K. (2011) Green Schools That Teach: Identifying Attributes of Whole-School Sustainability. Masters Thesis, Colorado State University, Fort Collins, CO, Summer 2011. Online: http://www.ibe.colostate.edu/thesis/Barr_Thesis%20Final.pdf

112 OWP/P Architects, VS Furniture and Bruce Mau Design (2010) The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning. New York: Harry N Abrams Inc

113 Department for Education and Skills (DfES) (2006) Design of Sustainable Schools: Case Studies, Schools for the Future series. Annesley: DfES

The previously mentioned studies did not systematically explore how a sustainable school building `teach` about various social, environmental, and economic aspects. For this reason it is believed that the teachers and pupils should be thoroughly interviewed.[114]

Additionally, the discussion about the sustainable schools generally is much more focused on the final product -the school, and not so much on the processes and tools used for designing and evaluating them. While some believe that we lack the essential **tools to undertake such research** [115], the others suggest that the tools for consulting pupils and teachers that can be replicated are scarce [116]. The tools used by OWP/P Cannon Design, VS Furniture, and Bruce Mau Design are mentioned in their studies, but were not well described, so that they could be used by other researchers. Therefore, we should strive to develop tools encompassing both sustainability and pedagogy aspects.

As the previous review showed there is a wealth of innovative ideas and experiments demonstrating how architectural design feature could be used to support learning. Though the potential learning opportunities constituted by the physical fabric of a school can not be denied, very few of the claims made have been supported by empirical evidence [117]. Rarely primary source of data has been used, such as the data from interviews, to back up the ideas.[118] While Blackmore et al claim that "there is little empirical research that considers what happens once in the space" [119], Fischer explains that "there is **insufficient qualitative/deep research** (emphasis added) on the relationship between pedagogy and design of learning environments". [120] An ever growing number of scientists warns that we lack research illuminating the connection of learning spaces and its instructional effectiveness. [121] I believe that this is particularly true for the sustainable schools. What is more, the need for deep and effective evaluation of innovative designs and ideas is even greater as they have few precedents. [122] The idea about the teaching potential of sustainable schools is certainly among the innovative ones, thus needs much further research.

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114 Temple, P. (2007) Learning spaces for the 21st century: A review of the literature, Centre for Higher Education Studies, Institute of Education, University of London. Online: www-new2.heacademy.ac.uk/assets/York/documents/ourwork/research/ Learning_spaces_v3.pdf

115 UNESCO Institute for Statistics (UIS) (2012) A place to learn: Lessons from research on learning environments. Montreal: UNESCO Institute for Statistics, p. 58

116 Blackmore, J., Bateman, D., Loughlin, J., O'Mara, J. and Aranda, G. (2011) Research into the connection between built learning spaces and student outcomes. Literature review Paper No. 22 Melbourne: Department of Education and Early Childhood Development

117 UNESCO Institute for Statistics (UIS) (2012) A place to learn: Lessons from research on learning environments. Montreal: UNESCO Institute for Statistics, p.58

118 Temple, P. (2007) Learning spaces for the 21st century: A review of the literature, Centre for Higher Education Studies, Institute of Education, University of London. Online: www-new2.heacademy.ac.uk/assets/York/documents/ourwork/research/ Learning_spaces_v3.pdf

119 Blackmore, J., Bateman, D., Loughlin, J., O'Mara, J. and Aranda, G. (2011) Research into the connection between built learning spaces and student outcomes. Literature review Paper No. 22 Melbourne: Department of Education and Early Childhood Development, p. v

120 Fisher, K. (2005). Linking Pedagogy and Space. Victoria: Department of Education and Training,p. 165

121See both Woolner, P., Hall, E., Higgins,S., McCaughey, C., and Wall, K. (2007) A sound foundation? What we know about the impact of environments on learning and the implications for Building Schools for the Future. Oxford Review of Education, 2007, 33(1), p. 47-70, and Clark, H. (2002) Building education: The role of the physical environment in enhancing teaching and and research. London: Institute of Education

122 Nair, P. (2005) Developing effective facilities for tomorrow's schools in Phan P. Li, John Locke, Prakash Nair, Andrew Bunting (2005), "Creating 21st Century Learning Environments", PEB Exchange, Programme on Educational Building, 2005/10, OECD Publishing. p. 22

Summary

The first step of a broad literature review about sustainable schools able to act as the “third teacher” resulted in establishing a set of sustainability themes or a framework. The framework comprises of a series of social, environmental, and economic sustainability themes to which contemporary school design should respond. As such, it will be used further in this research for developing research questions around it in chapter 5, and exploring and analyzing schools in chapter 6 and 8. Comparison of Serbian educational goals with the themes from the framework suggests that they quite well correspond to each other. This implies that contemporary Serbian school design should take into consideration not just pedagogical ideas, explained in chapter 3, but sustainability themes as well. However, the discussion about how school design should respond to both sustainability and pedagogy could not be found in Serbia. Evidence from this chapter suggests that this discussion is far more developed in Western countries. Numerous studies ventured into explaining the link between the physical fabric of a sustainable school building and pedagogy, and discussed in greater depth how a school building can `teach`. Yet the arguments presented at the end of this chapter indicate that the debate is far from being complete and conclusive. It was clear that we need

- new tools for exploring how sustainable schools could act pedagogically;
- tools that encompass both sustainability and pedagogy issues;
- new tools which could architects, teachers, and pupils to express their opinion on the matter; and
- more qualitative/deep research resulting in more empirical evidence.

Being aware of these facts, in the chapter that follows, I will venture into designing and discussing appropriate methodological approach, research design and research tools that could enable me to collect more evidence and better understand how sustainable schools could impact on the learning process, incite and even provoke learning, thus act as the “third teacher”.

05

"A game is a particular way of looking at something, anything."

- Clark C. Abt

RESEARCHER - ARCHITECT: A METHODOLOGICAL POSITION

Taking the role of both the researcher and architect was fundamental to the way I have developed methodological approach and the case study research tool. As a researcher I have collected and evaluated a large amount of primary and secondary data. As an architect and a designer I have interpreted this data through design, so as to create an appropriate methodological approach and a research tool. The results of this work present sublimation of empirical evidence arising from the research, and my imagination, inspiration and personal knowledge. The accent was on qualitative and interpretative approach.

During the first year of my research I was able not just to take various research methodology courses provided by the University, but also to participate in designing and delivering a variety of workshops with the Bureau for Design and Research (BDR) based at the Sheffield School of Architecture, and Die Baupiloten, based at the Technical University Berlin. At the workshops we consulted teachers, local authority members, pedagogues, kindergarten and primary school pupils, as well as physically disabled, and developmentally challenged children (Fig. 5.1., 5.2., 5.3.). We aimed to inspire them to contribute to school design, critically reflect on various aspects of their current educational institutions, raise awareness about sustainable design, explain the impacts of learning environments, and include everyone in envisioning a better future for their schools. Consulting such a diverse population meant designing a set of tools, different for every occasion. They had to be age-appropriate, cognitively and physically suitable for the participants. We combined a power-point presentation of exemplary schools, with narrative writing and collage making, we used modelling, play and performance elements, as well as mapping.

At the very beginning of my research such a rich and diverse experience taught me that several factors are important for a successful communication and understanding between architects and various participants. Some of them are: the length of the workshops, the role we as architects/researchers take, the type and combination of research tools we choose, the way we structure our questions, as well as the way we record our work. These collaborations presented a great opportunity for me to merge theoretical knowledge from the courses, with the practical experience. Critically reflecting on this experience enabled me to better understand the complexity of framing an appropriate research methodology and designing an appropriate research tool. It provided me with inspiration for developing my own methodological approach and research tools.

The game Spector: Sustainability Inspector has arisen out of my understanding how we as architects and researchers can approach the research in a creative way, and design innovative tools for engaging children in critical and constructive evaluation of our design work.[1] This tool helped me immensely in a search for answers to the question I posed at the beginning of this research: How do teachers and pupils evaluate various social, environmental, and economic sustainability issues in the schools, and the ability of the school environment to impact the learning process, and raise awareness about sustainability issues, that is to say, act pedagogically? Discussing these questions with architects, teachers and pupils from three schools in England, Germany, Spain, helped me to better understand sustainable school issues, and illuminated my decisions when proposing a set of design ideas for the first sustainable school in Serbia.

Fig. 5.1. Workshop for children with Die Baupiloten, Hamburg

Fig. 5.2. Workshop for teachers and pedagogues with Die Baupiloten, Hamburg

Fig. 5.3. Workshop for teachers with the BDR, Airdale

1 Described in detail in chapter 5, p. 72-76

For this purpose various research steps were designed so that firstly, architects, teachers, and pupils of the schools in England, Germany, Spain and Serbia could critically reflect on the matter, and secondly, that teachers and pupils from the school in Serbia could envision and propose a more sustainable future for their school. The research methodology, approach, and tools will be discussed in the succeeding lines.

THE RESEARCH METHODOLOGY, THE RESEARCH DESIGN AND THE UNDERLYING THEORIES

Architectural, as well as research design, should not be predefined by theories, methodology or an inflexible set of steps. Due to the complexity of this multilayered study, at the beginning of the research no single research theory, method, design or tool has been adopted, as it would limit the breadth of the study and accomplishment of the study aim. Instead an interrelated and mutually complementing set of research approaches and tools was devised. The most important characteristics of this approach will be described and justified in the text that follows.

Research methodology

The choice of adequate research design depends on the research question guiding a study. As this study aims to better understand how pupils and teachers evaluate sustainable school design and its pedagogical potential, a **qualitative** approach was taken. This approach seems to be the appropriate one because qualitative studies search for reasons and motives by answering questions such as “how”, “why”, and “what is it like”.[2] Qualitative studies attempt to “document the world from the point of view of the people” [3] participating in the research, and in that way provide a “deeper understanding of social phenomena” [4]. In an analytical and systematic fashion qualitative studies address circumstances and issues related to everyday life. They are flexible, subjective, speculative, political, grounded and based on case studies, which enables them to be innovative.[5]

As usual with qualitative research the theory at the end will be built on the findings from the research. Taking this **inductive** approach [6], the goal of this research was not to refute or confirm a hypothesis set at the beginning, but to complement an already existing body of knowledge about sustainable schools with new illuminations. The facts obtained through empirical research in school were interpreted with the help of theory, and in this way turned into usable data.[7] In this way the options were neither narrowed down by specific hypothesis, nor predetermined by a set of data. This enabled me as the architect and the researcher to stay as open as possible. Before any conclusions were made, the challenge was discovering how teachers and pupils experience and evaluate sustainable schools. Without the views of teachers and pupils the understanding about the pedagogical potential of sustainable school would be incomplete.

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2 Bryman, A. (2008). Social research methods. 3rd ed. New York: Oxford University Press

3 Hammersley, M. (1992) What’s wrong with ethnography?: Methodological explorations. London: Routledge, p. 165

4 Silverman, D. (2008) Doing Qualitative Research: A comprehensive guide. London/New Delhi: SAGE Publications, p. 8

5 Ibid.

6 Bryman, A. (2008). Social research methods. 3rd ed. New York: Oxford University Press, p. 10

7 Ibid.Brayman explains that facts should be interpreted with the help of existing theories, so as to be turned into usable data.

Including them is very important because Malone explains that teachers and pupils are not "passive recipients of the environment they find themselves in, but are constantly negotiating and reconstructing spaces in powerful and significant ways"[8]. Taking such a **phenomenological** perspective in this study means that the subjective and personal experience of teachers and pupils was acknowledged, and that their "lived experiences of place in its multiple, dynamic, and contradictory nature"[9] was explored. A phenomenological approach signals that the architect/researcher did not assume at the beginning what participants mean, and suggests that he/she was willing to make significant attempts to understand the meanings occupants ascribe to events and interactions in the designed environment.

Considering the lived experience of the occupants suggests that this research assumes that the reality is subjective. People, objects, events, do not possess sense, significance, and meaning; they are rather conferred on them. According to Bogdan and Biklen acknowledging that the human experience is mediated by interpretation [10], the researcher constructs a series of readings or interpretations elicited from the participants. Consequently, the research process, the interpretation of data collected, and the conclusions derived from them, were inevitably coloured by the researcher's feelings and beliefs.[11] All of these facts suggest that the philosophy behind the qualitative approach taken in this study, or epistemology (What can we know about the world around us?) was **interpretivism**.

Furthermore, the accent in this research was on the value of interpretation both from me as the architect/researcher, as well as the architects, teachers, and pupils. The understanding about sustainable aspects of schools and their pedagogical potential was constructed by the previously mentioned participants in this research. According to Brayman assuming that the reality is not only subjective, but is also multiple, as seen by all of these participants, suggests that ontological position (Is there reality external to social actors?) behind this study was **constructionism**.[12]

Research design

For the clarity of the discussion about the research methodology behind this study, its research design or the framework should be delineated. This research design was:

- **Non-experimental, observational and descriptive** – it was observed and described how pupils and teachers evaluate sustainable aspects and the pedagogical potential of schools in England, Germany, Spain, and Serbia.
- **Analytical and comparative** – the results from the schools were analysed with the help of existing literature on the matter, and compared with each-other, so that the recommendations could be developed for the situation in Serbia;
- **Cross-sectional, based on case studies** – the data from schools was collected at one, fixed point of time from multiple cases.

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8 Malone, K. (2007) Child Space: An anthropological exploration of young people's use of space. New Delhi: Concept Publishing Company, p. 16

9 Lim, M. and Barton, A.C. (2010) Exploring insideness in urban children's sense of place. Journal of Environmental Psychology, 30, p. 330

10 Bogdan, R.C., and Biklen, S.K. (2007) Qualitative research for education: A introduction to theories and Models. Boston: Pearson Education, p.27

11 Greene and Hogan stress the role of researcher in the process and explain that "there is not such a thing as an objective record of behaviour that is independent of the observer`s ideas and hypothesis". See Greene, S. and Hogan, D. (eds) (2005) Researching children`s experience: Approaches and methods. London: SAGE Publications, p. 95

12 Bryman, A. (2008). Social research methods. 3rd ed. New York: Oxford University Press

A case study approach is chosen as suitable for this study as it allowed the investigation of highly complex understanding of sustainable learning environments, and their utilisation as teaching/learning tools from the perspective their designers – the architects, and their users – the teachers and pupils. Yin argues that a particular strength of case study research is that the phenomenon is studied in a real-life, 'natural ' setting, where participants are observed, and a large amount and variety of sources and evidence are used (documents, interviews, observations, artefacts, etc.).[13] The case studies in this research were not a testing ground for a theory as in natural sciences, where a theory is proved or refuted. The theory generated through the use of case studies rather proved more or less useful for making sense[14] of the various ways sustainable schools can teach, and illuminated the decision making process for a school design in Serbia. The results obtained using various tools and multiple informants were compared with existing knowledge from a wide range of disciplines, so that complete and full as possible understanding of the matter was created. Comparing and contrasting the ways users defined the pedagogical potential of sustainable schools, discovering differences and similarities was central to understanding how the pedagogical potential of sustainable schools is defined .[15] It should not be considered that case studies can produce only locally and conditionally relevant knowledge. Flyvbjerg believes that the case study approach is focused on understanding the contextually rich setting, rather than simple generalisation, and can produce relevant and illuminating knowledge for some other settings.[16]

The underlying theories

In order to as fully as possible tackle the question set at the beginning, this research 'bricolaged' [17] several research approaches and theories such as: research by design, evidence-based design, and participatory action research.

Research by design

The ultimate goal of this research is proposing a set of design ideas for transforming one school in Serbia into a more sustainable and pedagogically valuable one. What is design, if not envisioning possible futures? When designing, architects use their imagination, inspiration, artistic skills, but also empirical evidence arising from research about previous good architectural practices. Although, throughout the process they do both research and design, these two do not mean the same. Groat and Wang suggest that while the hard core research is determined by a set of propositional components: strategy, hypothesis, tactics, and usually strives for the ultimate and absolute objectiveness; the design is impacted by human reason, which cannot be fully explained in a propositional way.[18]

13 Yin, K.R. (2008) Case Study research: Design and Methods. 3rd edition. SAGE Publications, p.8

14 Dovey explains that the case studies are a testing ground for theory, where theory proves to be more or less useful for making sense of a place under study. See Dovey, K.(2010) Becoming Places: Urbanism/Architecture/Identity/Power. New York/ Routledge, p.8

15 Ibid.

16 Flyvbjerg, B. (2004) Five misunderstandings about case study research, in: C. Seale, D. Silverman, J. Gubrium and G. Gobo (Eds) Qualitative Research Practice. London, Sage

17 Bricolage is "a pieced-together, close-knit set of practices that provide solutions to a problem in a concrete situation". See Denzin, N. and Lincoln, Y. (2000). Handbook of qualitative research. 2nd ed . Thousand Oaks, CA: Sage, p. 4

18 Groat, L. and Wang, D. (2002) Architectural Research Methods. New York: John Wiley and Sons, p. 105

It seems that the acknowledgement of the importance of personal knowledge and interpretation differentiates design from traditional research. Van Ouwerkerk and Rosemann observe that additional difference between the research and design is the difference between the probable and the possible.[19] While the product of research is a set of probabilities, the design produces possibilities. While the research is descriptive, the design is prescriptive.[20] Yet, design has the power to sum up and evaluate the probabilities arisen out of research, and direct them towards concrete realisations.[21]

The research by design approach taken in this study is considered as sublimation of research and design activities in an iterative process, continually informing each other. It is understood as travelling the way from researching to making and proposing. Embracing this approach meant acknowledging the fact that the product of this thesis will not be just a critical and rational response of an architect on the current state of the arts in the field of sustainable school design and their pedagogical potential, but also an emotional and intuitive one.

Although, architectural design can be guided by the personal views, understandings and beliefs of the architect, design can be executed in a rigorous manner as any other research. Hill argues that architectural design is able "to combine intuition, reason and ideas from a number of disciplines, in a manner comparable to the most innovative and experimental research in the sciences".[22] Researching and analysing contemporary challenges, and acting on the discovered, architects produce new buildings, plans, designs, programmes– in other words new forms of knowledge. They reflect on familiar or unfamiliar problems, try to make sense of the unique socio-technical situations and in that way build new theories. According to Schon through rigorous reflection-in-action activities they explain how we can make good decisions in specific situations, rather than to produce an abstract theory.[23] Yet, Till believes that what qualifies architectural design as an "exemplary form of research" is the in-depth description of not just the final product, but also an explanation of the context in which the design is set, the processes undertaken, and the methods used.[24]

Additionally much of the architectural research is focused on the physical outcomes of design. However, the methods and tools used for executing such research should be equally important. Rosemann stresses this as crucial because research by design does not involve research and design only, but it "occurs in the development and application" of new design and research methods and techniques, which generate possibilities and open new visions for the future.[25]

19 Van Ouwerkerk, M. and Rosemann, J. (2001) Research by Design: International Conference, Faculty of Architecture Delft University of Technology, in Co-operation with the EAAE/AEEA, November 1-3, 2000, Volume 2

20 Lawson, B. (2002) The subject that won't go away But perhaps we are ahead of the game. Design as research. Architectural Research Quarterly, 6 (2), p.110

21 Ganeshirt, C. (2007) Tools for Ideas: Introduction to architectural design. Basel/Boston/Berlin: Birkhauser, p.15

22 Hill, J. (2003) Introduction: opposites that overlap. The Journal of Architecture, 8(2), p. 163

23 Schon, D.A. (1983) The reflective practitioner: How professionals think in action. London: Temple Smith, p. 203

24 Till, J. (2001) Research and design in academia. Architectural Research Quarterly, 5 (1), p. 8

25 Rosemann, J. (2001) The Conditions of Research by Design In Practice in Van Ouwerkerk, M. and Rosemann, J. (eds) Research by Design: International Conference, Faculty of Architecture Delft University of Technology, in Co-operation with the EAAE/AEEA, November 1-3, 2000, Volume 2, p. 77

Due to these reasons throughout this thesis the research methods, the procedures and the context in which they were applied are described. In this way the research by design inquiry, as an important approach behind this study will culminate in a set of well explained research tools, design ideas for a particular school in Serbia in chapter 8, as well as in explanatory framework which could be used for better understanding of the pedagogical potential of sustainable schools beyond specific location in Serbia in chapter 7. I believe that the exploratory nature of the research by design approach is what makes this study innovative. It guides the study to surpass the boundaries of existing knowledge in the realm of the sustainable school design and research methodology, and in that way contributes to both.

Evidence-based design

Lang argues that through design architects must maximize the possibilities for others.[26] By doing so the work of architects has consequences on human beings. As previously stated, the design process in this study rests not solely on the personal and subjective, but is informed by theory. Researching the sustainable school design through available literature and case studies in England, Germany and Spain, this study strives to explore the "leading edge of change so we could propose what might be".[27] This approach, known as evidence-based design, meant that the decisions about a particular design were based on research.[28] The empirical evidence from the case studies was compared and contrasted with the existing literature on the matter from a wide variety of disciplines.

Only then it was hypothesized, through a set of design ideas, what a more sustainable school in Serbia could be. The conclusions from the case studies were not simply imposed on a school design in Serbia, but were filtered through a series of contextual challenges. Lippman believes that this is crucial because "a key part of…responsive approach to evidence based design…is analysing the site-specific data and professional experience, and comparing them to academic research findings, taking into consideration the particular economic, social, cultural, and political factors that form the context within which particular design is developed and implemented".[29] The particular strength of evidence-based design in this study was the combination of evidence from conversations with the teachers, the pupils and the architects with the academic research and personal experience. In this way the evidence-based design, as a part of a tailor-made approach to this study, provided greater understanding about the pedagogical potential of sustainable schools. In times when a great number of researchers call for "a system for assembling theories into a coherent and practical tool for restructuring education and educational facilities"[30] the importance of such research approaches comes to the limelight.

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26 Lang, J. (ed) 1974 Designing for Human behaviour: Architecture and behavioural science, p. 42

27 Huberman, A.M. and Miles, M.B. (2002)The qualitative researcher`s companion. London: SAGE Publications, p. 185

28 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons

29 Ibid, p. 41

30 Taylor, A. (2001) Programming and design of schools within the context of community. Desigshare. Online: http://www.designshare.com/Research/Taylor/Taylor_Programming_1.htm

Participatory action research

"Action research begins with hopes, dreams and desires".[31] This research started with my dream and desire for the change of school design in Serbia, and a hope that architectural design of one school could be the first steps towards initiating that change. Similar to the other action research studies, this study aims to change an unsatisfying practice[32]: school design in Serbia. It is hoped that the dissemination of the study results and design ideas could lead to the improvement of school design and policy.

Looked through this perspective this research could be classified as political action research.[33] Equally important purpose of this study is to contribute to general well-being of the community in and around the school in Serbia, and in this way contribute to a more equitable and sustainable future. Whyte believes that developing such research strategies, which merge research and action, is crucial if we desire the advancement of both the science and the human welfare.[34]

Bringing a more sustainable future for the school is not a task that could be achieved by an architect solely. It is important that people affected by the change participate. Verba argues that "can be brought rapidly only if the persons who are expected to change participate in deciding what the change shall be and how it shall be made".[35] Therefore, this research is based on the democratic premise that everyone concerned by a design should be involved in its creation and evaluation of its quality. Teachers and pupils from the school in Serbia equally and fully participated in the process of joint decision making. The design of the research tool enabled them to identify various problems in schools, collect and analyse the data, design solutions and use the knowledge acquired through the process to agitate social, political and practical transformations. As in some other cases this lead to an increased sense of community, gave the teachers and pupils a feeling of working together towards jointly set goals, and increased their awareness about their rights and responsibilities.[36] Including the occupants of the school as active researchers, lobbyists for change, problem solvers and place makers, is what delineates this research as participatory action research.

Evidently architects have to design a process that is not just informative, but educational and transformative as well. My job as an architect/researcher was not just to produce a final design for the school in Serbia, but to design a participatory design process which could lead to an informed, knowledgeable, emotional, logical, and more personal relationship of the occupants and their future school. Throughout the process theory was merged with practice, action with reflection, and in this way empowering practical knowledge was produced - necessary and useful to the people wanting to make the change. As the following explanation of the research tool will show, the most important aim behind the design of the tools for this research was incorporating an educational element in it. In this way teachers and pupils were supported to develop critical and creative skills so they can become active agents of change.

31 MacNaughton, G. and Hughes, P. (2008). Doing Action Research in Early Childhood. Maidenhead: Open University Press, p.5

32 Reason, P. and Bradbury-Huang, H. (eds.) (2001) Handbook of Action Research: Participative Inquiry and Practice. London: SAGE Publications

33 Bogdan, R.C., and Biklen, S.K. (2007) Qualitative research for education: A introduction to theories and Models. Boston: Pearson Education, p. 237

34 Whyte, W. F. (1991). Participatory Action Research. Newbury Park: Sage, p. 8

35 Verba, S. (1981) Small group and political behaviour: A study of leadership . Princeton: Princeton University Press, p.206

36 Sanoff, H. (1990) Participatory design: Theory and techniques. United States: Bookmasters

I believe that the educational dimension of the participatory action research is what empowered all of us to make knowledgeable decisions and fight for bringing the desired change. The data we generated from the process was used with bodies in charge for school design both on the local and the regional level.

To summarise, previously described research designs and approaches informed the creation of various research steps. Yet, they present more than just a sum of parts. Their synthesis is reflected in the tools specifically designed for this research – the game Spector, mapping and modeling workshops, as well as in the final result of this research - a series of design ideas for transforming a school in Serbia presented in chapter 8. They all build on evidence gathered from a broad literature review, but they also present a creative, intuitive and subjective response of an architect. They are tools that allow participants in this research to take the roles of researchers and designers, and stimulate them to actively fight for the changes they desired.

PARTICIPANTS

Selection criteria

Qualitative research acknowledges that behaviour of humans is always situated in the context in which it occurs. “The goal of situating the researcher in the context of the phenomenon is to capture the complexity of the relationships and experiences of individuals in the places where they learn, work, play”.[37] Children and teachers in their everyday environments – schools were seen as the best source of information about the sustainability issues of their schools. Consulting them in their schools, meant avoiding controlled situations and environments which could constrain participants, and have significant impact on their responses.[38] Additionally, the schools were chosen as sites for consultation because everyday environments present a great opportunity for perception, emotional and objective as possible, response.[39] I have spent a few days in each school (though not prolonged periods of time as an ethnographer would do), believing that the children’s and teachers’ understanding of the pedagogical potential of sustainable schools could be better understood when it is observed, researched, discussed and recorded in a setting which they have to evaluate and criticise.

The most important selection criteria for the schools in Germany, England and Spain was the architects’ explanation that they have tried to tackle as many sustainability issues as possible through school design, and that they ventured into designing the schools to impact the learning about the local sustainability themes, thus act as the ‘third teacher’. The participation of the school in Serbia was initiated by the school’s head teacher. Wishing to turn their school into a more sustainable and pedagogically valuable one, the school contacted me via the Serbian Ministry of Education, and embarked this journey.

Involving architects in the discussion was important because they could explain their vision, together with the constraints met during the design and construction phase. Involving teachers in the discussion was crucial because they are the experts on the sustainable school environment which they use on a daily basis.

37 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 43

38 Lewis, A. and Geoff, L. (2000) Researching children`s perspectives. Buckinghnam: Open University press

39 Lang, J. (ed) 1974 Designing for Human behaviour: Architecture and behavioural science,p.11

No one better than them can explain the potential links between the school space and the curriculum, together with the utilisation of school space and design features as teaching tools. Lastly, children were consulted as active social agents[40], able to comprehend things around them and evaluate their school space, and its teaching potential, from the perspective of sustainability.

Sampling method

As usual with qualitative studies the generalisability of the findings to the whole population of each and every school is suspended in the favour of the greater understanding. The discovery of contextualised meaning which different participants ascribed, as a way of identifying important issues, was a priority. The most important goal was selecting a sample which consists of as many as possible teachers and pupils, so that different voices and opinions could be heard. Criterion sampling [41] was used in selecting schools in England, Germany and Spain, as well for selecting architects, pupils and teachers in schools, so as to maximize the range of responses.

The participants were chosen based on the criterion that they were involved in designing or living and being educated in sustainable schools envisioned to act pedagogically. They were volunteers with strong motivation, who offered interesting perspectives and good insight into the relevant issues of designing and using sustainable schools as teaching tools. The responses collected in this research are in not representative of the whole population of teachers and pupils in the schools.

ETHICAL CONSIDERATIONS AND DATA COLLECTION

Whenever research involves working with people a multitude of ethical considerations arise.[42] Therefore, this study was ethically approved by the Sheffield School of Architecture`s ethics review committee. In order to be able to make informed decisions whether to participate or not architects, teachers, pupils and the pupil's parents were provided with information letters and consent forms.[43] I have contacted the architects and the head teachers of the schools directly, distributed the letters and explained the aims of the research. The head teachers announced and explained the research in the schools, invited interested teachers and pupils to participate, and disseminated the information letters and consent forms. In the whole process the participants' right to privacy and confidentiality was respected, and they were left with a minimum two weeks time to decide whether to take part or not. The information letters, tailor-made for each group of prospective participants, explained in depth the topic of the research, activities through which they could contribute, the way the results will be analysed, used and disseminated, and how their identity will be protected. Additionally, the consent forms asked for agreement separately for interviewing the participants, taking their photos, video and audio recording them, and disseminating the data produced from the research. The participants` names were changed so that their identity is protected. The consent forms were signed both by the participants and me, as the primary researcher, on the first day of our consultations.

40 James, A., Jenks, C. and Prout, A. (1998) Theorizing Childhood. Cambridge: Polity Press.

41 Crabtree, B.F., and Miller, W.L. (eds) (1999) Doing qualitative research. 2nd ed. London: SAGE Publications, p. 39

42 Skånfors, L. (2009) Ethics in Child Research:Children's Agency and Researchers' 'Ethical Radar', Childhoods Today, 3 (1), p.1-22

43 Alderson, P. and Morrow, V. (2004) Ethics, social research and consulting with children and young people.2nd ed. Barkingside : Barnardo's

Fig. 5.4. Workshop with teachers in Fort Pienc, Barcelona

Fig. 5.5. Workshop with teachers in Simeon Aranicki, Stara Pazova

THE RESEARCH TOOLS

The tools for critical engagement

Until recently, evaluation and design were reserved for experts.[44] Not often it is acknowledged that occupants have important contributions to make through their observations, critique and opinions - especially if those occupants are children. Yet, children and young people can significantly contribute to assessments of preschools and schools. Including their voice is our legal imperative [45] and it is very important because their opinion usually differs from adults'.

Recently across the literature it is acknowledged that "the ability to not just know, but also to empathize with the user comes only at the deepest levels of their expression. By assessing people`s feelings, dreams and imaginations, we can establish resonance with them"[46]; and "understanding users is key to deliver inclusive and user-friendly environments, products and services. User researc can…result in an empathic engagement with the user's needs and aspirations".[47] Though what still remains problematic is that architects interpret others` perceived needs and do not give them an opportunity to formulate their own needs.[48] Therefore, I as an architect strived to develop new participatory evaluation tools that will help me not just to know, but to empathise with and understand participants of all ages, give them the freedom to independently formulate and express their opinion.

Believing that human behaviour has a key role in the gap between predicted and actual building sustainability performances, a **participatory post-occupancy evaluation** method was created in order to actively and fully engage occupants in the discussion. Post-occupancy presents a great opportunity for architects to get feedback on building performance, and for occupants to be critically and creatively engaged in the discussion about sustainable environments. [49] Involving users in the evaluation of the success and failure of our designs can help us to build the new theoretical insights, knowledge for professional practice and illuminate our decision making. Thus the tool created helped us to:

- develop a critical relationship within a myriad of sustainability issues, and
- create an opportunity to examine, rethink and develop constructive suggestions about holistic, pedagogically and sustainably more valuable lifestyle in the occupants' schools. Thus the aim of the research method was to facilitate educational experience also, and enabled both the participants and the researcher to "explore more authentic relationships with the environment".[50]

Explorations in every school started with **participant observations**. They occurred as a preparatory work for going into the 'field'. Between the meetings with the head teacher and teachers, or before and after them I have spent an hour or two

44 Pivik, J.R. (2010) The perspective of children and youth: How different stakeholders identify architectural barriers for inclusion in schools. Journal of Environmental Psychology, 30, p. 510-517

45 UNESCO (1989) Convention on the rights of the child. Online: www.unesco.org/education/pdf/CHILD_E.PDF

46 Sanders, E.B.N. (2002) From User-Centred to Participatory Design Approaches. In Frascara, J. (Ed.) Design and the Social Sciences . London: Taylor & Francis, p. 4

47 Coleman, R. Lebbon, C. Clarkson, J. and Keates, S. (2003) Introduction: from margins to mainstream, in: Clarkson, J. (ed) Inclusive Design: design for the whole population, London: Springer-Verlag,p.1-30

48 Banham, R. (1972) Alternative Networks for the Alternative Culture? In: Design Participation: Proceedings of the Design Research Society's Conference, UK: The Design Research Society, p.15-19.

49 Wheeler, A., Boughlagem, D. and Malekzadeh, M. (2011) What do young people tell us about sustainable lifestyles when they design sustainable schools? Post-Occupancy Evaluation of New Schools with the Participation of Children. Paper presented at PLEA 2011 - 27th Conference on Passive and Low Energy Architecture , Louvain-la-Neuve, Belgium, p. 65-70

50 Ibid, p. 65

making short descriptive observations in the field diary, with the sustainability themes developed through literature review in my mind.

During the next step the architects from Die Baupiloten (Germany) (n=1), Building Design Partnership (England) (n=1) and Pich Aguilera Architects (Spain) (n=2) participated in a **semi-structured interview**.

This was followed by the consultations for teachers, where they participated in a **semi-structured group interview with mapping** (England n=5; Spain n=7) (Fig. 5.4.).

Although, it was planned that the teachers and the pupils from the school in Germany participate, due to the high volume of testing at the end of the year, when the workshops were scheduled, the consultation with them were cancelled. The workshop with the teachers in Serbia (n=25) was slightly different (Fig. 5.5.). It started with a presentation, where I have shared the information arising from this research, about successful sustainable school practices.

It was followed by semi-structured group interviews which consisted of two parts - the critical and the creative one. The critical part was the same as in all the other countries.

During the creative part they were provided with small pictures of successful school designs from around the world, and the task was to use them to collage suggestion and ideas for school improvement.

The pupils in England (age 13-15, n=35) and Spain (age 11-14, n=15) participated in the photo expedition of their school, followed by semi-structured group interview with mapping and photo-elicitation, transformed into a game titled Spector – Sustainability Inspector.[51] Once again the workshops with the pupils (age 7-14, n= 48) in Serbia were slightly different. The consultations started with a presentation where I have shared the successful sustainable school stories across the world, in order to inspire and stimulate them to think (Fig. 5.6.). It was followed by the critical part in the form of the game, as in all the other schools.

The questions for the architects, the teachers and the pupils were developed around the 22 sustainability topics discovered through the literature review, which were placed on the cards, separately developed for each group of participants. The sustainability topics, discovered through the literature review[52], were:
- social (safety and security; health; physical activity; food; sense of a community; participation; inclusion and equity; cultural diversity; sense of a place; education);
- environmental (school grounds; building construction and materials; light; ventilation, cooling and heating; water; waste and recycling; transportation; energy) and
- economic (cost-effectiveness; operation and maintenance; new technologies; and flexibility and adaptability).

While the architects and teachers draw the cards one after the other, and explained their opinion, the cards for the pupils were a part of the game Spector – Sustainability Inspector (Fig. 5.7.).

Fig. 5.6. Presentation at the beginning of the workshop with pupils in Simeon Aranicki, Stara Pazova

51 For more details see design portfolio p. 3

52 Foe a detailed overview of the sustainability themes see chapter 4, p.40

Fig. 5.7. Elements of the Spector game

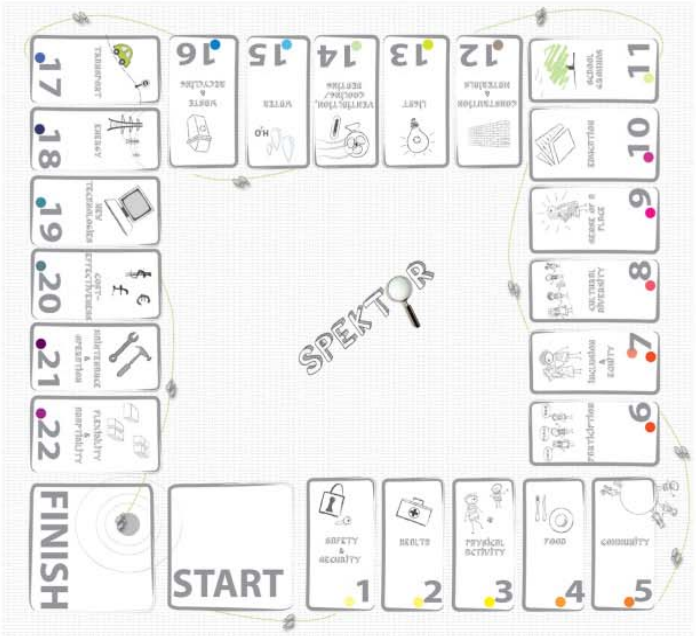
SPECTOR

GAME BOX

GAME RULES

GAME CARDS

GAME BOARD



COUNTERS AND DICE

Fig. 5.8. Pupils during the four stages of the game

Suspect step - pupils in Serbia

Inspect step - pupils in Serbia

Inspect step - pupils in Spain

Discuss step - pupils in Serbia

Discuss step - pupils in Spain

Detect step - pupils in Spain

Detect step - pupils in Spain

The participants red the questions from the cards, explained their opinion, wrote their comments on post-its (red arrow-negative comment, green arrow-positive comment, and speech bubble- new ideas and recommendations for improvement), and pasted them on the provided school plans, right next to the places they corresponded to. The whole process was video and audio recorded.

The consultation for the architects and teachers took place during one day and lasted approximately two to three hours. The workshop for pupils occurred on two days, and lasted for two to three hours on both days. The pupils in Serbia had one additional modelling workshop which lasted for four hours. In England two architecture master students helped me to facilitate the workshop for the pupils, while in Spain one colleague architect and one teacher, assisted me with both the workshop for the teachers and pupils, and acted as translators when necessary. In Serbia fifteen architecture students helped me to facilitate all the workshops.

Spector – Sustainability Inspector: Important characteristics of the game

The game consists of four steps (Fig. 5.8.). The first 'suspect' step instructed pupils to pick from the 22 cards with 'suspected' sustainability topics. Each card was divided into two fields - "think about" which explained the topic, and "answer and photograph" which gave students a specific task. The second 'inspect' step invited students to grab their toughest weapon, their photo camera, and photograph evidence for their answer. These photos were printed out and brought back to pupils for the second workshop. During the day two, the third 'discuss' step signaled it was the time for the board game.

By rolling the dice, each team of students moved from one field to the other. When one team was on one field, everyone revealed their photos taken on that topic and discussed them. After presenting and explaining their answers the next team was ready to roll the dice. The last 'detect' step encouraged students to locate the space on a provided school plan to which their photos corresponded. Beside the photo, they placed post-its with their comments. The game was played until all the photos were revealed and all sustainability issues had been discussed and mapped.

The most important goal of the game was to provide pupils with a tool to explore, discuss and document their opinion, suggest changes and improvements, while being actively involved in learning about sustainability aspects of their school. The game builds on a metaphor of an inspector who is looking for evidence of sustainable school through photo expedition. In the quest for their answers students took different tours through the school, thus created their own adventures. Role playing games have proved to be very useful tool to stimulate people discuss their opinion.[53] Therefore, the role of the inspector was there to liberate students to express their views. Additionally, one of the crucial aspects of the game is the challenge.[54] The game Spector does not encompass challenge in a sense that there is something to be won, or certain amount of points to be collected. The main challenge was collecting enough data to document, justify and defend opinions about the sustainability aspects of the school.

53 Barreteau, O., Bousquet, F. and Attonaty, JM. (2001) Role-playing games for opening the black box of multi-agent systems: method and teachings of its application to Senegal River Valley irrigated systems. Journal of artificial societies and social simulations, 4 (2). Online: www.jasss.soc.surrey.ac.uk/4/2/5.html

54 Salen, K. (2003) Rules of Play: Game Design Fundamentals. Cambridge, Massachusetts: MIT Press, p.314

Furthermore, interactions were one of the very important aspects of the game. The game enabled social interaction between the pupils, and the pupil and the researchers; cognitive interaction with the game system on a psychological, emotional and intellectual level; functional interaction with the material components of the game, explicit interaction by following the game rules, and beyond-the-object interactions when the pupils interacted outside the game system and co-constructed suggestion for improvement of their school.[55] Interactions between players, the game system, and the context, in which the game was played, were all components of meaningful play from which meanings emerged. In Spector game cards, photo cameras, photos, board, counters, dice, school maps and stickers were "things-to-think with "important artifacts aiding the thinking process".[56] Moving them around pupils were able to tell a story and express their opinions. As carriers of meaning they made knowledge and information explicit, tangible, portable and persistent.[57] The game pieces were an inherent part of the language and therefore argumentation. Acting as boundary object they involved participants with different opinions, motivation, skills and competencies, contributed to a more constructive dialogue, and allowed rich interpretation.[58] Pictures and stickers were used as evidence to support arguments.

They sparked discussion and stimulated pupils to ask their peers further questions thus deepened the dialogue. Pupils had a chance to explore and interpret field materials collaboratively and negotiate understandings. Taking photos, placing them on the school plan, and commenting them via stickers, was a process of creating information artefacts – rich set of information, interpreted in various ways, which enabled the discovery of multiple perspectives. The process significantly impacted the quality of the game as the more information we can store in material objects of the game environment, the more players` "minds are free to engage with the situation at hand".[59]

Theoretical background of the game Spector - Sustainability Inspector

As it was stated previously the goal of the game was not just to be a useful tool for researchers, but also to serve as a useful tool for exploring the sustainable school and learning about its sustainable aspects (Fig. 5.9.). Therefore, the theoretical background of the game as a learning tool must be explained.

Today, it is widely acknowledged that children have their own way of understanding the world around them. They do not learn by copying and absorbing ideas from the world around. Through age appropriate activities they actively observe, experiment and construct their knowledge.[60] This Piaget`s constructivist theory of knowledge was further developed by Kolb`s experiential way of learning.[61] By touching, moving, assembling and disassembling, or in other words by doing, children learn experientially. This process is reinforced when what is learned should be explained. On that path children go through four stages which interestingly correspond to four stages of the Spector game (Fig. 5.9.).

55 Ibid, p. 35

56 Papert, S. (1980) Mindstorms – Children, Computers and Powerful Ideas. New York: Basic Books Inc. Publishers

57 Gray, D., Brown, G.D. and Macanufo, J. (2010) Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers. Sebastopol: O'Reilly Media, p.37

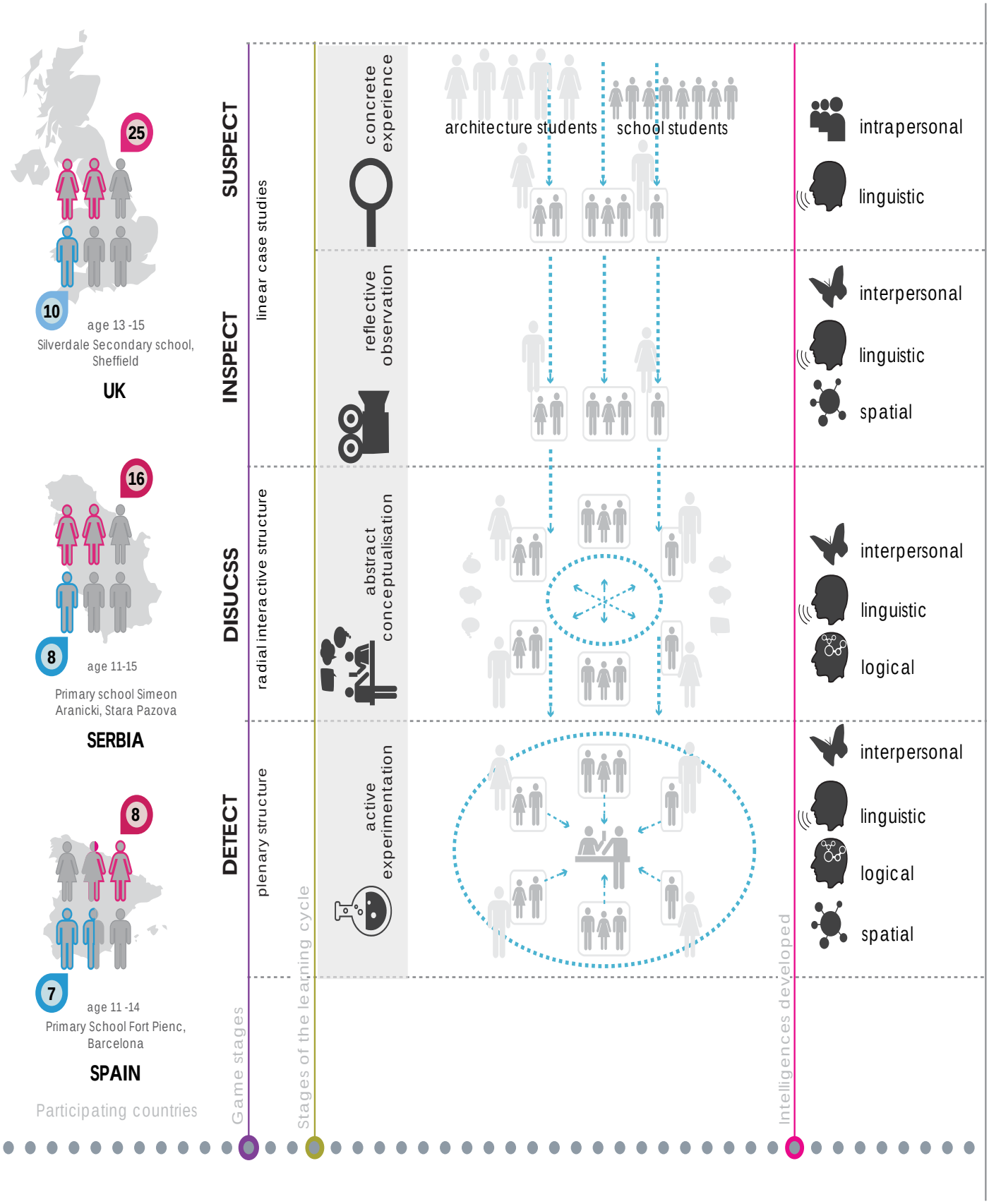
58 Leigh, S., (1989). The structure of Ill-structures Solutions: Heterogeneous Problem-Solving, Boundary Objects and Distributed Artificial Intelligence. Distributed Artificial Intelligence 2 (1989), p. 37-54.

59 Gray, D., Brown, G.D. and Macanufo, J. (2010) Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers. Sebastopol: O'Reilly Media, p. 37

60 Piaget, J. (1926) The language and thought of the child. London: Routledge&Kegan

61 Kolb D.A. (1984) Experiential Learning experience as a source of learning and development. New Jersey: Prentice Hall

Fig. 5.9. Spector game - a tool for exploration and learning



- Suspect = concrete experience -seeing reality as it is, understanding its richness and complexity (learning by observing the school space);
- Inspect = reflective observation -acting upon specific question using practices, tools and techniques (answering questions from the cards, commenting and taking corresponding photos as evidence);
- Discuss = abstract conceptualisation -understanding information disregarding specific context (discussing the answers and explaining the meanings behind the photos);
- Detect = active experimentation -putting gained knowledge into practice (mapping photos and comments on the school plan and suggesting new ideas for improvement).

Looked through this perspective learning through playing the Spector game enables critical reflection on transformed experience.

Yet, children do not learn alone. They learn in a social context through interaction with their peers and more knowledgeable and skilled adults.[62] Architecture students and I did not acted as mere transmitters of knowledge, but as facilitators of the learning process. Playing the Spector game pupils had the opportunity to learn and co-construct knowledge about sustainable school environments with their peers, with architecture students and me as the facilitator of the whole process.

Gardner`s theory of seven dimensions of intelligence also impacted the development of Spector game.[63] By playing the game students employed:
- logical intelligence (students had to analyse, give reasons, explain their opinion, and document positive and negative comments about photographed spaces in the school);
- linguistic intelligence (students had to clearly present their opinion about photographed spaces and describe their ideas for improvement);
- spatial (students had to explore the school and connections between different spaces, evaluate how they are interlinked);
- interpersonal (students had to work in group with peers and with older or younger students);
- intrapersonal (students had to analyse each other's weaknesses and strengths, and decide who will be photographing , who will be writing answers down and who will guide the expedition through school).

Lastly, the Spector was developed to acknowledge different learning styles resting on flexible learning theory.[64] The whole process is designed is to support the fact that some students learn better by describing things to themselves, some by teaching them to others, some through demonstration and instruction, and some through collaboration with specialists from the area.

62 Vygotsky, L.S. (1978) Mind in Society: The Development of Higher Psychological Processes. Cambridge: Harvard University Press

63 Gardner, H. (1983) Frames of Mind: Theory of Multiple Intelligences. New York: Basic Books, Inc., Publishers

64 Collis, B. & Moonen, J. (2001) Flexible learning in a digital world: Experiences and Expectations. London: Kogan page Ltd.

The tools for creative engagement

Although, the critical discussion over the school plans entailed a creative part where all the participants could develop suggestions and ideas for improvement of their school, the creative workshops were developed much further for the pupils in Serbia. After using the game to critically evaluate the sustainability aspects of the school, they participated in modelling workshops where they could design and model their suggestions for turning their school into more sustainable and pedagogically valuable one. The younger pupils (age 7-11, n=24) modelled their ideal, smart and sustainable school in a box, while the older ones (age 11-14, n=24) remodeled their school using the existing ground floor plan. They were provided with the wealth of modelling material and an array of photos sorted under themes such as: animals, plants, furniture, technical and mechanical parts, and communication technologies.

The younger pupils were encouraged to address the sustainability issues discovered though modelling imaginative and unbelievable landscapes for learning. Towards the end of the workshop we spared some time to play with schools in the boxes. We moved around various elements, used coloured foils as light filters and battery lamps to create different atmosphere. We perforated the box from various sides so the pupils could photograph the important scenes. During this playful process they developed a myriad of characters, wove the stories around the learning adventures with them, and captured the gist of the stories in a tiny poem. The older pupils developed more specific learning scenarios, concrete technological and technical proposal (solar panels, water harvesting system) and spatial arrangements (multimedia room, classroom for free time activities).

The tools for critical and creative engagements: Successful choices?

Participant observation proved to be a very useful tool for initial engagements with the field and the participants.[65] Stepping in the field allowed me to see how children interact with the space, witness the events, talk with the pupils, see the school environment through pupils eyes as much as it was possible, capture significant moments in place with photo camera and make notes in the field diary. Stepping outside the field enabled me to take the intuitive insights from the field, discuss them in greater depth with the architects, teachers and pupils, and place the conclusions into the wider system of existing knowledge. Short observations written down in the journal have the power to create the sense of feel and place and convince the audience that the researcher "has been there" and that the readers "could have been there too".[66] As such they will be used throughout the analysis to illustrate certain points and support arguments.

The **semi-structured interviews** were conversational, allowing the two way communication. The structure of the interview was maintained by the set of predetermined sustainability topics, while open questioning allowed hidden facts, tacit knowledge and new sub-themes and interpretations to constantly emerge.[67]

65 Spradley, J. (1980) Participant observation. 1st ed. Orlando: Holt, Rinehart and Winston

66 Sikes, P. (2005) Storying schools: issues around attempts to create a sense of feel and place in narrative research writing. Qualitative Research, 5 (1), p. 79

67 Spradely, J.P. (1979) The Ethnographic Interview, USA, Belmont: Wdasworth

The respondents had the freedom to determine the nature, the structure and the content of their answers.[68] All participants were able to control the content, pace and direction of their conversation with the minimum help; discussing things important for them under each topic. As they were executed in a group, they stimulated the reflection of all participants, maximised the richness of the data collected, which could not be achieved in a one-to-one interview.

Fig. 5.10. Map produced with the pupils in Fort Pienc, Spain

Furthermore, **photo expedition**, as a form of on the go method, enriched traditional research methods.[69] It was very useful for uncovering children's perspective and illuminating the way children use and evaluate the space.[70] In this study the photo expedition allowed children to work in a different setting from the usual ones, creatively engaged them in open discussion, stimulated storytelling and was a great spatial opportunity to respond to.[71] My colleagues, architecture students, and I walked along pupils' paths, visited the places which according to them illustrate specific sustainability issues the best. In this way we learned a lot about the quality and the pedagogical potential of their schools. Only by allowing myself to experience the perspectives of the children, I could step back, describe and analyse it, and develop a broader and deeper understanding of the matter under this study.

Fig. 5.11. Map produced with the teachers in Simeon Aranicki, Serbia

Additionally, "creating or referring to photographs and plans can be a valuable way to understand an existing environment as a first step to change or development".[72] The **photos** produced by the pupils indeed enabled rich insight into their understanding, evaluation and appreciation of social and physical aspects of their schools, and their potential to be used as teaching tools. The photos gave us an opportunity to depict and document the relationship between the occupants and their schools, as well as the relationship between the occupants in those schools.[73] Besides documenting participants` opinion, photoelicitation stimulated the discussion during the mapping, triggered their memory, revealed new perspectives and assisted me to build trust and rapport.[74] For the teachers and pupils in Serbia they were useful tools for collaging their creative proposals. Photos as visual stimuli made the issues more concrete than using just words.[75] However, the photos were never left to speak for themselves. They are representations of representations[76], and as such their meaning was discussed and discovered with participants. Photos, with the participants' ascribed meanings, will be used as empirical data to support the findings.[77]

Maps produced during this research entail specific understanding and interpretation of the occupants (Fig. 5.10. and Fig. 5.11.). What teacher and pupils included or omitted presented their different experience, priorities and interpretations.

68 Lewis, A. and Geoff, L. (2000) Researching children`s perspectives. Buckinghnam: Open University press

69 Kusenbach, M. (2003) Street-phenomenology: the go-along as ethnographic research tool. Ethnography, 4(3), p.445-485

70 Loebach, J. and Gilliland, J. (2010) Child-Led Tours to Uncover Children's Perceptions and Use of Neighbourhood Environments. Children, Youth and Environments 20 (1), p. 52-90

71 Watson, C. and Thomson, K. (2005) Bringing Post-Occupancy Evaluation to Schools in Scotland. Evaluating Quality in Educational Facilities. OECD. Online: www.oecd.org

72 Woolner, P. (2010) The design of learning spaces. London: Continuum, p. 68

73 Collier, J. and Collier, M (1986) Visual anthropology: Photography as a research methods. Albuquerque: University of New Mexico Press, p.77

74 Epstein, I., Stevens, B., McKeever, P. and Baruchel, S. (2006) Photo elicitation interview (PEI): Using photos to elicit children's perspectives. International Journal of Qualitative Methods, 5 (3), p. 1-11

75 Scott J. (2008) Children as respondents, in Christensen, P. and James, A. (eds) Research with Children: Perspectives and Practices. New York: Routledge, p. 91

76 Banks, M. (2001) Visual methods in social research. London: SAGE Publications,p. 50

77 Gaber, J. and Gaber, S.L. (2004) If you could see what I know: Moving planners' use of photographic images from illustrations to empirical data. Journal of Architectural and Planning Research 21 (3), p. 222-238

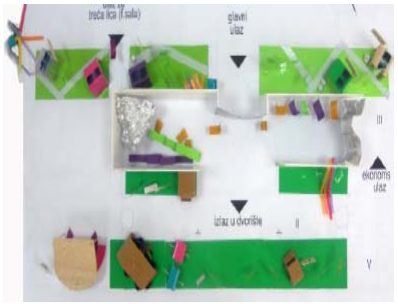


Fig. 5.12. School model produced by pupils in Serbia, age 11-15

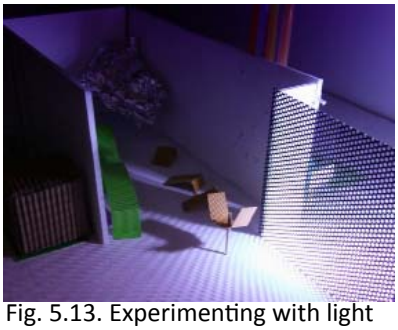


Fig. 5.13. Experimenting with light filters. School model produced by pupils in Serbia, age 11-15

Mapping activities helped us to develop multitude of perspective on the issues and broadened each other's views.[78] Mapping the photos and comments on a school plan enabled the children to assemble the material gathered through photo expedition, assign the material to a specific location on a school plan, and through discussion decode and ascribe meanings to that material. It allowed pupils to critically reflect on the photos taken; and for both pupils and teachers it was an opportunity to document their behaviour and spatial relationships. In other words, it was an "opportunity for depicting multisensory, lived experiences of space".[79] The whole process was very empowering. The occupants contribution was made visible through maps, it established them as a legitimate source of valuable information [80], thus made them very proud. Mapping as a design agency in this research mediated between the factual data and the prospects about what it could become[81], between the current critic and the wishes for the future.

The **model making** workshop enabled children to reflect on their critical appraisal, assimilate new knowledge and recreate existing school (Fig. 5.12.-5.15.).[82] Scaling down environments gave children an opportunity to play and conceptualise, create and experience new spaces and activities in them.[83] Pupils acted as designers, explored issues, and express their view through activities that seemed are rather far away from their everyday life in school, and their abilities as perceived by teachers.

Competently engaging with the tasks at hand and rising to the challenge, they speeded up the osmosis of creative ideas, inspired me as an architect and demonstrated that the membrane between the world of experts and non-experts is very porous one. Additionally, the models they produced countered the teachers' doubt about their competency and made both the teachers and the pupils exceptionally proud. Combining words and images that are not usually used to describe school environments they created scenarios rich with analogies, conceptual links and metaphors. They went beyond ordinary description of physical elements and helped everyone to break the habitual learning space use patterns. Inspiring metaphors came with a set of associations that changed our perspective, helped us think differently, and initiated new and through-provoking questions.[84]

Through physical and cognitive interactions with the modeled environments they created and recreated stories and short poems. Stores, scenarios and poems as expressive arts have the power to capture a social phenomenon. They indeed were tools which successfully and powerfully captured multiple truths about children's experience.[85] Though they presented a specific imaginative interpretation of intended space use, they were also incomplete which made them open for negation, change and interpretation of the architect/designer. The ones produced by the children in this study entailed a wealth of illuminating ideas, that inspired the future design for their school.

78 Sobel, D. (1998). Map-making with children. Portsmouth, NH: Heinemann.

79 Powell, K. (2010) Making Sense of Place: Mapping as a Multisensory Research Method. Qualitative Inquiry, 16, p. 539. Online: www.qix.sagepub.com/content/16/7/539

80 Allen, J. and Massey, D. (eds) (1995) Geographical Worlds- Shape of the World: Explorations in Human Geography. Oxford: Open University Press, p.21

81 Dovey, K.(2010) Becoming Places: Urbanism/Architecture/Identity/Power. New York/ Routledge, p.29

82 Hart, R. (1979) Children's experience of a place. New York: Irvington Publishers

83 Adams, E. and Ingham, S. (1998) Changing Places: Children`s participation in environmental planning. London: The Children`s Society

84 Gray, D., Brown, G.D. and Macanufo, J. (2010) Gamestorming: A Playbook for Innovators, Rulebreakers, and Changemakers. Sebastopol: O'Reilly Media

85 Furman, R., Langer, C. L., Davis, C.S. Heather P. Gallardo, H.P. and Kulkarni, S. (2007) Expressive, research and reflective poetry as qualitative inquiry: a study of adolescent identity. Qualitative Research,7 (3), p. 301-315

The benefits of using multimethod approaches are numerous. They are reflexive and they enable the participants and the researcher to take part in the meaning making process together, which leads to discovery of layered meanings and greater understanding of the participants' perspectives. According to Clark and Moss such mosaic approaches recognise the "hundred languages" children use, they are participatory, they treat children as experts on the environments they inhabit every day, they focus on their lived experience, they are reflexive, adaptable, suitable for use in a variety of settings, and have the potential to be embedded in schools as a tool for listening and consulting children. [86]

Fig. 5.14. School model produced by pupils in Serbia, age 7-10

THE ROLE OF THE RESEARCHER

Firstly, along the way the role of an architect was not divorced from the role of a researcher. If we want the quality of both architecture and research to improve, I believe we must play both parts. During the observations in schools I adopted 'observer as a participant' role, which is characterised by both sympathy and objectivity about the research questions.[87] The children and the teachers were aware of my presence in schools, my role was not hidden, and through time we developed a good relationship. During the consultations that followed, my role usually developed in 'research as a friend' role.[88] When research involves people this role takes time to catch on, but through time trust between both parties grows, and access to valuable information is greater. Especially in Serbia, my role as a 'coach' was very important.[89] I acted as someone who is there to inspire and guide the participants through the whole process. I did not act as the only expert in the field. Instead I tried to help them to facilitate the change and not direct it solely.

Fig. 5.15. Photographing an activity in the school model produced by pupils in Serbia, age 7-10

86 Clark , A. and Moss, P. (2001) Listening to young children: The mosaic approach. London: National Children's Bureau for the Joseph Rowntree Foundation, p. 5

87 Spradley, J. (1980) Participant observation. 1st ed. Orlando: Holt, Rinehart and Winston

88 Fine, G.A. and Sandstrom, K.L. (1988). Knowing Children – Participant Observation with Minors. London, Sage.

89 Whyte, W. F. (1991). Participatory Action Research. Newbury Park: Sage,p.40

ANALYSING THE DATA

The data analysis process was informed by the content analysis method.[90]As a method of data investigation it is very useful for simplifying, categorising and reducing great quantities of data into ordered segments of manageable data.[91] The analysis was made easy as the themes for the first level of analysis were already built in the research tool – the sustainability themes discovered throughout the literature.

The first step of the process was a review of the maps. The teachers and pupils' positive and negative comments, suggestions for improvement and corresponding photos were ordered under sustainability topics, from general to place specific comments were differentiated, and I counted how many times each comment or suggestion appeared. The results were presented on Sustainability HotSpot analysis maps developed for each school (Erika Mann - M:EM; Silverdale - M:SD; Fort Pienc - M:FP).[92] On the maps general comments were places outside the schools plans, while place specific comments were mapped together with photo(s) on the corresponding place on the school plan. Simultaneously, all the sustainability topics, with the emerging comments and suggestion were entered into NVivo program. This constituted an initial analytical framework.

The second step was transcribing the videotaped interviews with the help of NVivo program, and adding the parts from the field diary. In this way each code, or sustainability theme became saturated with relevant data. The video tapes, transcripts, extracts from the field diary, and artifact (photos and maps) were read, listened to and review for several times in a systematic fashion, so that as many as possible sub-categories and crosscutting categories are discovered, as well as individual, unique and illuminating stories. Towards the end a summative analysis was developed for each topic, clearly stating when a conclusion was based on one or more than one source. The conclusions were explained with the help of the existing literature in the field of architecture, developmental psychology, environmental psychology, pedagogy, and educational studies.

The most important conclusions were visually presented with the help of diagrams. The maps, graphs, diagrams, and photos as visual devices have been gaining on the research agenda[93], because they are very useful for making conclusions visually comprehensive, as well as place and context specific. Using visual data displays for presenting the research results is very usual in architectural research. [94]

The themes emerged from creative modelling workshops with pupils in Serbia who have been analysed in a similar fashion. The elements and photos pupils used for modeling their future school were sorted under various topics such as flora, fauna, peers, technology,and so on before the workshops. During the workshops, by the way pupils were selecting material and creating stories around them the prevailing topics for each child or pair of children could be easily spotted.

90 Stemler, S. (2001) An overview of content analysis. Practical Assessment, Research & Evaluation, 7 (17). Online: www.pareonline.net/getvn.asp?v=7&n=17

91 Siveramn, D (2006) Interpreting qualitative data. 3rd ed. London: SAGE Publications, p. 163

92 For more details see design portfolio p. 4-9

93 Bogdan, R.C., and Biklen, S.K. (2007) Qualitative research for education: A introduction to theories and Models. Boston: Pearson Education, p. 170

94 Groat, L. and Wang, D. (2002) Architectural Research Methods. New York: John Wiley and Sons

Towards the end the hierarchy of the topics, from the most to the least important one for each model, was created with pupil or a group of pupils working on one model. The hierarchy was checked and confirmed with the pupils twice – once at the end of the workshop, and once at the follow up presentation of our joint work.

EVALUATING THE QUALITY OF THE RESEARCH

Evaluating **credibility** of qualitative research means discovering how truthful are the findings. A study is credible when the inquiry is conducted in a way to ensure that the subjects, in this case the schools and the participants under study, are accurately identified and described.[95] Credibility depends on the "information richness".[96] As both the research context, the similarities and the differences between the schools and the participants, were described in this chapter, I believe this study strived to ensure credibility within the stated boundaries – the settings, the population and the theoretical framework set for this study. Additionally, the credibility of the results of this study arises from the fact that the data collection took place within the schools which were evaluated.[97] Lastly, throughout the analysis the conclusions derived were supported with quotations, parts from the field diary, and photos.[98]

The most important parameter of quality for this study is **transferability**, in other words the applicability of the findings about the pedagogical potential of sustainable schools from England, Germany and Spain to another context in Serbia. The transferability of research findings is increased when the theoretical framework for collecting and analysing data is explained, which is done throughout this chapter. Additionally, for the same purpose the various sources of data will be triangulated. According to Marshal and Rossman "a study in which multiple cases, multiple informants, or more than one data gathering methods are used can greatly strengthen the study`s usefulness for other settings".[99] Using the cases from different countries minimised the impact of culture and country specific variables.

The insights of architects, teachers, and pupils, elicited using multiple research tools will be described in depth and triangulated with the already existing literature on the matter from the fields of architecture, pedagogy, developmental and environmental psychology, sociology in chapter 6. In this way the findings will be framed with existing theories and tied to the available body of knowledge in chapter 7. Only then, insights will act as guidance for school design in Serbia in chapter 8.

95 Marschall, C. and Rossman, G.B. (1995) Designing qualitative research. 2nd ed. London: Sage, p. 143

96 Crabtree, B.F., and Miller, W.L. (eds) (1999) Doing qualitative research. 2nd ed. London: SAGE Publications, p. 33

97 Kirk, J. and Miller, M.L. (1986) Reliability and validity in qualitative research. London: SAGE Publications

98 Ratcliff, D. (1995) Validity and Reliability in Qualitative Research. Online: www.docstoc.com/docs/40257330/Validity-and-Reliability-in-Qualitative-Research

99 Marschall, C. and Rossman, G.B. (1995) Designing qualitative research. 2nd ed. London: Sage, p. 144

Discussing the **reliability** of the study means accounting for the changing conditions that might affect the phenomenon under study. However, the question of reliability is contested because constructivist ontology behind many qualitative research suggests that the participants construct and reconstruct their knowledge about the settings.[100] For this reason the circumstances that might have affected the teachers and pupils interpretation were discussed in this chapter. Additionally, it means questioning whether the same results could be obtained again and whether the same tools and procedures could be replicated. By describing in detail the research process and the tools used in this study, I believe they could be replicated with ease.

Qualitative research, and especially research by design, assumes that each researcher/designer brings a unique view to the study. The goal of such a research is not to produce standardised information that could follow the same procedures, replicated by other research. The goal is to produce "a coherent and illuminating description". [101] **Confirmability,** or the extent to which the study results could be confirmed by others, is one more quality standard that is questionable and disputed. As every architectural design is a personal vision of an architect, it is quite unlikely that the same set of ideas could be replicated by someone else. Therefore, the confirmability of the design ideas produced at the end of this study in chapter 8 could not be discussed. However, strategies were employed to enhance the confirmability of the steps on the way towards creating those ideas. Firstly, a few articles have been published in peer-review journals. The peer-review process gives credence to qualitative research and reduces researcher bias.[102] Additionally, supervisors followed the way conclusions were derived and a colleague from Spain, who authored one of the journal articles with me played the role of the 'devil's advocate' checking the conclusions derived from the data.

Limitations

However this, as every other research, has its drawbacks which must be noted. Post-occupancy assessments once again proved to be expensive and time consuming.[103] Additionally, though employing multimethod approaches enabling the research to collect a wealth of data, and see a rich picture of the issues under study, it also means intensive work with large amount of various data which for young, novice, and a single researcher can be very cumbersome. The contextual involvement enabled the participants to read their school environments deeply and critically, yet, as always with the interviews, there is no guarantee for the truthfulness of their answers. As all of the participants described the sustainability issues as neither all positive, nor all negative, I believe that they tried to be as objective as possible. Lastly, due to the financial and time constraints not all occupants could be included. Thus the maps and photos produced are not completely neutral or true. They depict only the opinion of participants included.

100 The assumption of an unchanging world is in direct contrast to the qualitative/interpretive assumptions that the social world is always being constructed, and the concept of replication is itself problematic. Ibid, p. 145

101 Huberman, A.M. and Miles, M.B. (2002)The qualitative researcher`s companion. London: SAGE Publications, p.174

102 Groat, L. and Wang, D. (2002) Architectural Research Methods. New York: John Wiley and Sons

103 Pivik, J.R. (2010) The perspective of children and youth: How different stakeholders identify architectural barriers for inclusion in schools. Journal of Environmental Psychology, 30, p. 510-517

In addition the dissimilarities between the cases existed, and the observations in Germany were not followed with the discussions with the teachers and the pupils, but were discovered through an interview with the architect. Therefore, the analysis that follows should be read with this in mind. Yet, the comments, the photos, the maps, left me with a clear overview of the challenges related to the research question, and a wealth of inspiration. Hence, I believe that the multimethod research approach was good for making the first step towards critical, constructive, and creative discussion about school sustainability issues, and the ways in which the sustainable school designs can act pedagogically.

Summary

So that the research steps made along the way are better understood this chapter discussed research methodology, design and underlying theories; described participants and data collection method; explained the research tools used; as well as data analysis method. At the end the quality of the research was discussed and the limitations delineated. The chapter that follows will discuss, describe and analyse the data gathered so as to develop key messages which could potentially contribute to our understanding how sustainable schools could act pedagogically, or in other words, act as the “third teacher”.

06

SUSTAINABLE SCHOOL ISSUES EMERGING: ANALYSIS OF THE CASE STUDY RESULTS FROM ENGLAND, GERMANY AND SPAIN

The following text will first describe the schools chosen as appropriate case studies, and discuss in depth their similarities and differences. This will be followed by the analysis of:
- the social, environmental, and economic sustainability issues in the schools under study,
- and the ability of these school environments to impact the learning process and raise awareness about these issues, that is to say act pedagogically.

The cases under study

Case Study 1 : Erika Mann Primary School, Wedding, Berlin, GERMANY

Erika Mann Primary School is located in the Berlin district (Bezirk) Mitte in the neighbourhood called Wedding (Fig.6.1.). In this ethnically, racially, and linguistically diverse area, characterised as socially deprived, the unemployment rate was exceeding 50%, 66% of the inhabitants lived under the line of poverty and large number of community members had no further or vocational education.[1] From the year 2000 until 2005, two fierce debates were shaking Germany strongly. The first one was over “PISA” shock, where the public was asking what caused the underperformance of Germany`s school children on educational PISA tests.[2] The second one, was about the multiculturalism in Germany and the success of inclusion programmes. This culminated in German Chancellor Angela Merkel`s declaration that multiculturalism, or “multi-kulti” as the Germans say, has failed totally .[3] This motivated the German government to initiate programs for school renovation, such as “All-Day Schools”(Ganztagschulen) and programs for revitalizing deprived neighbourhoods, such as “Districts With Special Development Needs – The Socially Integrative City”.[4]

In this atmosphere in 2002 the Wedding neighbourhood management formed the partnership with Die Baupiloten, a group from the Technical University of Berlin. They joined forces and started working on an old historic school building. This school building was built, from the 1914 till 1916 as a part of the three-wing building complex, according to the plans of Ludwig Ernst Emil Hoffmann. From 1916, until the 1999 when the school was named Erika Mann, the building was a home for several different schools. The school layout follows the “L” shape. Before the refurbishment, long and rather dull corridors, were flanked with classrooms on one side. On the opposite wall there are windows overlooking the school yard in the inner patio. With its strict and authoritarian character the school building was a typical example of the Prussian architecture.[5]

……..

1 Hofmann, S. (2004) The Baupiloten: building bridges between education, practice and research. Architectural Research Quarterly, 8(2), p.114-127

2 The Programme for International Student Assessment or PISA is evaluation of pupils performance (age 15) in mathematics, science, and reading carried out throughout the world by Organization for Economic Cooperation and Development OECD. For more information about “PISA“ shock in Germany see Stanat, P. & Baumert, J. (2002). PISA-Studie – Deutschland nur im Mittelfeld. Basiskompetenzen von Schülerinnen und Schülern im internationalen Vergleich. Wirtschaft & Wissenschaft, 10 (2), 42–51.

3 BBC , 17 October 2010, Merkel says German multicultural society has failed. Online: www.bbc.co.uk/news/world-europe-11559451

4 Becker, H., T. Franke, R.-P. Löhr and V. Rösner (2004), Socially Integrative City Programme – An Encouraging Three-Year Appraisal. Online: www.sozialestadt.de/en/veroeffentlichungen/zwischen bilanz/1-socially-integrated-city-appraisal.shtml>.27 July.

5 For more information about the Erika Mann School see : www.erika-mann-grundschule.com

During the 2002 and 2003 the first reconstruction took place, and from 2006 until the 2008 the second one. Die Baupiloten, together with the architecture students from the school, developed a refurbishment plan for the school which supposed to help pupils overcome the language and cultural barriers, and as well integrate the school with the community to become learning centre for all the inhabitants.[6] Today, this school for approximately 400 pupils is often mentioned as an example of a socially-engaged architecture.

The school is conceptualised as a place for learning, living and establishing important relationships. Important principles in this school are learning through drama and theatre, learning according to your own tempo, inclusion and integration, tolerance and violence prevention, and sustainability. This school is open during all day and is a part of "All Day Schools" initiative.

Case study 2 : Silverdale School, Bents Crescent, Sheffield, UNITED KINGDOM

Silverdale School is situated in Bents Crescent neighbourhood, 5 km from the Sheffield city centre (Fig. 6.1.). The school was first opened in 1957 as a Secondary Modern School, and in 1969 it became a Comprehensive School. The current school building is a new one, constructed from 2006 till 2009, as a part of Building Schools for the Future programme. Today, this school serves around 1200 pupils, aged 11 to 18.

Building Design Partnership, a major international, interdisciplinary practice of architects, designers, engineers and urbanists was commissioned to design the new school building. They aimed to create sustainable, energy-efficient and flexible learning environment, an environment that can act as a social catalyst in this multiethnic community.

Unlike the two schools in Berlin and Barcelona, which are tightly interwoven into the community blocks, the Silverdale School rests on 9.1 hectares surrounded by green belt predominantly residential to the north, agricultural to the east and south, and leading to the Peak District National Park to the west.[7]

The main slogan in the Silverdale school is "Everywhere. Learning". The main aims are leadership, global citizenship and independent learning. The school believes that by involving the extended learning community: the parent body, the local community and the wider communities of business and the world of work, is a good way of working towards these aims. This school has specialised in languages and stresses the importance of ICT development. They have a special group of pupils working in a "Sustainable Silverdale" group, who take extra care about all the sustainability issues.

Case Study 3 : Fort Pienc Primary School, Fort Pienc, Barcelona, SPAIN

Fort Pienc School is situated in the Fort Pienc neighbourhood in Barcelona`s Eixample district (Fig. 6.1.). It is a public school which consists of a kindergarten (for children age 3-5) on the first floor, and a primary school (for children age 6-14) occupying the rest of the building. In 2006, the school moved into this building from a prefabricated one situated nearby. Today, with 3714 m^2 it is a school for 500 students and 33 teachers.

6 Hofmann, S. (2004) The Baupiloten: building bridges between education, practice and research. Architectural Research Quarterly, 8(2), p.114-127

7 For more information about the Silverdale school see www.sheffieldbsfschools.com/websites/silverdale/Pages/Home.aspx

The school is a part of a larger complex of buildings in one block. Together with civic centre, day-care, market, residence for elderly, and a library it forms the heart of the Fort Pienc community. Just before the summer Olympic Games in 1992, it was a part of a city redevelopment plan. At that time, the whole neighbourhood lacked identity. To solve that, big districts in Barcelona were re-organized so that all the services were joined and used mutually in one community. It was expected that this would create the warm atmosphere of a small town, replacing the cold atmosphere between unknown people in enormously big neighbourhoods.

The whole complex, promoted by the town hall, was designed by architects Josep Llinàs in 2000. Later on in 2005, the school was designed by Pich-Aguilera architects. The school and the block were designed and constructed at different times because public schools in Spain are the government`s responsibility, and all the community facilities are the responsibility of a local town hall. The main idea behind the project was that the school and the civic centre use both facilities jointly. This would hopefully in future contribute to greater integration of community members.[8]

A very important principle in this school is respecting a child as an individual. The teachers strive to develop each child`s thinking skills, communication and reasoning skills, support curiosity and encourage teamwork. Involvement of the parents and the members of the local community is an important priority. The school has a very strong music, arts, and sustainability curriculum.

Implementation Case study 4: Simeon Aranicki Primary School, Stara Pazova, SERBIA

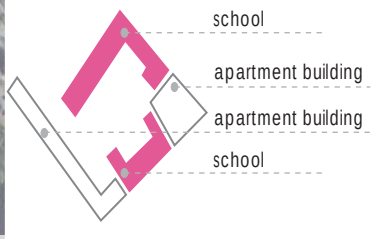
The Primary School “Simeon Aranicki” is located in the far west, 2.5 km from the Stara Pazova town centre (Fig. 6.1.). The school was built as a part of the School Building Modernisation Programme and started to operate in September 2009. Today with 3054 m^2 it is a school for 430 pupils, age 6-15, and 47 teachers. The school carries the name of the local priest and educator Simeon Aranicki (1870-1946). It sits on a plot of 95 acres occupying the hole west part of the block, while the northeast is taken by the Serbian Orthodox Church, and the southeast by plots for family houses.

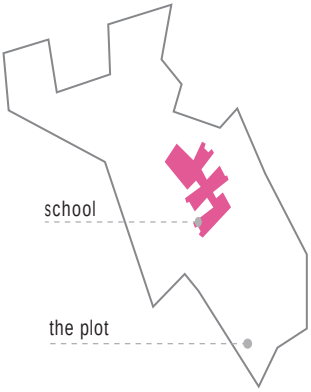
The neighbourhood of the school is called in jargon “Little Bosnia” as it is primarily inhabited by the refugees from Bosnia during the 1991-1995 war. This school operates in two shifts, where odd years go to the school in the morning and the even ones in the afternoon. The shifts are changed on a weekly basis.

The main vision of the school is the development of each pupil`s potential, so they can contribute to the advancement of important societal goals. This should be done through team work in which teachers, pupils, parents, and local community members are included. Their mission is to develop active, critical and tolerant learning approaches tailor-made for each pupil, so they can be fully developed as persons and adequately prepared for the life in the contemporary society. The long-life learning of the school teaching staff is continually supported. Since the school started to operate the teachers, the pedagogue and the school head teacher realised that the physical space of the school did not quite fit their educational agenda.

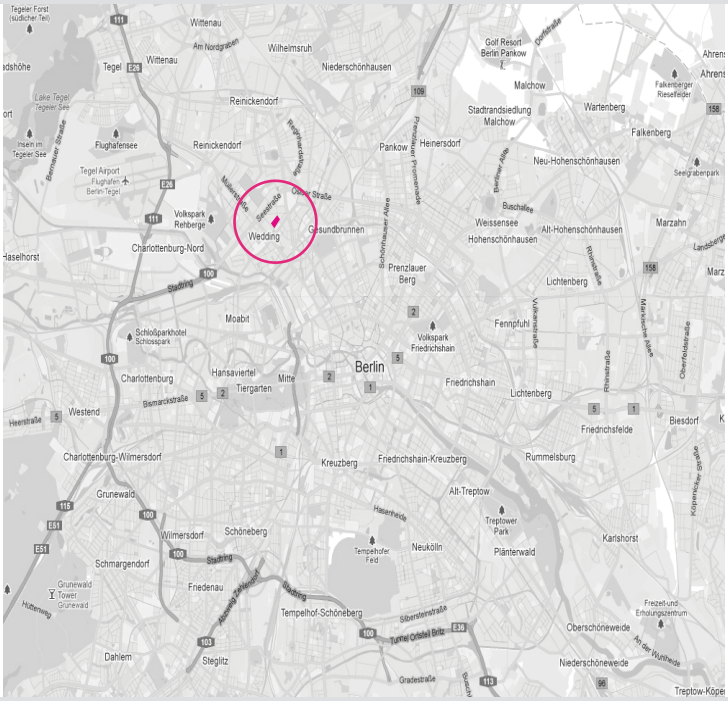
8 For more information about Fort Pienc school see: www. escolafortpienc.blogspot.com

Fig. 6.1. School locations

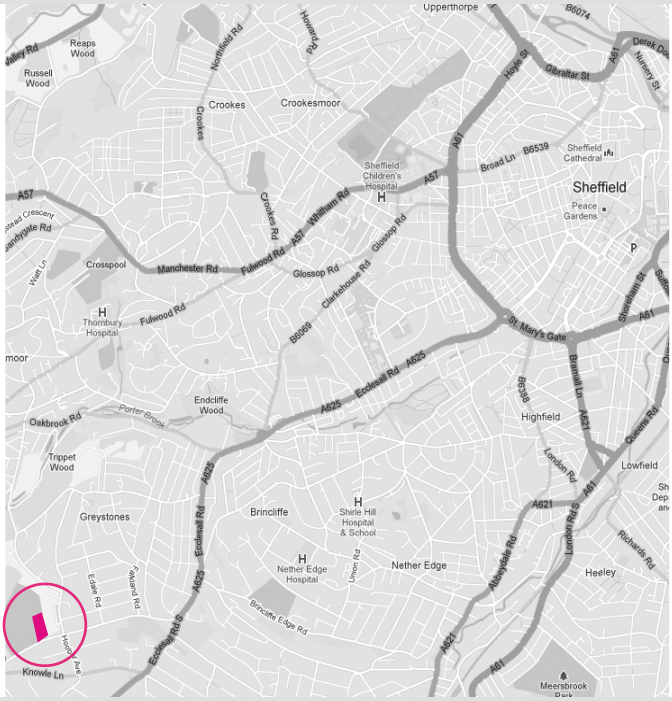




Utrechter Straße 25, 13347 Berlin, Germany



Bents Crescent, Sheffield, S11 9QH, United Kingdom



jun / / / december 2010

october / / / december 2011

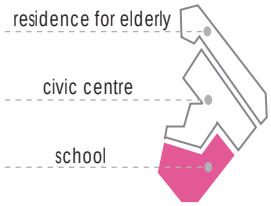

Fort Pienc Plaza
11:45/20.03.2012.


south-east facade
12:12/20.03.2012.


north-west facade
13:12/6.06.2011.


entrance
13:15/6.06.2011.

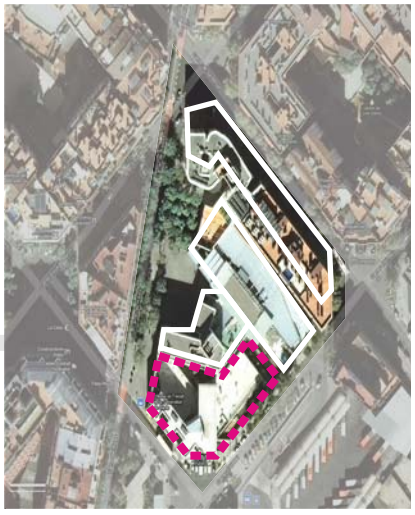

south-west facade
11:48/20.03.2012.

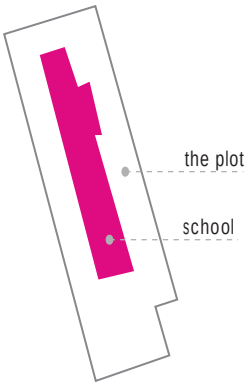



north-west facade
13:25/606.2011.


east facade
13:31/6.06.2011.


entrance
11:58/20.03.2012.





Plaça Fort Pienc, 4-5, 08013, Barcelona, Spain

Boska Buhe, b.b., 2230, Stara Pazova, Serbia

may / / / june 2012

may / / / septemer 2011

As all the other schools from the School Building Modernisation Programme, the layout of the school is a standardised one, which has been repeated throughout the programme, and adapted to multiple locations.[9] This was the main motive for to school staff, led by the head teacher, to start seeking through the Ministry of Education and the local authorities adequate partners to help them firstly develop their ideas, and secondly find financial support for the transformation of their school. When the head teacher was informed by the Ministry of Education about this research aiming to create the first sustainable school for Serbia, the school instantly embarked this research, and until today fully cooperate.[10]

Similarities and differences between the case studies

The similarities among the schools are:
- all schools are state owned;
- all schools were part of their government`s school building program;
- all schools reside in ethnically mixed socio-economic groups; and
- the main tasks behind the school design in England, Germany, and Spain was creating sustainable schools and integrating them in the local communities, while this exactly was one of the very important aims that should be tackled through school design in Serbia;
- although different as types, the primary schools in Germany, Spain, and Serbia operate similarly as the secondary one in England. Younger pupils in primary schools are not based in just one classroom, they go in different ones for specialised subjects (sciences, I.T., and similar).

However, there are some differences between the schools. In the following lines they will be explained together with the steps and measures taken, where it was feasible, to counter possible differences emerging from specificities of these cases.

Despite the fact that the schools are for different stages of education (schools from Germany, Spain and Serbia are primary schools, while the school from England is a secondary one), due to the different educational systems, the ages of the children overlap. This provided me with the possibility to consult children of similar age. As it was very important that everyone participates in envisioning a more sustainable future for their school, pupils of all ages were consulted in Serbia (age 7-14). Children aged 11-14 were consulted in Spain, and children aged 13-15 in England. This difference must be acknowledged because children of different age are at different developmental stage, thus read, interpret and prioritise certain aspects of the space differently.

Secondly, the schools in Germany and Spain are buildings within the block, standing on a very small and tight plot, while the schools in Serbia and England are free standing buildings, with the second one on a very large plot of land. The lack of green areas around the schools within the block, especially in Spain where the pleasant climate enables a lot of teaching and learning activities to take place outside, made the children and teachers prioritise this as an issue.

The differing climates impacted how pupils and teacher use and appreciate spaces. The mild Barcelona climate, throughout the year enables teachers and pupils to extensively use the spaces around the school for teaching, learning, playing, gardening and similar. In colder and more humid climates in Sheffield and Berlin

9 For more information about school building modernisation programm in Serbia see chapter 3, p. 26-28

10 For more information about Simeon Aranicki school see: www.simeonaranicki.edu.rs

this was not possible.

The schools in Germany, Spain and Serbia are in rather densely populated communities. Their catchment area (measured in m^2) is quite small, unlike the Silverdale school, where the catchment area, due to the low-rise housing, is very big. This impacted the time children have to travel to/from school and the amount of time spent in school. Children from schools in Germany, Spain, and Serbia, who live not more than 10 minutes by walk away from the school, are able to spend more time in school and even use it for after school activities (using sport fields to practice sports, and playgrounds for play). This is unfortunately not the case with Silverdale where some of the children have to travel to/from school for more than 40 minutes.

Furthermore, the time teachers and pupils spent in their schools since the schools were built or refurbished is different. In Erika Mann it is 8 years, in Fort Pienc 6 years, in Silverdale 3 years and in Simeon Aranicki only 2 years. This time impacted to what extent pupils and teachers bonded among themselves, and with the school space, to what extent they explored their school, and learned how to transform and adapt it for various teaching, learning, and socialising activities.

Fourthly, the size of these schools is different. The primary schools Fort Pienc, Erika Mann and Simeon Aranicki are for up to 500 pupils and the Silverdale for up to 1200 pupils. The size of a school can impact on a sense of safety and security, a sense of community, and a sense of place.[11] For this reason the Silverdale school is divided into departments which gather pupils around subjects they are most interested in, especially through (extra)-curricular and elective subjects. In this way the school within the school was created, with a number of smaller communities.

Lastly, cultural values and beliefs, specific for each location, impacted how certain school sustainability aspects were observed, commented and prioritised among the pupils and teachers in all four countries.[12] Although everyone shared a common belief that we must care for our social and physical environment, that the school environment plays a crucial role in the process, and that it can constitute a great medium for transmitting important sustainability messages, intra-cultural variables impacted on the way some of the sustainability topics were prioritised, the extent they were relevant for each school, thus the amount of time, attention and willingness of the participants to discuss each of the sustainability topics.

To conclude, as the focal point of this research was not to determine how different age, cultural and context specific variables can impact pupils` and teachers` perception of various sustainability issues within a certain school, and its pedagogical potential, they will not be discussed in detail here. However, the most important ones have been explained, and they indeed present an interesting avenue for future research. The similarities between the cases minimised the potential effects of the variables, made the comparison between the cases easier, and increased the transferability of results from England, Germany, and Spain in Serbia.

11 Cotton, K. (1996) School size, school climate, and student performance. Online: www.nwrel.org/scpd/sirs/10/c020.html

12 For more information about the impact of culture on perception of sustainability see: Nazarea, V., Rhoades, R., Bontoyan, E. And Flora G. (1998) Defining indicators which make sense to local people: Intra-cultural variation in the perception of natural resources. Human Organisation, 57 (2), p. 159-170; and UNESCO (2012) Culture and religion for a sustainable future. Teaching and learning for a sustainable future: A multimedia education programme. Online: www.unesco.org/education/tlsf/mods/theme_c/mod10.html

ANALYSIS OF THE CASE STUDY RESULTS FROM ENGLAND, GERMANY AND SPAIN

The following text presents the analysis of:
- the social, environmental, and economic sustainability issues in the schools under study,
- and the ability of these school environments to impact the learning process and raise awareness about these issues, that is to say act pedagogically.

Issues emerged during the participatory exploration with the architects, teachers and pupils will be described and analysed in the succeeding lines. Quotations from the interviews, observation from the research journal, and photos will be used where appropriate and important to support research findings. Each sustainability theme will summarise the experiences from the case studies in England, Germany and Spain. The main reason for the summative analysis is that under one sustainability topic some similar issues emerged in all schools. Secondly, issues will be described under the sustainability themes where they emerged, so that the same discussion is not repeated twice.

Where important certain points will be illustrated with the photos made by the participants. The photos will be marked with codes such as M: SD 0.1 P:05. The code stands for M = Map; Name of the School: Silverdale (SD), Fort Pienc (FP), Erika Mann (EM); Floor plan: basement (-1.0), ground floor (0.0), first floor (1.0), second floor (2.0), third floor (3.0); P= photo, followed by the number of the photo from that plan.[13] The specific location to which each of the photos corresponds to could be found on the Sustainability HotSpot Analysis Maps. All Sustainability HotSpot Analysis Maps could be found in design portfolio. Additionally, the analysis of each theme will be accompanied with a visual display of the most important connection and conclusions related to the sustainability topic discussed.

13 For the Sustainability HotSpot Analysis Maps see design portfolio, p. 4-9

THEME 1: Safety and security

Fig. 6.2. M:SD 1.0 P:5
6th Form Room. The walls of the tecahers`offices in the far back should be more transparent.

In Fort Pienc School and Silverdale School almost everyone reported feeling safe and secure. One of the factors was the way children are taken care of by their teachers. The children explained that they feel protected, respected and treated as equals. Langhout argues that nurturing relationships, pedagogical caring, democratic processes and student-teacher mutual understandings are crucial in order for children to develop a sense of safety.[14] Not just people, but physical environment in schools under this study impacted the perception of safety positively, and negatively also.

The school layout, the position and transparency of spaces within the layout were important characteristics that impacted teachers' and pupils' perception of safety. For example, Silverdale school was designed to have six wings attached to a main building. Each wing is a home to a group of subjects such as arts, science, design and technology. The idea was that, beside traditional teaching spaces-classrooms, pupils have flexible break-out spaces that could be used for different learning activities. Isolated offices with no transparent walls, away from the break-out spaces made overlooking of various activities in these spaces cumbersome for teachers. Concerned for pupils' safety, and not wanting to leave them out of their sight, this led teachers to constantly observe the pupils.
Jack, 53, teacher, Silverdale, explained:

> *Safety and security depends on staff doing discrete watch. Senior members spread evenly around the school to enable safety...it gives more presence. There are areas where students do not necessarily feel safe because we can't supervise advertently everywhere.*

The large majority of the pupils agreed that as consequence spaces that could not be directly supervised by teachers, could not be used.

> *We can`t use any facilities alone...they lock us in*- Elisabeth, 15, pupil, Silverdale.

While visual contact was extremely important for teachers, pupils found this irritating and interpreted it as a lack of trust. Knowing where to go if a problem emerged, was sufficient for them to feel safe and secure.

> *We have a student support team. It`s on the second floor. We can easily reach them if we need them* - Rosie, 14, pupil, Silverdale.

The degree of transparency of staff room could be interpreted as a spatial representation of the distance between teachers and pupils, and the degree of prevailing hierarchy.[15] Repositioning the departmental offices near the break- out spaces, and putting transparent or semi-transparent walls between them could probably ameliorate the situation (Fig.6.2.). This would enable teachers to sit in their offices and easily overlook pupils` activities, minimising the chances of anything unseen to happen. It would help the students not to feel as being constantly supervised. In this way not just the sense of safety, but the sense of community could be increased.

14 Langhout, R.D. (2004) Facilitators and inhibitors of positive school feelings: An exploratory study. American Journal of Community Psychology, 34, p. 111–127

15 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

Fig. 6.3. M: FP 2.0 P:17
Narrow corridors in Fort Pienc school.

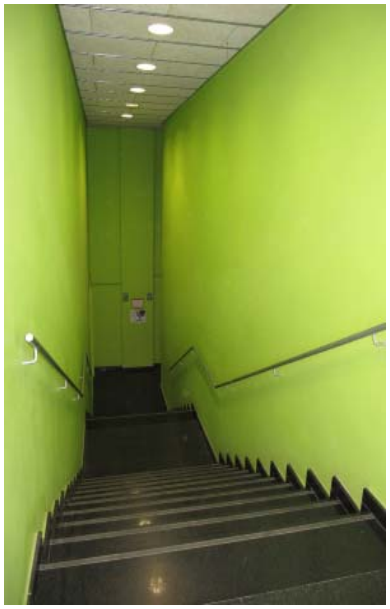


Fig. 6.4. M: FP -0.1 P:1
A dark corridor leading to the gym in the basement in Fort Pienc school.

Doing things away from constant gaze and control of the teachers gives pupils an opportunity to practice independence, take responsibility for their learning, and does not invade their privacy. Reay and Lucey suggest that the lack of privacy can have a negative effects on pupils` social and emotional development, and the quality of their life in school.[16] Pupils` safety and security, which is of paramount importance for parents and teachers, should be balanced with the pupils` need for doing things on their own.

Moreover, during the interviews the teachers and pupils in Fort Pienc revealed that **the position of the school within the community and their mutual connections can impact a sense of community, out of which feeling of safety and security springs.** Both groups explained that a myriad of activities, within the school and the civic centre next door, is what enables teachers, pupils and community members to work together, get to know each other better, and share important local knowledge.[17] Knowing your neighbours and being known by them[18], and building strong connections between the school and the local community[19], is what helps pupils perceive certain environments as safe.[20] In safe environments children can establish new relationships. [21] This can consequently impact on whether stable relationships between community members will be developed, and important local knowledge created and shared. Creating a safe school is the task of the whole community, where schools should be functionally integrated within the community.[22] There should be a variety of spaces that foster interactions between the school and the community members.

Additionally, **the size of the space was related to the feeling of safety and security.** Teachers in Fort Pienc explained that the narrow corridors easily get crowded during breaks, thus cause stress, strain and even vandalism (Fig.6.3. M:FP 2.0 P:17). Atlas and Schneider explain that high-density, crowded spaces are related to children`s psychological overexcitement, children behaving in a more aggressive, destructive, and less interactive way. [23] In this way the learning atmosphere can be severely disturbed.

Moreover, the large majority of pupils from Fort Pienc, stressed that the scariest places are in the basement where the gym is (Fig.6.4. M:FP -0.1 P:1). One of them, Luciano, 12, explained:

> *There's a room for the equipment by the gym which is full of bugs and it is gross. We do not feel safe there…it's scary when we are down there and the light is off.*

16 Adams, R. (1995) Places of childhood, in P. Henderson (ed.) Children and Communities. London, Pluto Press, p. 157-168

17 For more details see theme sense of community

18 Reay, D. and Lucey, H. (2000) I don't really like it here but I don't want to be anywhere else': children and inner city council estates. Antipode, 32 (4), p.410-428.

19 Langhout, R.D. (2004) Facilitators and inhibitors of positive school feelings: An exploratory study. American Journal of Community Psychology, 34, p. 111–127

20 Watt, P. and Stenson, K. (1998) It's a bit dodgy around there': Safety, danger, ethnicity and young people's use of public space, in (eds) Skelton, T. and Valentine, G. Cool places: Geographies of youth cultures. London/New York, Routledge, p. 249- 265

21 Human Science Research Council (HSRC) Chapter 3 Methods to help children feel calm and safe, in Emotional Behavior book, Online: www.hsrc.ac.za/Document-1674.phtml

22 Atlas, R. and Schneider, R.H. (2007) Schools Behind Bars? Designing safe and secure environments for schools and colleges doesn't mean they need to look like detention facilities. School Security, Security Technology and Design, p. 32-38. Online: www.experts.com/content/articles/ratlas5-schools-behind-bars-design-safety.pdf

23 Moore, G.T. (1986) Effects of the spatial definition of behaviour settings on children's behaviour. Journal of Environmental Psychology, (6) 3,p. 205-231

This reveals that **pupils associate the amount of light, the seclusion of a space and cleanliness with fear.** Edwards and Torcellini suggest well lit spaces reduce fear and increase the feeling of safety.[24] On the contrary, when building design produces isolated spots positioned far away from supervision[25], such as a gym in the basement of this school, it causes children to be fearful. Lastly, a lack of cleanliness in the room for sports equipment, locker rooms and toilets made children feel unpleasant. Through incivilities and signs of disorder, what a school meta-communicates relates to students' perception of (un)safety[26]; transmits the message of responsibility and care, and impacts children's perception of a place as (un)welcoming[27]. Tackling these problems through architectural design of a school is important because children should feel safe, secure and calm to be able to learn.

Lastly, in Silverdale and Fort Pienc both teachers and pupils strongly agreed that CCTV was a real improvement in dealing with incidents in school, as it monitors and records everything. Though, what showed to be problematic is the lack of control over some of the equipment.

> *Internal and external CCTV are not compatible and are overlooked by different authorities...external one is run by the facilities management team and it takes a lot of time to get hold of the recordings... Managing school impacts some sustainability aspects* – Brian, 61, school staff member, Silverdale.

It is clear that **safety depends on how and by whom the systems are managed, and to what extent occupants have the control over them.**

Designing safe and secure sustainable schools is a challenge for architects. There is not a flawless school design that can eliminate all the security issues. Developing participatory design, involving all the design professionals, pupils and school staff, understanding concerns, local conditions, school philosophy and local security policies could help us. Nayak believes that consulting occupant`s could help us understand the ways they use the space and "may enable stakeholders, agencies and researchers…to rethink the very meanings of "fear" and "safety" and lead "to a more inclusive and holistic approach to...safety".[28]

If we want to design school environments to support, rather than hinder learning, we should understand which places occupants perceive as safe and secure, and which not. Places that pupils perceive as safe and secure can stimulate them to move around the school, be physically active [29] and freely explore their environment, which is crucial for cognitive, emotional and motor development.[30]

……..

24 Edwards, L. and Torcellini, P. (2002) A Literature Review of the Effects of Natural Light on Building Occupants. Technical report NREL/TP-550-30769, http://www.nrel.gov/docs/fy02osti/30769.pdf

25 Atlas, R. and Schneider, R.H. (2007) Schools Behind Bars? Designing safe and secure environments for schools and colleges doesn't mean they need to look like detention facilities. School Security, Security Technology and Design, p. 32-38. Online: www.experts.com/content/articles/ratlas5-schools-behind-bars-design-safety.pdf

26 Langhout, R.D. (2004) Facilitators and inhibitors of positive school feelings: An exploratory study. American Journal of Community Psychology, 34, p. 111–127

27 Maxwell, L.E. (2000) A safe and welcoming school: What students, teachers, and parents think. Journal of Architectural and Planning Research, (17), 271-282.

28 Nayak, A. (2003) Through children's eyes: childhood, place and the fear of crime. Geoforum, 34, p. 303

29 Farley, T.A., Meriwether, R.A., Baker, E.T., Watkins, L.T., Johnson, C.C. and Webber, L.S. (2007) Safe Play Spaces To Promote Physical Activity in Inner-City Children: Results from a Pilot Study of an Environmental Intervention. American Journal of Public Health, (97) 9, p. 1625-1631

30 Weinstein, C.S. and David, T.G. (Eds.) (1987) Spaces for children: The built environment and child development. New York: Plenum Press, p.9

Fig. 6.5.


1
SAFETY
&
SECURITY
11 SCHOOL LAYOUT AND DESIGN
position
(seclusion)
distribution
of teachares
and pupils
transparency
size
density and crowding
1-11 The school layout, the position, the transparency, and the size of spaces within the layout were important characteristics that impact perception of safety.
1-5 Relationships between teachers, pupils, and neighbours impact feeling of safety, when there is variety of spaces to facilitate meaningful and engaging activities through which they bond.
1-13 Amount of light and brightness of a space is assoiated with fear.
1-18 Technical equipment can improve safety, but the occupants have to know and be able to control it.
1-21 Cleanliness and maintenance of school space impact perception of (un)safety.
21 OPERATION and MAINTENANCE
cleanliness

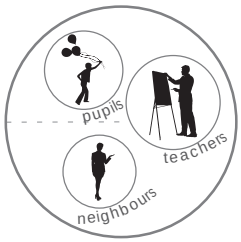
A SUMMARY OF THE EMERGING THEMES

- **SAFETY AND SECURITY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

5 SENSE OF COMMUNITY

neighbourhood

celebration



{ location + activity + actor(s) }

13 LIGHT

18 NEW TECHNOLOGIES

operation and control

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig 6.6. M: FP 0.0 P:4
Playing and socialising with peers and teachers in the Fort Pienc school yard.

THEME 2: Health

Massachusetts Technology Collaborative suggests that the school environment affects pupils, as well as teacher socio-physical health.[31] In this analysis pupils and teachers brought health issues in relation to physical activity, food, light, ventilation, cooling and heating themes. Thus, under these themes it will be explained and discussed how the school design impacted health.

THEME 3: Physical activity

In both Fort Pienc and Silverdale **the playgrounds and sport fields, inside and outside the schools, were most frequently described as places that stimulate pupils to be physically active.** Despite the series of design flaws they spotted, such as:
- no vegetation, no shade from the sun or from rain, and no places for children who do not enjoy football and basketball in Fort Pienc, and
- the lack of proper sound insulation between the sports and the main hall, which limits the use of sports hall after school hours inside the Silverade school, most of the pupils in both schools named these spaces as their favourite. Marco, 13, a pupil from Fort Pienc explained:

> *We have fun everywhere on the playground, we can play, talk, exercise… sometimes we learn with teachers there… we love our time on the playground* (Fig.6.6. M:FP 1.0 P:4).

It seems that **playgrounds and sport fields are not just places important for exercise, but for learning as well.** Boys explains that "the quickest way to activate the brain is to move", in other words, knowledge and action are interlinked.[32] Through physically challenging, but safe, play and sport activities, children can stay healthy, learn about their bodies and the world around them, they can relate with each other, establish relationships, learn to express feelings, release tensions, solve problems and use language.[33] Play on sport fields is crucial for children`s health, as well as psychological well-being.[34]

Additionally, **sports fields were delineated as good places for bonding, building group cohesion and developing social skills**. This is because in Silverdale and Fort Pienc teachers, non-teaching staff and pupils play different sports together. Oriol, 13, from Fort Pienc said:

> *We often play basketball and football with our teachers or with kitchen staff*.

Similarly, Elisabeth, 13, from Silverdale explained:

> *Sports hall is good for socialising, group bonding with peers and teachers*.

……

31 Massachusetts Technology Collaborative (2003) Green School Initiatives: A summary of studies related to student health and productivity. Westborough, MA, Renewable Energy Thrust. Online: www.mtpc.org/Project%20Deliverables/GB_General_LIFT.pdf

32 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 134

33 Human Science Research Council (HSRC) Chapter 3 Methods to help children feel calm and safe, in Emotional Behavior book, Online: www.hsrc.ac.za/Document-1674.phtml

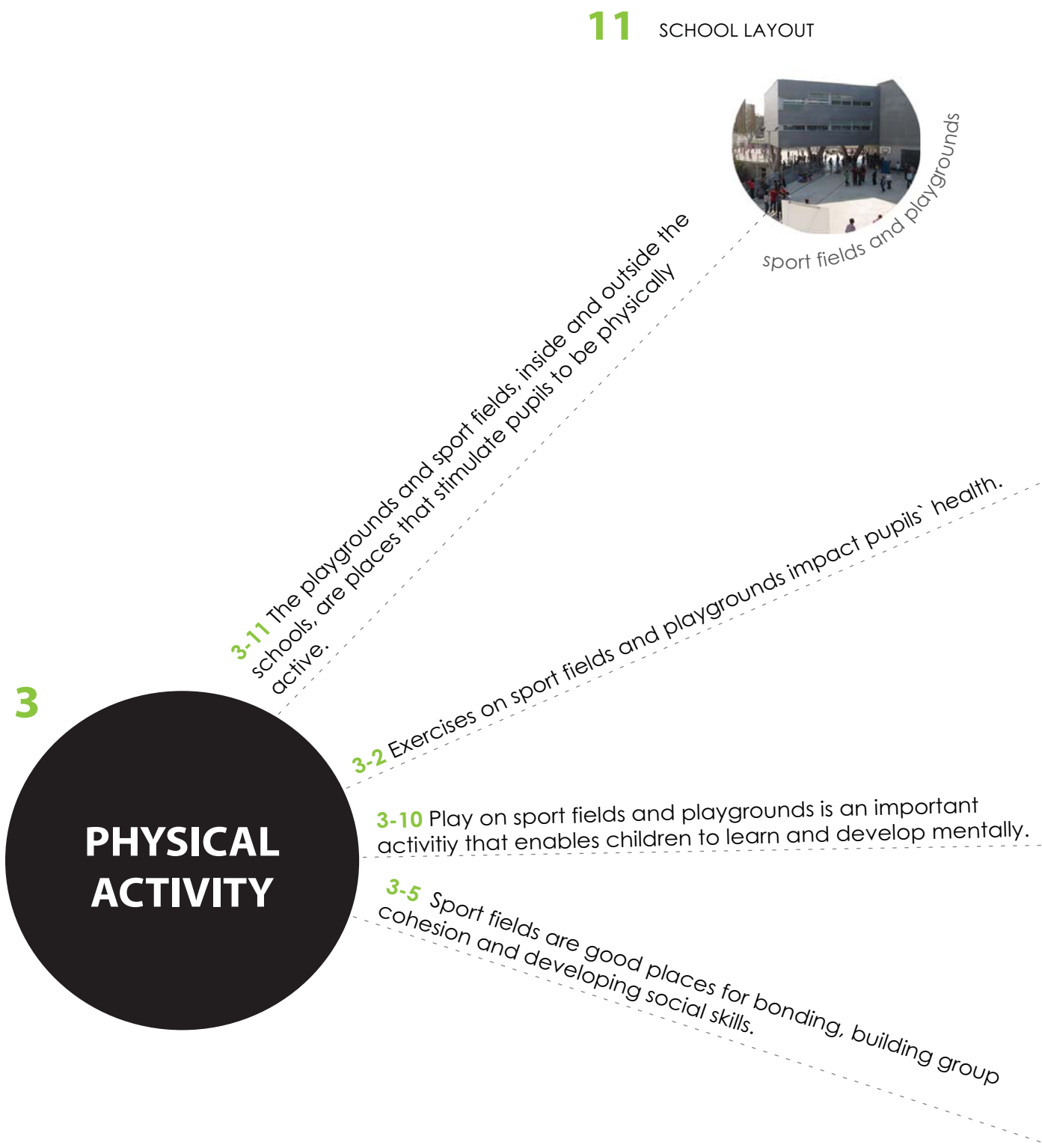
34 Malone, K. (ed) 2007) Child Space: An anthropological exploration of young people's use of space. New Delhi: Concept Publishing Company, p.8

Teachers echoed this sentiment. John, 37, teacher, from Silverdale said:

> *Staff play football, tennis or badminton every Friday. There are plenty of space and diversity of facilities to use. Nice changing facilities enable all of us to participate more. Sport fields are used also for extra-curricular activities and sport clubs with pupils. Facilities on site are more accessible now* [after the rebuilding of Silverdale school]*… the school design with a variety of sport spaces has helped us with that*.
>
> *Opportunities for recreation all time around impact our morale and team spirit* – Edward, 54, teacher, Silverdale.

Activities on various sport fields enable teachers and pupils to know each other better, feel closer and communicate easier. In this way the development of a strong sense of community is supported. Traditionally, sport fields and playgrounds were seen as spaces that encourage physical activity. Lately, they have been gaining in importance as arenas for mental, and social growth. We need much more exploration about how design of such spaces could stimulate communication, bonding, as well as play which are important for children`s development.

Fig. 6.7.


11 SCHOOL LAYOUT
sport fields and playgrounds
3-11 The playgrounds and sport fields, inside and outside the schools, are places that stimulate pupils to be physically active.
3
PHYSICAL ACTIVITY
3-2 Exercises on sport fields and playgrounds impact pupils` health.
3-10 Play on sport fields and playgrounds is an important activitiy that enables children to learn and develop mentally.
3-5 Sport fields are good places for bonding, building group cohesion and developing social skills.

A SUMMARY OF THE EMERGING THEMES

- **PHYSICAL ACTIVITY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

2 HEALTH

physical activities

10 EDUCATION

learning through play

5 SENSE OF COMMUNITY

social activities

bonding through play

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig.6.8. M: FP 0.0 P:6
Raised beds for planting in Fort Pienc school.

THEME 4: Food

In Fort Pienc the most highly praised design features of the school patio were raised beds for growing food. Simone, 12, pupil from Fort Pienc clarified why:

> *We like the garden because we grow plants and learn about healthy eating, we play and have fun there…we are proud to have a garden…the vegetables we eat when they are grown make us healthy* (Fig.6.8. M:FP 0.0 P:6).

It is by no means a recent phenomenon that **the quality of food impacts children`s health and consequently their ability to concentrate and learn in school**.[35] Though, children praised these design features not just because the consumption of the food produced made them feel healthy, but also because **the raised beds were a valuable learning resource for them, they helped them socialise, demonstrate their skills and abilities.** More than two thirds of pupils in this school agreed that this is because activities around the raised garden beds are connected to the curriculum, and many parents and community members come and work with pupils there. On the other hand, what pupils reported as problematic is the fact that teachers do not motivate them to use the beds. Especially, as they grow older they use them less and less. It seemed that the teachers appreciated more the activities around cultivating plants and vegetables as fun and entertaining activities for the younger pupils, and have not seen them as serious and useful learning activities for the older ones.

In Silverdale the situation was quite different. During the design phase a very large part of the plot was left for the community garden. Beside as engaging learning tool, the garden was envisaged as a place where a sense of community within the community, and within the school, could be established, and developed through joint food production. Today, due to the lack of teachers', pupils' and neighbours ' interest in running this programme, and the lack of curriculum developed around the plot (Fig.6.9. M:SD 0.0 P:16) Mark, 15, pupil, Silverdale concludes:

> *We learn about food only in the food technology department. We like to spend time outdoors, we have good facilities, but they should be better designed for learning about food and we should all participate.*

Food growing facilities can be a valuable learning tool only when the learning activities around them are well structured, connection to the curriculum is clear, and the roles and responsibilities of teachers, pupils and community members are well defined.

Places for growing food, as well as the once for consuming food, were seen by some pupils in Fort Pienc and Silverdale **as spaces which provide them with an opportunity to socialise**. For example, Anna, 14, pupil from Silverdale described the school canteen as a place

> *for sharing lunch, a place for all years to eat, relax, and interact with each other.* Augusta, 12, pupil from Fort Pienc had a similar opinion.

> *We discuss our things there…things important to us.*

35 World Food Programme (WHO) (2008) School feeding policy – a hunger safety net that supports learning, health and community development.Rome: WHO

Many children from both schools criticised the way the lunch was organized. As all years come to have lunch simultaneously the canteen can get overcrowded. This prevents pupils to eat in peace, rest and just chit chat.

The activities around producing, preparing and consuming food are very important for children. This is because they present an opportunity for them to learn new skills, be informed about healthy nutrition, feel a sense of power and feel important to their teachers, parents and the wider community.[36] According to Desmond et al these activities are also a chance for them to exercise responsibility.[37] Chawla argues that growing and cultivating fruits and vegetables bring the pupils in direct contact with the nature, and make them highly sensitive to their environment.[38] Lastly, joint food production and feeding seems to enables pupils to socialise and develop a sense of community. Today, there is a substantial literature demonstrating the educational benefits of cultivating food in schools[39], yet we need a much more research about the appropriate design for stimulating the pedagogical potential of, not just activities, but the places for cultivating, preparing and consuming food.

Fig. 6.9. M:SD 0.0 P:16
Unused plot for planting in Silverdale school.

36 Human Science Research Council (HSRC) Chapter 3 Methods to help children feel calm and safe, in Emotional Behavior book, Online: www.hsrc.ac.za/Document-1674.phtml, p. 12

37 Desmond, D., Grieshop, J. and Subramaniam, A. (2004) Revisiting garden-based learning in education. Rome: Food and Agriculture Organization of the United Nations, p. 33

38 Chawla, L. (2002) Insight, creativity and thoughts on the environment: integrating children and youth into human settlement development. Environment and Urbanization, (14) 2, p. 11-22

39 For example see: Food and Agriculture Organization (FAO) (2010) A new deal for school gardens. Online: www.fao.org/docrep/013/i1689e/i1689e00.pdf; Nelson, J., Martin, K., Nicholas, J., Easton, C. and Featherstone, G. (2011) Food growing activities in school. National Foundation for Educational Research Report. Online: www.nfer.ac.uk/nfer/publications/OFGA01/OFGA01.pdf; Department for Environment, Food and Rural Affairs (DEFRA) (2012)Food growing in schools: Taskforce report. Online http://www.gardenorganic.org.uk/pdfs/FGIS%20Main%20Report%20March%202012.pdf

Fig. 6.10.

11 SCHOOL LAYOUT AND DESIGN

raised beds

4-11 Highly praised space in the school yard were raised beds for growing food.

4

FOOD

4-2 The quality of food impacts health.

4-10 Activities around producing, preparing and consuming food are important learning opportunities.

4-5 Joint food production and feeding enable pupils to socialise and build social cohesion.

5 SENSE OF COMMUNITY

joint planting

A SUMMARY OF THE EMERGING THEMES

- **FOOD** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

2 HEALTH

vegetables grown in the school

10 EDUCATION

learning through planting

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig.6.11. M: FP 0.0 P:12
Fort Pienc plaza in front of the school - the place for various community activities

Fig.6.12. M:EM 2.0 P:4
Throne of the Silver Dragon, seating spaces along the corridor
source: courtesy of die Baupiloten www.baupiloten.com/

THEME 5: A sense of community

> *It was somewhere around the lunch break. The bell rang and a group of five to six boys run out of the school on the Fort Pienc plaza. Here and there a neighbour was passing by. An old man was sitting on a bench enjoying the Barcelona sun. In his long woollen sweater it seemed he did not believe the spring was there. As soon as the group saw him, they joyfully started skipping. In an instant they gathered around his bench screaming at the top of their voice "Heeeeey, Diego! ". Every single line, on the old man`s face, wrinkled just like a prune, smiled. Though, he could probably be their grandfather, he greeted them in the same boyish fashion doing high five. His gnarly hands, maybe form long years doing manual work, shakingly, but slowly, took a hand full of candies and offered them to the boys. While walking away I left them busy in a blissful conversation about something that my rather unadvanced Spanish speaking abilities prevented me from understanding.* - (Observation from the field diary, Fort Pienc Plaza, 12:28/20.03.2012.)

A sense of community in the Fort Pienc community and subsequently in the school could be easily felt and observed. Walking around the school and sitting on the Fort Pienc Plaza children, teachers and neighbours waving and greeting each other by their first name, could be easily seen. Interviews with teachers and pupils, later on, revealed that **the position of the school within the community and the joint use of the facilities by the school and the local neighbours is what fosters the development of a sense of community.** The joint space use strategy, along with the limited space within the school, caused the teaching and learning to be taken outside the school walls. The mild Barcelona climate, throughout the year, enables this also. Trying to be resourceful as possible the school is using two nearby parks, patios inside building blocks, Barcelona`s North Bus Station and all the facilities within the block (the square, the civic centre, the children's centre and the library). Many school`s curricular and extracurricular activities: dance and theatre performances, recitals, concerts, fundraising for different purposes (school trips, parties, and parents' meetings) and school work exhibitions happen here (Fig.6.11. M:FP 0.0 P:12). As community members work in the school with pupils on many projects, the community also has a strong presence in the school. For example, teachers told that a native Pennsylvanian female student, living in the nearby student's residence, is regularly giving English classes to the children, then parents and community members come to present their profession, plant and cultivate herbs, vegetables, fruit in the garden, and decorate the school. Being aware of all of these facts it could be understood what Julia, pupil, 12, sad:

> *Here we are all good friends…we have good relationships.*

Favourably positioned in the heart of the neighbourhood, this school is tightly interwoven into the community milieu. A multitude of activities in various school and civic centre facilities are helping children to develop strong bonds, a sense of belonging, caring and responsibility. These close ties with the community can support social and ethical development.[40]

40 Rigolon, A. and Alloway, M. (2011) Children and their development as the starting point: a new way to think about the design of elementary schools. Educational and Child Psychology, (28) 1, p.64-76

The design of corridors with features stimulating interactions, was seen as an important factor impacting the development of a sense of community in Erika Mann school. To illustrate, the corridors were designed not to be just a link between two places in school, but a pathway turning the transition into an exciting experience, adventurous journey and a learning space (Fig.6.12. M:EM 2.0 P:4). Special places were developed alongside the corridors that allow pupils and teachers to stop, sit and talk. The architect explained:

> *I do think that spaces encourage communication. In the first evaluation kids said that they are now* [after the corridors have been refurbished] *happy to meet their friends there. So the transformation seems to give them the chance to meet someone. Because in a hallway you do not just stop and stand there. If you have the opportunity to sit there and someone comes by, you start talking and playing together. So it is very encouraging. The head teacher wanted the transformation quite expressive because she hoped that it would help the kids to overcome barriers of language and all sorts of other barriers. And it seems to work.*

Well structured activities around these thoughtfully designed spaces, were another factor brought into relation with the bonding of the teachers, pupils, neighbours and knowledge exchange. In the case of Erika Mann school previously mentioned corridor spaces were not developed to serve for just occasional chit chat. Together with activities around them they were designed to support learning. As a large number of pupils entering the first grade have poor knowledge of German, neighbours and parents volunteer as their reading partners, and use the space alongside corridors to work. The architect of the school commented:

> *O yes...that`s for learning...that`s mainly for learning. So sometime during the school hours you can find pupils sitting there* (in the corridors) *doing homework or some other work...I have seen kids sitting there with their reading partners.*

During the observations in school in these corridors is where I found the conversation, discussion, fun and laugh. It could be due to the fact that the circulation stimulates communication. Martin argues that"circulation patterns surrounding activities encourage children to look around and see what is available, and fluid traffic patterns provide a means for better communication".[41] For this reason, corridors should not be seen as spaces that provide just connections between places in school. If we design them to enable opportunities for pupils, teachers and local community members to meet, exchange ideas, problems and solution, or just gossip, they can be transformed into real social skill training arenas, that significantly impacts the development of a sense of community. What is more, learning means continual interaction between people, and between people and the environment.[42] Therefore, Ogden et al argues that spaces simulating these interactions can serve as platforms where learning can be even more powerful that the formal learning enacted in traditional classrooms, lecture theatres or libraries.[43]

Fig. 6.13. M: EM 2.0 P:8
Chill room. Classroom for free time activities
source: courtesy of die Baupiloten www.baupiloten.com/

Fig.6.14. M: EM 3.0 P:12
Snuffle garden. Classroom for free time activities
source: courtesy of die Baupiloten www.baupiloten.com/

Fig.6.15. M:SD 1.0 P:5
6th Form Room in Silverdale.

41 Martin, S.H. (2006) The classroom environment and children`s performance: Is there a relationship? in Spencer, C. and Blades, M. (Eds.) (2006). Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press, p.96

42 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p.92

43 Ogden, H., Upitis, R., Brook, J., Peterson, A., Davis, J. and Troop, M. (2010) Entering School: How Entryways and Foyers Foster Social Interaction. Children, Youth and Environments 20 (2), p. 153

Fig.6.16. M:SD 1.0 P:2
Seating under the staircase.

Fig.6.17. M:SD 1.0 P:3
Pocket in front of the elevator.

Fig. 6.18. M:FP 1.0 P:3
Benches in the corner of the playground.

Fig.6.19. M:SD 0.0 P:22
Seating along the corridors.

Additionally, **joint use spaces, characterised by balanced power instead of adult control, seem to have a positive effect on creating a sense of community.** Multi - purpose rooms, such as "Chill Room" and "Snuffle Garden" in Erika Mann according to the architect (Fig.6.13. M:EM 2.0 P:8; Fig.6.14. M:EM 3.0 P:12), and 6th form room (Fig.6.15. M:SD 1.0 P:5) and library in Silverdale, according to the teachers and pupils were recognised as places that stimulate interactions, where they can always go and discuss things that are important to them, learn, read, talk to teachers and peers, or just relax. In order to explain this Joana, 15, pupil form Silverdale, briefly commented:

> *All students go to the library and 6th form. We talk to heads and teachers there or eat lunch with friends. There are comfy chairs and a lot of computers...there is no year exclusivity...all are welcome. We can read, talk and relax"*- (Fig.6.15. M:SD 1.0 P:5).

The most frequently used adjectives by Silverdale pupils to describe these places were:

> *"Comfortable", "relaxing", "private", "peaceful", "safe" and "uninterrupted".*

As playgrounds are predominantly regulated by pupils, and classrooms by teachers, these joint use spaces in schools need greater attention in the future as the places where the power could be balanced and relations re-established.

Lastly, **the size of spaces and the opportunity for the levels of privacy to be regulated, strongly emerged as factors determining how successfully a certain space impacted the development of a sense of community.** In order to clarify her peers' opinion Anna, 14, pupil form Silverdale said:

> *There are no places for us…there are not a lot of private spaces. We like the smaller spaces because they are secluded, comfortable, and out of the way.* (Fig.6.16. M:SD 1.0 P:2; Fig.6.17. M:SD 1.0 P:3)

Similarly, in Fort Pienc during the school breaks many pupils could be found seated together in groups in different corners of the playground (under the stairs in the yard, behind the fences of the stairs) secretly whispering and playing games. Eva, 13, pupil from Fort Pienc observed:

> *We all really like the tables at the end of the playground, we like to sit on the benches…there we can play and talk with our friends in peace* (Fig.6.18. M:FP 1.0 P:3); and Alba, 12, added
> *We like to sit in a corner and talk about our things* (Fig.6.20. M:FP 1.0 P:8).

Observing the photos made by pupils and talking to them leads to conclusion that both Silverdale and Fort Pienc schools lack the variety of purposefully designed small, calm and private spaces that stimulate encounters between pupils and teachers. The lack of such spaces could have a negative impact on bonding between pupils and teachers, and the way the other spaces in school operate. To illustrate, a series of niches along the corridors were designed and built in Silverdale, in order to provide students with a place to sit, relax, chit chat or have a quick bite (Fig.6.19. M:SD 0.0 P:22). Yet, today they are not used very often as pupils do not perceive them as private enough. Thus, the library and the room for the 6th form, two places highly cherished by pupils, can easily get

> *cramped, loud and uncomfortable*- Marc, 15, pupils, Silverdale.

As Joana, 16, pupil form Silverdale puts it:

they are simply not big enough for all of us.

School environment should allow levels of individual and group privacy to be regulated. Same degree of intimacy across the school decreases the possibilities for subtle interactions. While Alexander states that "no one can be close together without also having frequent opportunities to be alone"[44], Lippman explains that "serenity may be achieved by providing learners with reflective, engagement, and proximal space".[45] Private and intimate places allow pupils to free themselves from excessive noise and visual distraction. Additionally, the size of the space was also an important factor. According to Moore children get easily overwhelmed by the size of the space. [46] Therefore, this aspect should be carefully considered during the design, as it has a crucial impact on social actions and interactions.[47]

Brown argues that all learning starts with a conversation.[48] For this reason schools should have places to invite children to stop and communicate. Having a variety of smaller scale, lower height tucked in spaces is important, because Pasalar explains that encounters are more likely to happen in smaller scale spaces naturally [49] and an opportunity for the occupants is provided to form relationships and connections, discuss sensitive issues, and learn to understand each other. Hertzberger adds that they are more appropriate for children's size and can easily recreate intimate home - like atmospheres.[50] In such places, children feel safe, secure, calm, and a sense of control and comfort is easily generated.[51] Such retreat and refuge shelters can help children escape from intense everyday stimulation in school.[52]

Both Lippman[53] and Hart[54] agree that social development can be a part of people-environment relationship and that the environment itself can be used as an instrument of socialisation. Monahan argues that the school environment can "enable and constrain certain modes of social action and interaction".[55] Important characteristics of spaces that impacted interactions among pupils and teachers were levels of privacy, size of the space, balanced power instead of adult control, and activities in those spaces.

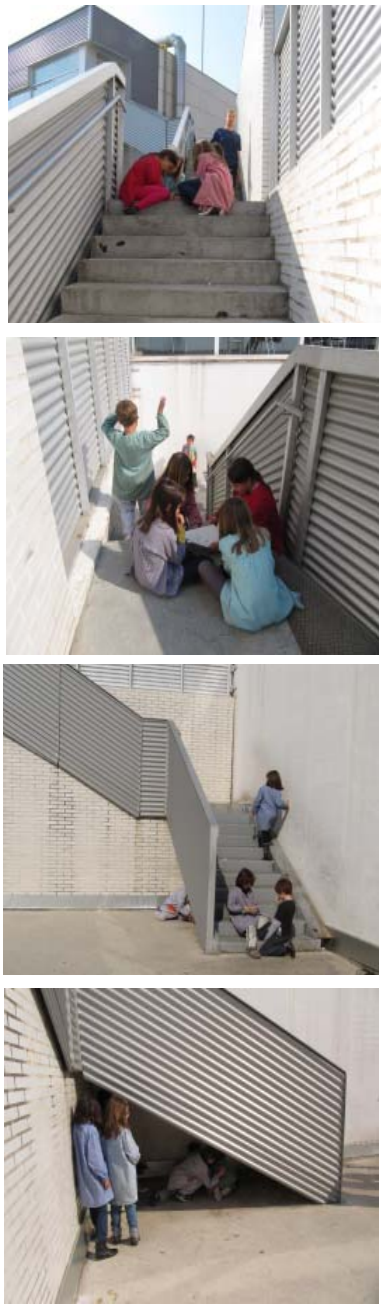


Fig. 6.20. M:FP 1.0 P:8
The lack of purposefully designed small and private spaces

44 Alexander, C. (1977) A pattern language towns, buildings, construction. New York: Oxford University Press p. 669

45 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 189

46 Moore, G. (2002) Designed Environments for Young Children: Empirical Findings and Implications for Planning and Design. In M. Gallop & J. McCormack (Eds.), Children and Young People's Environments. Dunedin, New Zealand: University of Otago, Children's Issues Centre, Chapter 5, (p. 53-63), p. 56

47 Bell, B. (2006) Scale in children`s experience with the environment. In Spencer, C. and Blades, M. (Eds.) (2006). Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press, (p. 13-25), p. 17

48 John Seely Brown. Online: http://www.johnseelybrown.com/

49 Pasalar, C. (2004) The effects of spatial layouts on students` interaction in middle schools multiple case analysis. Online: www.lib.ncsu.edu/resolver/1840.16/5083, p. 262

50 Hertzberger, H. (2008) Space and Learning. 010 Uitgeverij

51 Human Science Research Council (HSRC) Chapter 3 Methods to help children feel calm and safe, in Emotional Behavior book, Online: www.hsrc.ac.za/Document-1674.phtml

52 Moore, G.T 1(986) Effects of the spatial definition of behaviour settings on children's behaviour. Journal of Environmental Psychology, (6) 3, p. 205-231

53 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 1

54 Hart, R. (1979) Children's experience of a place. New York: Irvington Publishers, p.346

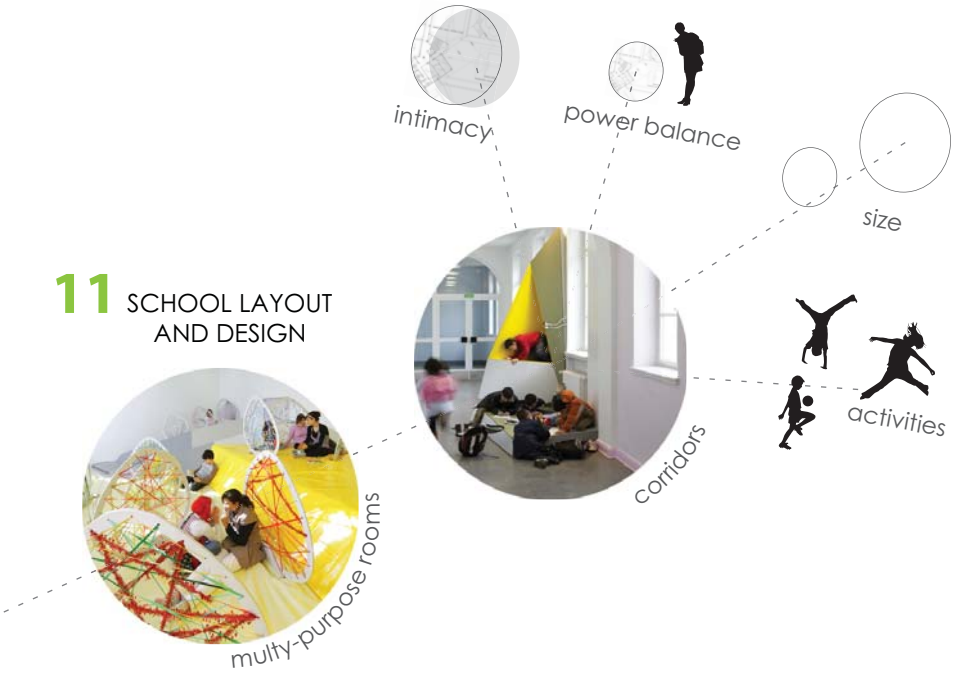
55 Monahan, T. (2000). Built pedagogies & technology practices: Designing for participatory learning. Online: http://www.torinmonahan.com/papers/pdc2000.pdf, p. 1

Fig. 6.21.


11 SCHOOL LAYOUT AND DESIGN
pupils
teachers
neighbours
joint use of facilities
5-11 The position of the school in the heart of the community, and joint use of civic centre and school facilities by pupils, teachers, and neighbours is supporting the development of strong bonds.
5
SENSE OF COMMUNITY
5-11 Multipurpose rooms and corridors were named as places where a sense of community can be developed. Important characteristics of those spaces that impacted interactions among pupils and teachers are levels of privacy, size of the space, power balance instead of adult control, and activities in those spaces.
5-9 Corridors are seen as pathway turning the transition from a place to place into an exciting experience and adventurous journey.
5-10 Learning means continual interaction between people, and between people and the environment.
10 EDUCATION
learning as continual interaction

A SUMMARY OF THE EMERGING THEMES

- **SENSE OF COMMUNITY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -



11 SCHOOL LAYOUT AND DESIGN

9 SENSE OF A PLACE

Through meaningful experiences not just activities are shared, but the identity and meanings of those spaces.

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Besides positively impacting children`s social behaviour, such small scale pockets have other important developmental impacts. Bell`s research demonstrates that the scale of the space impacts children's cognition.[56] Additionally, evidence from Moore`s research suggest that in smaller groups, children show greater verbal initiative, greater exploratory behaviour, and reflective, cooperative and task focused behaviour is increased.[57] These studies explain how certain design features can stimulate interactions and children's development, as well as why smaller scale space are important. Difficulties arise, however, when an attempt is made to incorporate both of these aspects in one space. As the school space is becoming more expensive, and as ever growing number of school design policies is advocating flexible and adaptable space arrangements, combining these two aspects in a single space, without jeopardizing its developmental potential, is a question that requires much further research.

THEME 6: Participation

In all three schools teachers and architects strongly agreed that during the participation process the pedagogical vision behind the school design should be discovered and established. Yet, what they perceived as an obstacle for translating these ideas into the architectural design of their school sometimes differed.

Teachers from Fort Pienc agreed that **when community development is not synchronised, and when the schools are not adequately integrated into those plans the learning process might be negatively affected.** For example, the idea of local authorities in Barcelona was that the school and civic centre facilities were jointly used by teachers, pupils and community members. As government authorities were in charge of building the civic centre, and the local authority of building the Fort Pienc school, the functional and organizational integration of school into the existing block with the civic centre has not been flawless. Though the library and mediatheque are separated from the school by just one glass wall, the pupils have to go out of the school, all the way around the central plaza and into the civic centre. Teachers admit that for this reason the activities planned to happen in the library are often omitted.

When during the participatory design process the roles and responsibilities are not clearly defined, the vision of how a certain space could foster learning might not be translated into the reality. To illustrate, in Silverdale the community garden was planned to be the catalyst of social interactions between local community and school. While teachers claim that the pupils` responsibility should be to organise the activities around it, pupils believe that teachers do not motivate them to use the plot. However, today the very large plot of land stands empty and is not used for learning.

Furthermore, it seems that when **the teachers, pupils, and community members are consulted during the design, the result could be an architecture that facilitates and supports interactions between all of them.** During the design of Erika Mann school teachers and pupils proposal were seriously considered. Additionally, a large part of the furniture was produced by local prisoners and by disadvantage young people gathered in special companies, musician produced musical instrument along the staircase, and parents, teacher and children were involved in simple technical work: hanging pictures, hanging textile over ceiling and wardrobes.

56 Bell, S. (2002) Spatial cognition and scale: a child's perspective". Journal of Environmental Psychology, (22), p. 9-27

57 Moore, G.T (1986) Effects of the spatial definition of behaviour settings on children's behaviour. Journal of Environmental Psychology, (6) 3, p. 205-231

According to the architect the architecture of the refurbished school "is planned to integrate the school into the community as an educational centre for all inhabitants of the district". [58]

On the contrary, **when teachers' and pupils' ideas are not carefully translated into the school design, the pedagogical potential of future spaces could be diminished.** For example, flexible learning was the main pedagogical idea that should have been supported by the school design in both Fort Pienc and Silverdale. They wanted their school spaces to meta-communicate that learning happens everywhere and that all learning styles are supported.

> *School head teachers having their schools built had discussed how the teaching would look like in the future and what kind of classrooms do they wanted…* [they concluded] *the teaching should happen in new and bigger spaces…so teaching could be done in smaller groups and we could work in a more personalised way with students* – Brian, 47, teacher, Silvedale.

The idea of having flexible spaces in Fort Pienc was not translated into design at all, while in Silverdale some flexible spaces were incorporated. Due to this teachers from both schools today thinks that the school space is not quite supportive of their teaching and learning ideas. While the teachers from Fort Pienc believed that more money is spent on making the facades beautiful according to architects taste, and at the expense of comfortable, flexible and pleasant inner spaces, architects of Fort Pienc school, similarly to the teachers from Silverdale, believed that their ideas were not translated into the design due to the tight budgets.

> *…the cost is always the priority before quality* - explained the architects of Fort Pienc school.
> *During the design phase there has been a lot of talk to have rooms separated by movable partitions. Architects respected this and in the first drawings put a lot of spaces like this. The local authorities pressured them to remove them because of the costs…because our government has changed the policy. This whole idea* [about bigger learning spaces] *came from Labour government… now we are at harder economical times and the new government is more conservative about education, so it is a problem.* – Mark, 37, teacher, Silverdale.

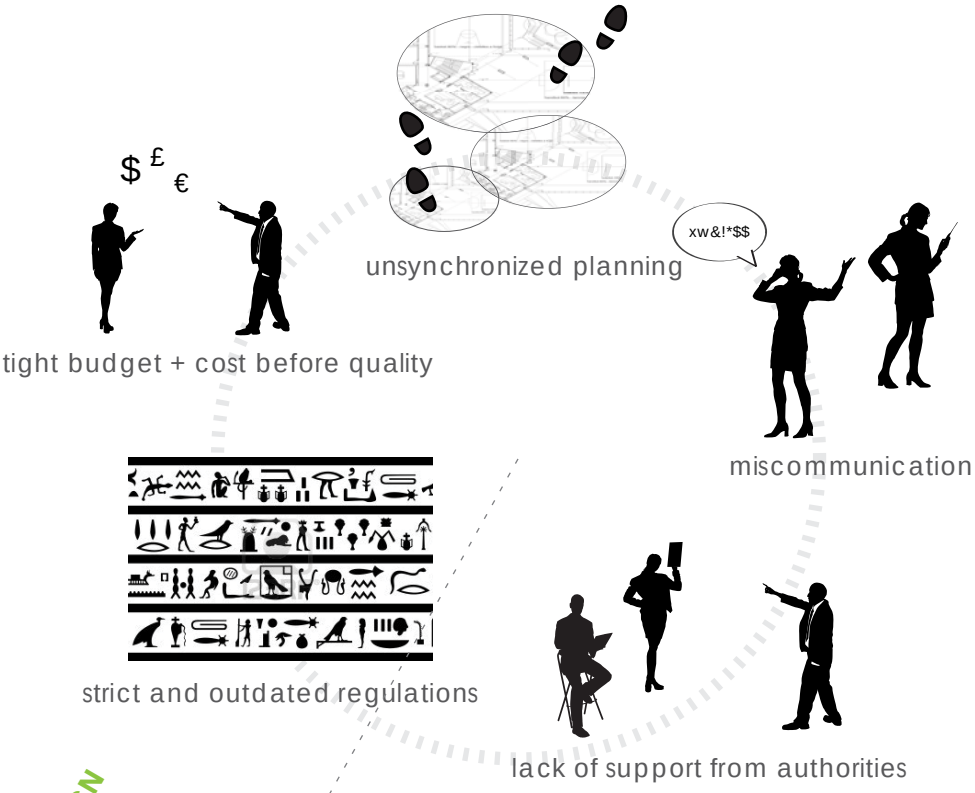
A tight budget and the lack of discussion with the teachers how the money available for school building should be allocated, can be a serious obstacle to translating teachers pedagogical vision into the school building design.

Additionally, it was discovered that **even when interesting pedagogical ideas are initiated by teachers and architects during the participatory design process, the success of the project is questionable if there is no communication and support from the authorities.** Agatha, 46, teacher, Fort Pienc, complained:

> *They* [Education Department and the local authorities] *never came to visit us, see how we work and what our problems are.*

58 Hofmann, S. (2004) The Baupiloten: building bridges between education, practice and research. Architectural Research Quarterly, 8(2), p. 121

Fig. 6.22.



OBSTACLES FOR PARTICIPATORY DESIGN PROCESS Lack of a common language between all parties, lack of support from authorities, tight budget, rigid, stiff, and restrictive regulations, and outdated school building standards are obstacles for participatory design process, and make designing and building sustainable school arduous.

6

PARTICIPATION

6-5 Participatory design process can lead to increased sense of community

6-20 Participation plays important role if we want a cost-effective school.

A SUMMARY OF THE EMERGING THEMES

- **PARTICIPATION** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

5 SENSE OF COMMUNITY

participation fosters sense of a community

20 COST-EFFECTIVENESS

participation -a process towards cost-effective school

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Architects of Fort Pienc school agreed much on this and added:

> *About one issue they* [the teachers] *are really right. They have all the experience gathered over the years and it should be used as a guide for a new construction…the problem is the reaction capacity of the institution in charge. Teachers, parents and us architects worked in order to improve the energy efficiency and environmental pedagogy but we had no support and answer from the authorities and most proposals were forgotten*.

To illustrate,

> *They did not accept reusing harvested water because they were afraid kids could get intoxicated if they touched the toilet water?????? Collecting water on the roofs was not accepted because the department had not regulations about that. This is what has happened to Fort Pienc-schools' head, she was asking for things that would be needed in the future, but the institution was not agile enough to incorporate them into the standards and legislation. There is no sufficient awareness yet*.

It was discovered that beside tight budgets, **outdated, restrictive and inflexible regulations can also be an obstacle on the way to designing more pedagogically potent sustainable schools.**

> *The Educational Department has some quality standards and usage descriptions which make it non feasible to incorporate the different proposals of various parties from school…as it comes to multi-functional and bigger classrooms… functional aspects such as the number of classes, or the pupils per class ratio were established by the department and no changes in relation to this were possible* - explained the architects of Fort Pienc school.

In addition, the discussion with the architect of Erika Mann School revealed that even when the budgets are tight, **extensive preparations are the key to delivering cost-effective design that responds to teachers and pupils vision.** Additionally, the cost of turning their ideas into reality was also minimised through their participation in simple technical work. "Here extensive preparations play crucial role where ideas, needs and wishes have to be translated into powerful architectural design. Only in this way we can have cost-effective design". [59]
Yet, **when the school design does not interpret occupants ideas and wishes, it could lead to extra spending in future**. Mark, 37, teacher from Silverdale says

> *I think we got the sense of pride but it is not fully communicated yet. By some very simple things we could do it. We are looking at them now, though we have to pay for them."*

It is clear that participation can prevent design mistakes and later costs for remedying them.

The lack of a common language between all parties, the lack of support from authorities, tight budget, rigid, stiff, outdated , and restrictive regulations when coupled with outdated school building standards can negatively affect the participatory design process, and are obstacles to designing and creating pedagogically more potent sustainable schools. In order to improve this situation we need synchronised group efforts, where all participants have their distinguished place and opportunity to express their opinion in a more democratic process.

59 Hofmann, S. (2007) Schools and Kindergartens under reconstruction, in Dudek, M. (ed) A Design Manual: Schools and Kindergartens. Basel/Boston/Berlin: Birkhauser, p.50

THEME 7 and 8: Inclusion, equity, and cultural diversity

In both Fort Pienc and Silverdale teachers and pupils were quick to point out how school design is hindering or promoting inclusion. In both schools pupils reported toilets for disabled, lifts and ramps as designs that promote inclusion as everyone, regardless of their abilities can use them. They noted that they are helpful not just for their friends in wheelchairs, but for all of them when they have a leg injured, or when they have difficulties walking.

Fig.6.23. M:SD 0.0 P:9
These lockers are ours! The lack of lockers for everyone in school.

On the contrary, **small and narrow spaces were named as obstacles that made moving for the pupils in wheelchair cumbersome.** Agatha, 42, teacher for the school, explained:

> *There is not enough room, classrooms are small and corridors are very narrow...it* (moving around) *is not easy.*

When Fort Pienc school accepted a student in a wheelchair, who has to move around with an infusion pole sometimes, this was made even more apparent. Teachers believed that having a child in the school who will constantly have to be accompanied by teachers or fellow pupils in order to be able to move around, because of the few design overlooks, is no different than pointing a finger at that child. This implies that inclusion depends on compatibility between the functional capacities of a person or a group and their environment.[60] Pivik explains that it is person-environment congruence.[61] Additionally, spatial relation can represent and reproduce social relations.[62] This means that physical barriers are easily transformed into social, emotional and mental ones. Hence, the inclusive design has to take into account not just physical access, but emotional and intellectual as well.[63]

Fig.6.24.M:FP 1.0 P:15 and 16
Pupils on the playground left out.

Additionally, Silverdale pupils believed that **unequal ownership of certain parts of space or within the space impacts to what extent pupils feel included and treated as equals.** They complained that the lack of lockers for everyone in school makes left out students angry, sad and can lead to serious verbal disputes (Fig.6.23. M:SD 0.0 P:9). The lack of storage for personal belongings is not just a practical problem, but a psychological as well, and can negatively impact a sense of community and belonging. Clark explains that the lack of personal territory can cause lack of social norms and values and lower pupils` self-esteem.[64]

Feeling of inclusion or exclusion can be developed through (physical) activities on sports fields, thus further weaken or strengthen a sense of community. Pupils from Fort Pienc pointed out that during playtime, some of their friends are left out because football and basketball courts take up the whole outer yard. Some of them do not enjoy playing these sports, and some of them cannot due to their disabilities. Diego, 13, pupil, Fort Pienc commented:

> *There should be a place for people who do not play football or basketball… something, some activities for them to do* (Fig.6.24. M:FP 0.0 P:15 and 16).

60 Iwarsson, S. and Stahl, A. (2003) Accessibility, usability and universal design positioning and definition of concepts describing person-environment relationships. Disability and Rehabilitation, 25 (2), p. 57-66

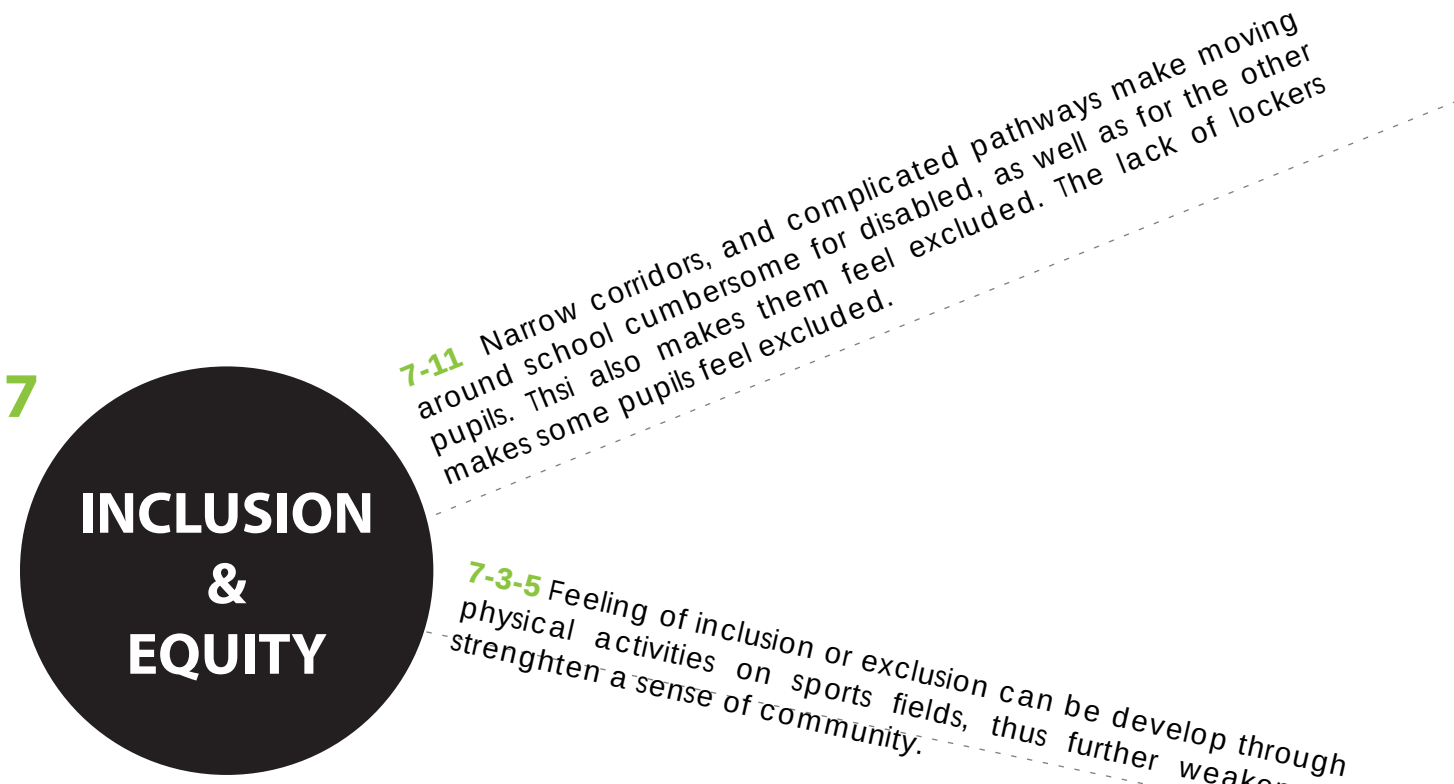
61 Pivik, J.R. (2010) The perspective of children and youth: How different stakeholders identify architectural barriers for inclusion in schools. Journal of Environmental Psychology, 30, p. 510-517

62 Malone, K. (2007) Child Space: An anthropological exploration of young people's use of space. New Delhi: Concept Publishing Company, p. 10

63 Commission for Architecture and the Built Environment CABE (2006) The principles of inclusive design. London: CABE, p. 15

64 Clark, H. (2002) Building education: The role of the physical environment in enhancing teaching and research. London: Institute of Education, p. 35

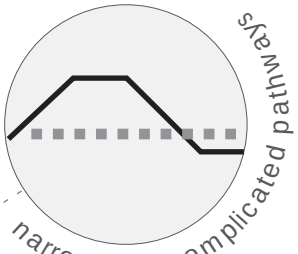
Fig. 6.25.


7
INCLUSION
&
EQUITY
7-11 Narrow corridors, and complicated pathways make moving around school cumbersome for disabled, as well as for the other pupils. Thsi also makes them feel excluded. The lack of lockers makes some pupils feel excluded.
7-3-5 Feeling of inclusion or exclusion can be develop through physical activities on sports fields, thus further weaken or strenghten a sense of community.

A SUMMARY OF THE EMERGING THEMES

- **INCLUSION AND EQUITY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

11 SCHOOL LAYOUT AND DESIGN



3 PHYSICAL ACTIVITY

5

SENSE OF COMMUNITY

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig. 6.26.


8
CULTURAL DIVERSITY
8-11 Design features in school such as signs in all languages and flags of all nations going in this school promote cultural diversity.
8-11 School design can promote and celebrate cultural diversity by interpreting occupants cultural and national features.

A SUMMARY OF THE EMERGING THEMES

- **CULTURAL DIVERSITY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

11 SCHOOL LAYOUT AND DESIGN

signs in all languages

flags

11 SCHOOL LAYOUT AND DESIGN

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig. 6.27. M:SD 0.0 P:7
Reception sign written in the languages of all nationalities going in this school

Fig.6.28. M:SD 1.0 P:13
Shelf with trophies.

Fig.6.29. M:EM 3.0 P:14
Celebrating cultural diversity through incorporating pictures of the pupils into corridor design
source: courtesy of die Baupiloten www.baupiloten.com/

Tackling this problem through design and providing enough space with various engaging (physical) activities for everyone is crucial, because on sport fields and playgrounds children receive affirmation, gain visibility and respect.[65] Engaging in physical activities pupils take up certain roles, make judgments about themselves and other children, and in this way construct their identities. According to CABE participation in physical activities impacts interpersonal relationships among children, as well as development of social hierarchy.[66] These hierarchies in turn impact inclusion or exclusion.

Some **design features were delineated by pupils as signs of the rich cultural diversity within the school.** Features that according to them celebrate the myriad of cultural backgrounds within the schools were: signs across Silverdale school written in the languages of all nationalities going into this school (Fig.6.26. M:SD 0.0 P:7), flags in the parking lot, and displays of artwork promoting culture, languages, history, and tradition of those nationalities. They equally valued spaces that allowed the to present their current contribution to the school culture, such as places for artwork displays, photographs and trophy shelves, that celebrate student achievement (Fig.6.27. M:SD 1.0 P:13). Except the signs in different languages, none of the mentioned features were architectural design features.

However, looking at the design of "Dragon`s breath corridor" in the Erika Mann school, and discussions with the architect, suggest that celebration of cultural diversity and transmission of important inclusion messages could be tackled through space design (Fig.6.29. M:EM 3.0 P:14). This corridor was designed with a particular aim to transmit the message of inclusion and celebrate cultural diversity. One side of the corridor wall in Erika Mann is cladded with a highly polished steel which has light reflecting characteristics similar to glass. On the other side of the wall there are pictures of all children in the school, that are changed with each new generation coming in. A picture of each and every child has its reflection in polished steel on the opposite wall. The architect believes that the space transmits the message of being proud of every child disregarding his/her age, gender, nationality and religion. In this way diversity of the local community was made visible through design. According to the architect this corridor makes pupils very proud. She explains that "the school could become a place of identification and support, as well as of multi-cultural communication".[67] **School design, in order to promote cultural diversity, should interpret occupants characteristics, cultural and national features.**

To conclude, adopting inclusive design strategies from the outset, though challenging is a must for us architects. CABE suggests that inclusion issues should be tackled through design because later this will affect everyone's lives in the school, increase a sense of belonging and security, a sense of welcoming, lessen anxiety, support neighbourhood diversity, encourage mutual and harmonious relationships, promote independent mobility, and promote physical and mental health.[68] Guidelines for creating inclusive schools that are comfortable for physically impaired pupils exist.[69] Yet, the inclusive design should be more that catering for the needs of impaired people. If we want the design to celebrate all the individuals in the school, and make them feel included, we need a much broader and holistic approach to design.

65 Atensio, M. (2007) Basketball is like breathing: Young people`s use of urban physical activity spaces. In Malone, K. (2007) Child Space: An anthropological exploration of young people's use of space. New Delhi: Concept Publishing Company (94-126), p. 115

66 Ibid

67 Hofmann, S. (2004) The Baupiloten: building bridges between education, practice and research. Architectural Research Quarterly, p.121

68 Commission for Architecture and the Built Environment CABE (2008) Inclusion by design: Equality, diversity and the built environment. London: CABE

69 Environ, (2009) Building Regulations 2009: Technical Guidance Document. Access and Use. Online www.environ.ie/en/Legislation/DevelopmentandHousing/BuildingStandards/FileDownLoad,20692,en.pdf

THEME 9: A sense of place

Teachers from both Silverdale and Fort Pienc mentioned **the interactions between community members, teachers and pupils as crucial factors that over the time give places their distinctiveness.** The statement for Brian, 47, the teacher form Silverdale illustrates this clearly.

> *Coming from the old building was a chance to bury something from the past, a chance to reinvent ourselves. We carefully thought what we want the school to stand for. At the beginning we rebranded everything. 'Everywhere. Learning' was the new slogan…and the main aims: leadership, global citizenship and independent learning. Does the building represent that today* (school slogan) *I would actually say no it is not. I think the people in it do. The people in the school they are the place.*

Fig.6.30. M:SD 0.0 P:10
Facade design - Silverdale

Strong bonds between the pupils and teachers in this school make it clear that "social relations make places".[70] But is a sense of place just a social construct? Further discussions and observations in the schools confirmed the belief of some authors [71] that the physical environment of a school has a significant impact on the development of a sense of place.

Fig.6.31. M:FP 0.0 P:20
Facade design - Fort Pienc

The design of the facades was described as an important element communicating a sense of place (Fig.6.30. M:SD 0.0 P:10). According to Silverdale and Fort Pienc teachers the physical characteristics of a school facade should be representative of the ideas about what really makes a certain school, because they are the first to be seen when one is approaching the school. However, the teachers from Fort Pienc believe that the facades of their school were made beautiful according to architects` taste, and at the expense of representative outer, and comfortable, flexible and pleasant inner spaces. They feel that the way the school looks and feels outside and inside is not representative of school pedagogical ideas, very strong art, music and environmental curriculum, and values and believes that they promote (Fig.6.31. M:FP 0.0 P:20). By strictly following the language of the block, today the school building has completely blended in, and there are no visual clues that behind these facades there is a school. The school cannot be visually distinguished from the civic centre to which it is attached. On the contrary, in Silverdale teachers believed that the architects have very successfully communicated through design an ideas very important to them - connecting the school with the surrounding nature.

> *I think when you approach the school it is fantastic…the light and the glass…it looks like the outside has been brought inside*- Paul, 43, teacher, Silverdale.

Walden argues that authentic aesthetic of a school façade can not only attract attention but transmit the values, the pedagogical ideas of the school, provide partly the identity and signal how community values education.[72]

70 Allen, J. and Massey, A. (1995) Geographical Worlds. Oxford University Press: Oxford, p.55

71 Stedman, R. C. (2002). Toward a social psychology of place: predicting behaviour from place-based cognitions, attitude, and identity. Environment and Behavior, 34(5), p. 561-581.

72 Walden, R. (ed) (2009) Schools for the Future: Design proposals from Architectural Psychology. Goettingen: Hogrefe

Fig.6.32. M:FP 0.0 P:13
Teachers, pupils and parents redecorated the small and tight reception area in Fort Pienc school, so as to try to communicate the welcoming spirit of the school.

The design and the size of the entrances and reception areas were also seen as crucial for communicating a sense of space. Marks`s, 37, teacher, Silverdale, remark points this clearly:

> *…when you first get in it, I think it is disappointing. I do not think the messages are reinforced, the reception area is quite small. We think it should be more what Silverdale is about…whether is everywhere learning or… Every time somebody comes into school gets messages from school, and we want that to happen.*

In both Silverdale and Fort Pienc the entrances were characterised as very small, unable to demonstrate the welcoming spirit of the school, and ideas that really mattered to this school community (Fig.6.32. M:FP 0.0 P:13). The mere experience of entering the building sets the tone for the experience of the whole school space. "If the transition is too abrupt there is no feeling of arrival and the inside of the building fails to be an inner sanctum".[73] They have to be inviting, comfortable and functional in order to engage the whole community- students, teachers, parents, school staff, and other visitors in discussion and ideas exchange. Truly they determine the type of messages and the tempo of interactions cherished at schools. [74]

According to pupils, **not just the way the school space looks and feels like, but the way it is maintained can transmit important school values and impact how a certain environment is perceived.** More than the half of the students interviewed in Silverdale agreed with their friend:

> *Our school is cleaner that many other schools. We enjoy that and we are very proud. This is what makes our school different form any other* – Anna, 15, pupil, Silverdale.

Interestingly, after the observations in Erika Mann school, it could be suggested that this process works vice-versa.

> *The first child to enter after my arrival in Erika Mann school was a boy. Not more than twelve years old, I would say. With his very dark and curly hair, I vividly remember him skipping down the corridor on the second floor in that late afternoon. In one hand he carried a case with his instrument, which to me looked like a violin. In the other he carried a sandwich. It must be that his classes have just finished and he was waiting for his music lesson to begin. He easily pulled down the benches called "The Throne on the Beat of the Wings" and one long "krkrkrk" could be heard. It sounded like the Silver Dragon greeted him. In an instant he made himself comfortable, unwrapped his sandwich and started eating. Every now and again a tiny piece of dark bread would crumble down his chin on the table. In just a few bites he gulped down his sandwich and it seemed to me that he will storm away. Surprisingly, his forefinger and thumb, resembling a small birds beak, started collecting the crumbs. His hand was jumping from one side of the table to the other, just like a hungry sparrow would do, around the crumbs thrown by an old merciful man. When he finished, he pulled out a paper handkerchief, wiped the table one more time, and threw both the crumbles and the handkerchief in the litter.*

73 Alexander, C. (1977) A pattern language towns, buildings, construction. New York: Oxford University Press, p.549

74 Ogden, H., Upitis, R., Brook, J., Peterson, A., Davis,J. and and Troop, M. (2010) Entering School: How Entryways and Foyers Foster Social Interaction. Children, Youth and Environments 20 (2), p. 150-174.

He pulled up the benches and again one muffled "krkkrkrkr" could be heard. The Silver Dragon flapping his wings, told him goodbye. - (Observation from the field diary, Erika Mann School, 15:48/20.10.2010) (Fig. 6.12 M:EM 2.0 P:4, on page 108.)

My observation in Erika Mann school, as well as discussions with the architects, suggest that pupils will take better care of the environments that they perceive as personally significant and likable.

Another important conclusion that emerged from interviews and observations is that **the design features must be skilful interpretations of ideas, wishes and beliefs of school members, in order to contribute to a sense of place.** When this is not the case, some of the features could be misinterpreted. For instance, in Silverdale a lot of concrete walls have been left bare and unpainted. Architects saw them as a distinguishing design feature, while teachers' and pupils`s opinion differed.

There is a lot of concrete around the stairwell and a lot of bare walls… this might be part of the cost implication. Visitors come to the school and ask: "When it will be finished?"…there is a lack of design in the school - Elisabeth, teacher, 43, Silverdale (Fig.6.33. M:SD 1.0 P:14).

Fig.6.33. M: SD 1.0 P:14
Concrete walls

Discussion with pupils from Fort Pienc suggests that, not just that they could be misinterpreted, but they could be personally completely insignificant and unable to contribute to the sense of a place. Some of the pupils commented:

There are other schools that are better, bigger and nicer"- Marco, 12;
It has a strange shape - Paolo, 13;

The shape of the building is ok and the colours are very nice - Celia, 14;

I think the shape is unique - Gracia, 12 (Fig.6.34. M:FP 0.0 P:19).

Fig.6.34. M: FP 0.0 P:19
V shaped columns in Fort Pienc

Beside this they could not name any distinguishing characteristic of their school space, explain why is it unique or special, nor explain how the school space makes them feel, are they attached to it, and whether it is personally significant to them.

Furthermore, places **have to be able to grow and be developed over time according to the occupants' needs and wishes so as to allow or even invite personalisation.** Briana, 15, pupil, Silverdale, clearly explained what makes their school :

Artwork displays that we put in the art department make the place look more like our school.

When asked what is happening with the rest of the spaces in the school she commented:

They are too nice! We can`t mess them up.

Fig.6.35. M: EM 3.0 P:15
Flying with the Silver Dragon
source: courtesy of die Baupiloten
www.baupiloten.com/

Moreover, **the design of a school space should be "image-free", so as to allow a multitude of interpretations and identifications.** To illustrate, themes, images and objects from pupils imaginary landscapes, discovered during the participatory design of Erika Mann school, were not direct objects of the design. Today, nowhere in the school the image of the Silver Dragon could be seen. Instead phenomenological aspects of the stories pupils told were interpreted spatially. The sensuous architecture, developed in this way, stimulates occupants to engage with the space and develop their own adventure with the Dragon. In this way various rational, emotional, and personal bonds with the space are formed.[75] Experience during the observation in Erika Mann seems to support this. In search for the corridor called "Flying with the dragon" one girl help me find it (Fig.6.35. M:EM 3.0 P:15). Remembering only that it was next to the aula, I asked her to show me the way to the aula. She responded:

"It is on the top floor where the firing clouds are.

Being sure that the space with the theme firing clouds does not exist in this school, I asked:

Firing clouds? What is that, what are they for?

She looked at me confused, as if she wanted to say: "Is it possible that you do not know?"; and responded instantly:

It`s where the Silver Dragon sleeps. They are firing so it feels warm when it sleeps.

Though the theme of the top floors is "Flying with the silver dragon" and the theme of the ground floor is "The dragon`s sleeping place", the lack of direct image attached to a certain space allows the myriad of interpretations through engagement.

To what extent such personal engagement are important, witness architect`s own experience.

I have a very nice experience. We worked with older kids in some secondary school and one kid told me that he went in a very exciting elementary school… he talked about Erika Mann Elementary. It was so much fun listening to him because he did not know that it was us that transformed the school... He told me how fantastic their school was, how much they liked it... they sort of inherited it... that's quite exciting.

Lastly, **when the local community participates in the school design, when the design arises from the local challenges and is representative of the communal situation, it can contribute to the identity and a sense of place within the whole community.** The architect explained:

The transformation was extremely important because everybody in the neighbourhood and around the school know about the Silver Dragon. That goes for the city. It was very important for the neighbourhood. That's why they gave us the money because they thought that the architecture was strong enough to have an effect on the neighbourhood.

Taking "the users' desires and the invisible-visible spirit of the place", the stories, the themes and their spatial interpretation, she believes managed to create tan-

75 Hofmann, S. (2007) Schools and Kindergartens under reconstruction, in Dudek, M. (ed) A Design Manual: Schools and Kindergartens. Basel/Boston/Berlin: Birkhauser, p.50-53

gible architecture that acts as social catalyst within the multiethnic community.[76] Unique spirit and identity of the school each new generation inherits, and through their own sensory engagement, identifies with. This is crucial as the greater the identification with the space is, the more the pupils and teachers will take care about their school. For example, "the identification, love and affection have been so great" that until today none of the newly built features in the Erika Mann school have been destroyed or vandalised".[77]

To conclude, in both Silverdale and Fort Pienc teachers agreed what Mark, 37, teacher, Silverdale said:

The vision how you what to shape the building is really important.

Though what still remains as a huge challenge is how architects interpret this vision through design. The unique school ethos should be discovered through the process of participatory design, and skillfully interpreted through the design of physical space. When the school space is not representative of the teachers and pupils' wishes and beliefs, they could feel as strangers in their own school. Additionally, they will not be able to identify with the school space, because "identifying with something means recognising oneself in it".[78] When there is no personal or emotional attachment to the learning environment, the school space loses its significance for the teachers and pupils. By displaying the artwork made by pupils, parents and local community members , trophies, certificates, and diplomas, teachers tried to inhabit and nest into the schools, increase the identification of pupils with the school, and make the place feel more like their own. Personalisation of space and high sense of ownership are crucial, because if people do not like, and are not attached to their environments, they will not care for them. Materials for personalisation can provide environmental clues and demonstrate to children that they are valued and important.[79] They are individual and collective expressions of identity. Addressing the identity of a school through the design and allowing it to develop through time is essential, because as Proshansky, Fabian, and Kaminoff argue the place identity impacts self identity and vice-versa.[80] Still there is a lack of research, documented evidence and explanations about how a sense of place is developed in educational settings.[81] What is more architects are rarely involved in such research. Adding to the discussion on the matter is important as unpleasant environments can taint the activities within them, lower student performance, increase negative perceptions among pupils and teachers and consequently contribute to bad behaviour and low attendance.[82] Therefore, Canter suggests that pupils and teachers should be seen as active participants in experiencing and defining their school space.[83] Architects should strive to effectively engage in discussion with them, so as to better understand the occupants-space experience, and use that knowledge to design spaces that stimulate learning.

76 Hofmann, S. (2004) The Baupiloten: building bridges between education, practice and research. Architectural Research Quarterly, p.118

77 Hofmann, S. (2007) Schools and Kindergartens under reconstruction, in Dudek, M. (ed) A Design Manual: Schools and Kindergartens. Basel/Boston/Berlin: Birkhauser, p.52

78 Walden, R. (ed) (2009) Schools for the Future: Design proposals from Architectural Psychology. Goettingen: Hogrefe, p. 102

79 Lorraine E. Maxwell, L.E., and Chmielewski, E.J. (2008) Environmental personalization and elementary school children's self-esteem. Journal of Environmental Psychology, 28 (2), p. 143-153

80 Proshansky, H., Fabian, A.K. and Kaminoff, R. (1983) Place-identity. Physical world socialization of the self. Journal of Environmental Psychology, 3, p. 57-83

81 Nespor, J. (2008). Education and place: a review essay. Educational Theory, 58 (4),p.475-489.

82 Woolner, P. (2010) The design of learning spaces. London: Continuum, p. 15-16

83 Canter, D. (1991) Understanding, assessing and acting in places: Is an integrative framework possible? ' in Garling, T. and Evans, G. (eds.) Environmental Cognition and Action: An integrated Approach. Oxford, Oxford University Press, p. 191-209

Fig. 6.36.

9-11 Authentic aesthetic of a school façade can attract attention, transmit the values of the school community, and reveal the identity. - Design of school entrances should transmit the welcoming spirit of the school. Multi-purpose rooms and corridors are places where a sense of school place could be easily "picked up".

9

SENSE OF PLACE

9-11 Desgn features should be based on teachers` and pupils` ideas, needs, and wishes, in order to be significant for the occupants, to enable identification, and contribute to sense of place.

9-6-5 The school design that represents teachers` and pupils` ideas expressed during participation easily becomes an expression of group identity, contribute to sense of place and strengthen sense of community.

A SUMMARY OF THE EMERGING THEMES

- **SENSE OF PLACE** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

11 SCHOOL LAYOUT AND DESIGN

concrete walls - Silverdale

V shaped columns - Fort Pienc

6 PARTICIPATION

corridor called the trone of the Silver Dragon

5

SENSE OF COMMUNITY

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig. 6.37. M:FP 0.0 P:25
Unmovaable sun blinds in Fort Pienc school.

THEME 12: Construction and materials

The photo expedition with the pupils in both Silverdale and Fort Pienc revealed that they were able to recognise some of the materials, like brick and concrete. Though, they were not able to say whether they are sustainable. This could be easily understood and no part of the school is used for teaching and learning.

Nowadays, many design manuals assist architects in choosing appropriate sustainable materials for their buildings.[84] Some architects and researches also described how some of those materials were applied in sustainable schools.[85] The others demonstrated how involving teachers and pupils in the building process is crucial for making the most of the varied educational opportunities arising from the joint school construction.[86] Discovering how the location appropriate sustainable materials should be chosen with the occupants, and then transparently and clearly integrated with the school design, so as to present an important resource for learning, is where the challenge lies. Therefore, this question must be attended with a greater care in the future.

THEME 13 and 14: Light, ventilation, cooling/heating

The position of the windows used for natural ventilation must be carefully planned taking into account the location of the school, so that the living and working conditions in the building are not tainted. To illustrate, both Fort Pienc and Silverdale were designed to be naturally ventilated. The only exception is a computer room in Silverdale. The problem with using windows for ventilation existed where the windows were positioned near parking lots or busy streets. In Sliverdale and Fort Pienc pupils and teachers complained about the air quality in the classrooms near the parking lots. Though the architects of Fort Pienc school did a study on the matter they overlook the bus station below the windows on the southwest façade (Fig.6.37. M:FP 0.0 P:25). These windows cannot be used for ventilation, because when they are opened they permit exhausting fumes and noise.

Additionally, **the ability of very large glass surfaces to provide copious amounts of daylight, and create a pleasant working atmosphere, must be balanced with their contribution to heat gains/losses.** Brian, 47, teacher form Silverdale commented:

> *Natural daylight in combination with artificial light is one of the best design features of the building. This is most apparent in the break out spaces where we have a full height glazed wall.* (Fig. 6.38. M:SD 1.0 P:15).

Though these glass surfaces immensely contributed to a pleasant and comfortable working conditions, they were associated with the heat loss. Teachers and the majority of pupils agreed that spaces with full height windows in Silverdale, that are opened and closed often (dining room, teachers and students' entrance) tend to be very cold, especially during autumn and winter. Likewise, teachers and pupils in Fort Pienc associated large glass surfaces, though covered with sun blinds, with excessive heat gain. The unmovable blinds, added to the problem with the windows on the south-west façade which are not used for ventilation.

84 Pullen, T. (2011) The Sustainable building bible: Building homes for a greener world. Ovolo Books, Kimbolton

85 See the discussion in Chapter 4

86 Hes, D. And Howard, P. (2010) Using Construction of Schools Buildings as a Novel Approach to Teach About Sustainability. AUBEA 2010 - Proceedings of the 2010 conference of the Australasian Universities Building Education Association, July 2010

The temperature in the school, especially during spring, summer and early autumn is very high, no fresh air could be permitted and spaces get stuffy quickly. The unmovable blinds can not help them reduce the heat gain and they make spaces on south-west too bright. Additionally, Agatha, 37, teacher Fort Pienc commented briefly:

> *Because we cannot move the blinds we had to buy curtains and movable blinds for the inside.*

These **design overlooks negatively impact learning and working and translate into an extra spending so that the life and work in the school could be more pleasant.**

Moreover, **if certain spaces within the school are occupied by the greater number of people than planned and designed for, problems with ventilation and excessive heat can easily occur.** Both teachers and pupils strongly agreed about the following statement:

> *Temperature of the school is much better now compared to before. Almost all areas of the school can be warmed quickly. In the summer the temperature can get too high in classrooms, offices and especially in the library and a 6th form room* – Brian, 47, teacher, Silverdale.

As explained under the section about a sense of community, exactly the library and the 6th form are the most favourite places, where the large majority of pupils spend most of their free time, thus make them overcrowded.

The opportunity to control the environment and all accompanying systems enable the occupants to create pleasant working and learning atmosphere.

> *Quiet and controlled environment are big improvements in terms of light and acoustics in the new school. Manual overrides make controlling the temperature and light easy and the environment pleasant*– Anna, teacher, 37, Silverdale (Fig.6.39 M:SD 2.0 P:2; Fig.6.40. M:SD 2.0 P:3).

It is evident that providing good quality ventilation, cooling and heating, and light strategies and systems is not enough. Users must know and be able to control and over-ride some of the light, ventilation, heating and cooling parameters. This will impact their satisfaction with the physical environment and stimulate them to use the systems at their optimal performance, thus lower the energy costs.[87]

Lastly, previously explained **poor environmental conditions were related** by teachers **to some health problems occurring in schools**. Anna, teacher, 37, Silverdale, commented:

> *Pupils go to the medical room to complain about headaches or dizziness. I believe this could be related to the classroom environment.*

All the teachers form Fort Pienc and Silverdale were of very similar opinion.

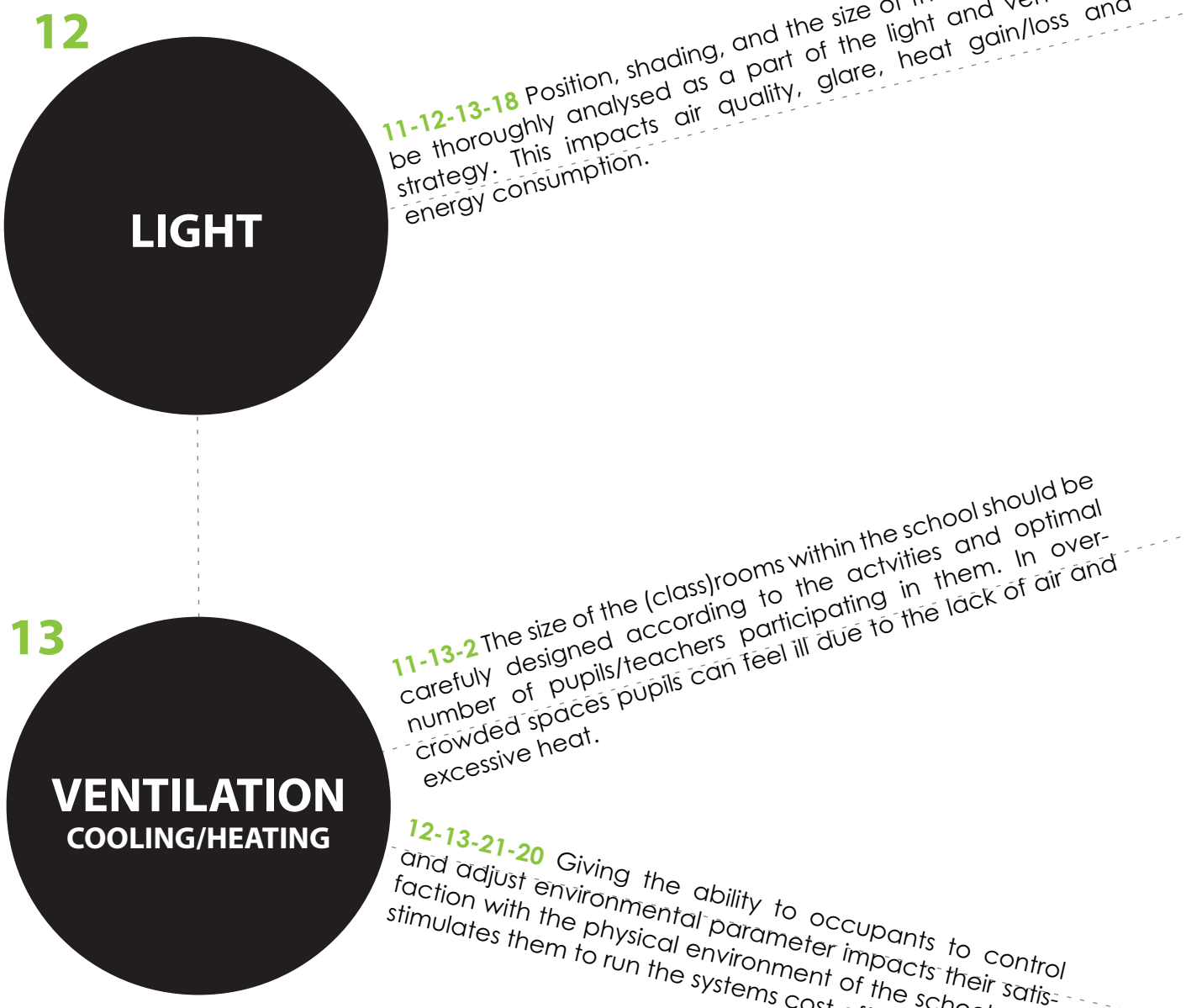
Fig.6.38. M:SD 1.0 P:15
Full height windows

Fig.6.39. M:SD 2.0 P:2
Heating manual overrides

Fig.6.40. M:SD 2.0 P:3
CO_2 sensors

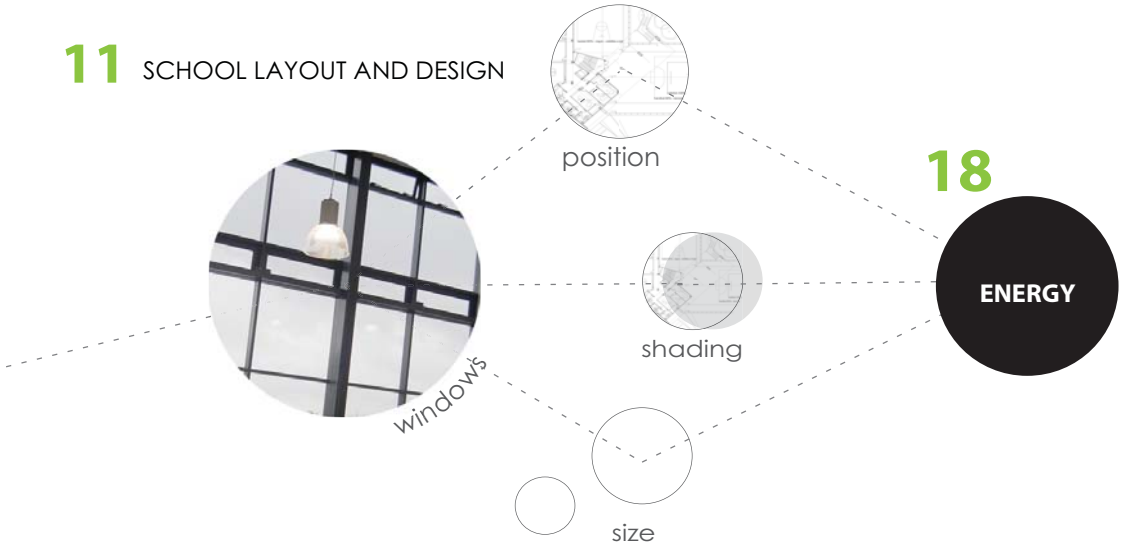
87 Leaman, A. and Bordass, B. (2001) Assessing building performance in use 4: the Probe occupant surveys and their implications. Building research and information, 29 (2), p. 129-143

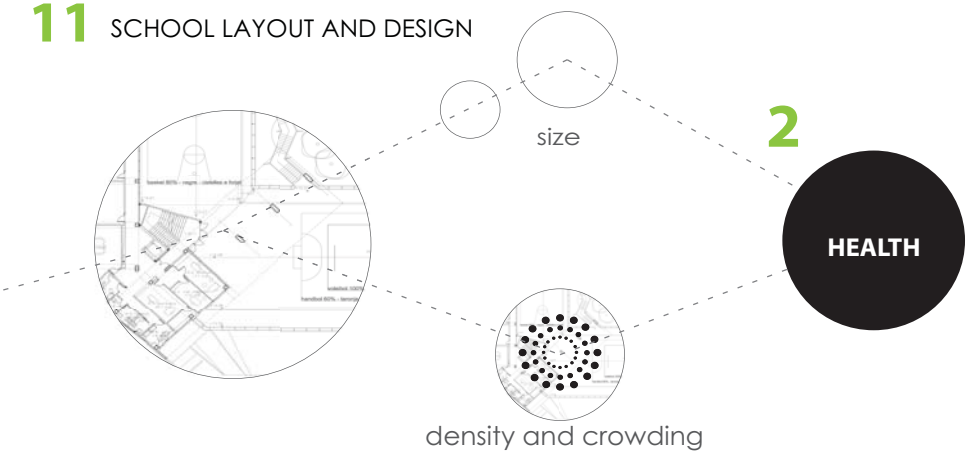
Fig. 6.41.

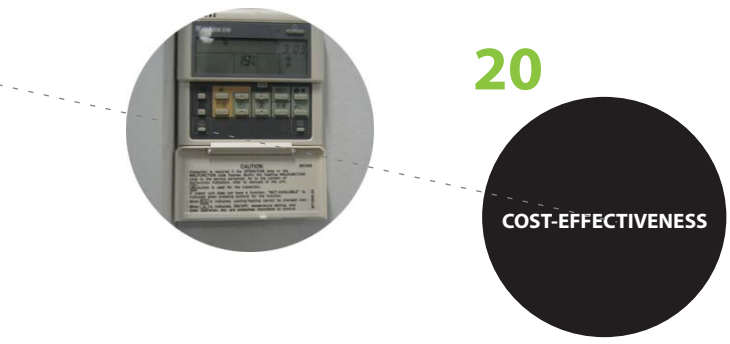

12
LIGHT
11-12-13-18 Position, shading, and the size of the windows must be thoroughly analysed as a part of the light and ventilation strategy. This impacts air quality, glare, heat gain/loss and energy consumption.
13
VENTILATION
COOLING/HEATING
11-13-2 The size of the (class)rooms within the school should be carefuly designed according to the actvities and optimal number of pupils/teachers participating in them. In over-crowded spaces pupils can feel ill due to the lack of air and excessive heat.
12-13-21-20 Giving the ability to occupants to control and adjust environmental parameter impacts their satis-faction with the physical environment of the school, and stimulates them to run the systems cost-effectively.

A SUMMARY OF THE EMERGING THEMES

- **LIGHT, VENTIALTION, COOLING/HEATING** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -







LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig.6.42. M:SD 2.0 P:6
Water taps

Fig.6.43. M:SD 0.0 P:26
Water harvesting from bike sheds

Today, the extensive research demonstrates that day light impacts academic performance, children`s cognitive development, elicitation of positive feelings, interest holding, and fear and stress reduction.[88] Similarly, poor ventilation, and consequently air quality, can make pupils drowsy, tempers flare, can impact their concentration, attention and academic achievement.[89] Besides there are many design manuals and guide books that assist designers when designing and optimising the performance of light, ventilation, cooling and heating systems.[90] Though, in the future it must be seen how engaging occupants in regulating environmental parameters could be used not just to stimulate them to think about reducing energy costs, but as a useful learning experience as well.

THEME 15: Water

Pupils in Silverdale said that **having enough fresh water taps around the schools is really important as it enables them to stay hydrated throughout the day** (Fig.6.42. M:SD 2.0 P:6). Maintaining appropriate hydration levels is crucial as it impacts health, contributes to well being and boosts people's capacity to learn and work, while thirst can deteriorate mental performance by 10 %.[91] Secondly, both pupils in Silverdale and Fort Pienc reported **water saving taps as the only water saving strategy known to them.** "Push on taps" can decrease water consumption by preventing the taps left running [92], thus increase the cost-effectiveness of the school.

Lastly, in Fort Pienc during the participatory design process teachers suggested having water harvesting system, as Barcelona, due to the climate conditions, can be susceptible to drought. Their plan was to use this system as a teaching tool. The outdated school building standards still do not allow this. Yet, **even the simplest water harvesting installations can be useful and interesting teaching tool for pupils** (Fig.6.43. M:SD 0.0 P:26). During the photo expedition in Silverdale pupils discovered a very simple water harvesting system on their bike sheds. They immediately reported this as a system that could help them understand how water from the roofs could be collected and stored.

Today the connection of appropriate hydration levels and the ability of pupils to learn and concentrate has been well documented.[93] Additionally, the guides, manual and books explaining the integration of water saving, harvesting, and recycling systems as a part of sustainable schools do exist.[94] Lastly, the pedagogical potential of such tools has been observed.[95] Yet, in future teachers and pupils should be included in the evaluation of the pedagogical potential of these systems.

88 For the discussion about the impact of school environments on health, attendance and academic performance see Chapter 4, p. 46

89 Ibid.

90 For the list of design manuals see Chapter 4, p. 42

91 Education and Resources for Improving Childhood Continence (2006) Water is Cool in School: A national campaign to improve the quality of provision and access to fresh drinking water for all pupils in UK primary and secondary schools. Bristol: ERIC

92 SMT Magazine, 30 April, 2012, Tapping in – How schools can save water and money. Online: www.smtmagazine.co.uk/tapping-in-how-schools-can-save-water-and-money/

93 Molloy, C.J. Gandy, J. Cunningham, C. and Slattery, C.G. (2008) An exploration of factors that influence the regular consumption of water by Irish primary school children. Journal of Human Nutrition and Dietetics, 21 5, p. 512–515

94 For the list of manuals see see Chapter 4, p. 42

95 Leatherman, P. (2009) Burton School Rain Water Harvesting System: An Educational Tool with Sustainable Benefits. Journal of Green Building, 4 (4), p.19-28

THEME 16: Waste and recycling

The lack of structured activities, alongside with the lack of motivation by teachers, can negatively affect pupils` interest in engaging in recycling and composting activities, even when recycling and composting facilities exist. While the pupils form Silverdale complained about the lack of

> *interesting practical projects*– Anna, 15, pupil, Silverdale,

and the fact that all the learning about this sustainability theme happens in the classrooms, pupils from Fort Pienc agreed that recycling activities, though rare, can be interesting.

> *We once used recycled material for our art project, it was so much fun… and we once collected old toys and clothing and brought them to the recycling point across the school, but unfortunately that's all* – Giulia, 12, pupil, Fort Pienc.

Other than this, learning through recycling and composting in both schools has been organised through very traditional activities such as differentiating plastic and paper from the other domestic waste. Pupils from both schools strongly believed that the lack of teachers' interest in these activities and encouragement is demotivating. When it comes to composting, again both schools reported to be aware that appropriate facilities do exist (Fig.6.44. M:SD 2.0 P:3), but are never used by pupils and teachers, just by the kitchen working staff.

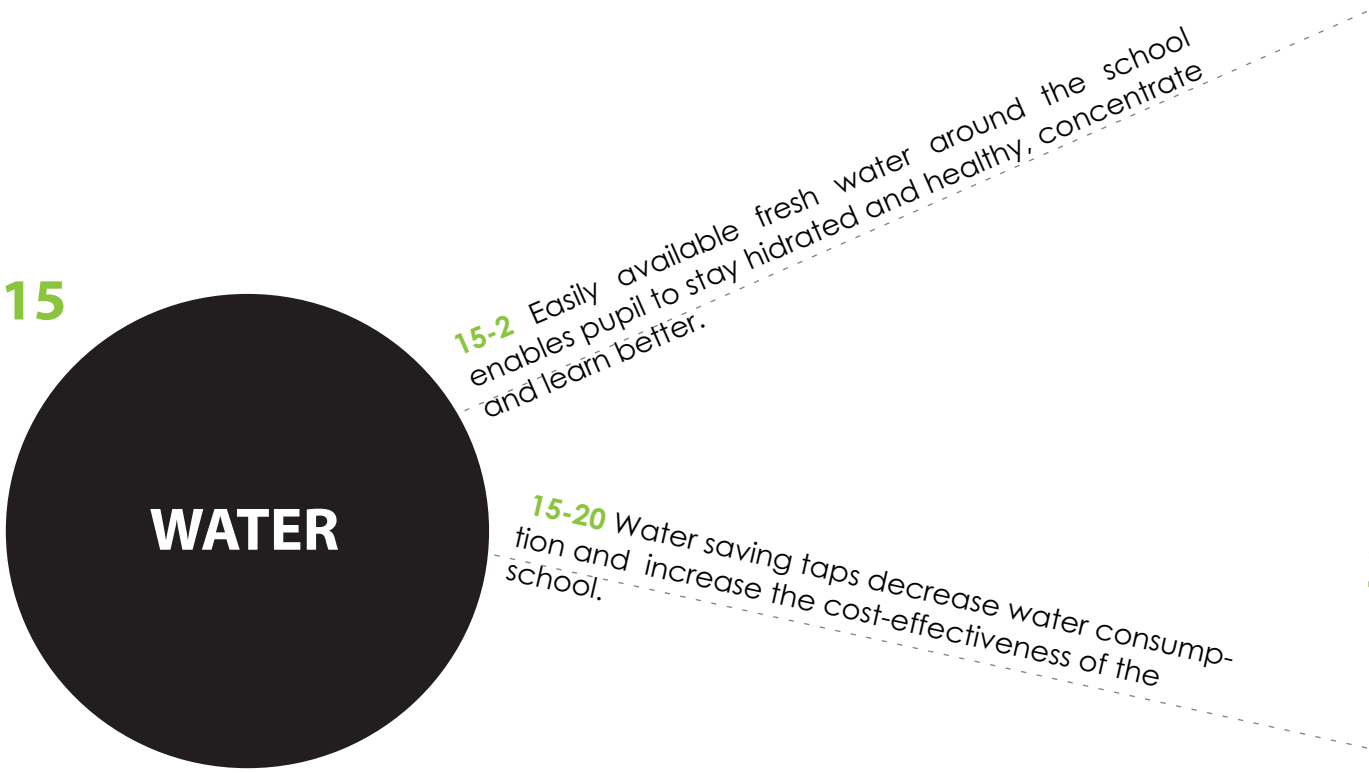
Examination of current architectural practice shows that architects tried through the design of sustainable schools to address the recycling issues and raise pupils' awareness about them. The worktops made from recycled bottles and the transparently built in insulation from recycled newspaper in Ballifield Primary School are good examples.[96] As mentioned many times before in this analysis, what we still need is empirical evidence emerged from participatory exploration with teachers and pupils to what extent such design features are successful "teachers", and if they are, what makes them successful.

Fig. 6.44. M:SD 2.0 P:3
Composting bins

Fig.6.45. M:SD 2.0 P:3
Posters raising awareness about recycling

96 Care, L. (2006) Primary Ideas: Secondary Thoughts. Century 21 Schools. Online: bdrblog.files.wordpress.com/2009/12/cs21-primaryideas-2nd-thoughts-l-care.pdf

Fig. 6.46.


15
WATER
15-2 Easily available fresh water around the school enables pupil to stay hidrated and healthy, concentrate and learn better.
15-20 Water saving taps decrease water consumption and increase the cost-effectiveness of the school.

A SUMMARY OF THE EMERGING THEMES

- **WATER** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

2 HEALTH

20 COST-EFFECTIVENESS

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Fig. 6.47. M:SD 0.0 P:18
Safe bike storage in bike sheds in Silverdale school.

Fig.6.48. M:FP 0.0 P:22
Bike racks - unsafe bike storage on the street

THEME 17: Transport

Discussion about the means of transport to and from school made it clear that incorporating sustainable school transport was not a part of school sustainability strategy neither in Fort Pienc, nor in Silverdale. Pupils from Fort Pienc live within walking distance of the school. In Silverdale the situation is different as the catchment area is very big. This means that some pupils live far away and they are driven by their parents or use buses. In both schools **the pupils cycling to school mentioned as very important having safe and secure bike storage spaces.**

> *We have to tie the bikes to the fence on the street and then we worry that someone could steal them* - Marco, 10, pupil, Fort Pienc (Fig.6.48. M:FP 0.0 P:22).

Contemporary research shows that there are some sustainable schools that encourage pupils to cycle to school through developing safe cycling pathways to school, organizing various events, or though engaging pupils in fun learning activities.[97] All of this effort is put because cycling has a positive effect on pupils` health and the reduction of $C0_2$.[98] However no examples could be found where the design of for example bike sheds or cycling routes was used to raise pupils' awareness about the importance of riding a bike to school. Hence, seeing how through design we could encourage cycling to school and learning about its benefits needs more attention.

97 Sustrans (2012) Bike It: Sustrans' school cycling project. Online: www.sustrans.org.uk/what-we-do/bike-it

98 Department for Transport (DTF) (2000) A safer journey to school: a guide to school travel plans. Online: www.gosmarter.co.uk/media/download/22.pdf

THEME 18: Energy

In Fort Pienc pupils were able to recognise sun blinds and sun protection panels as features that help the building remain cool, and reduce the need for using the electricity for cooling. Additionally, solar panels in the school, used for water heating, were recognised as system for reducing the electric energy consumption for water heating. Similarly, pupils in Silverdale recognised automatic light switches, energy saving light bulbs, using windows for natural ventilation and green roof as design features and technologies used for energy saving. Unfortunately, both the teachers and pupils reported that they:

> *learn about energy and environmental impact just in a classroom* – Marc, Anna, Steven, 14, pupils, Silverdale.

Applying new technologies for producing energy in-situ (for example from renewable sources) and developing strategies for saving it (integrating day light with electric light, decreasing the need for HVAC by developing natural ventilation systems, designing energy efficient building enclosure) can decrease energy consumption, thus decrease operating costs in the future, and if thoughtfully integrated into school design can serve as educational tools.[99]

Fig.6.49. M:FP 0.0 P:23
Electricity box

In spite of not using the full potential of a school building as a teaching tool, it was amazing to see both in Fort Pienc and Silverdale, how easily **pupils picked up information about energy issues from their school environment.** They were quick to spot the electricity box, the readers in the maintenance room, and the cabinet on the wall with all the installations (Fig.6.49. M:FP 0.0 P:23). Moreover, they identified a variety of energy and water wasteful behaviour around the school and suggested many improvements, such as composting, photovoltaic panels, light sensors, in order to make their school more energy-efficient and sustainable.

The literature review on energy issues shows that there are many sustainable school design manuals that could assist architects designing this aspect of sustainable schools.[100] Studies describing using dashboards and electricity readers as an educational tool for the occupants also started to emerge lately.[101] As this topic is new and emerging one much further research with the occupants is needed, so as it could be evaluated how these systems should be designed and integrated into sustainable schools as valuable tools for learning.

99 Evans, D. (2004) High-Performance School Buildings: Resource and Strategy Guide. 2nd ed. Sustainable Buildings Industry Council, New York State Energy Research and Development Authority, Albany, NY. Online: www.smartstructuresdist.com/highperformance.pdf

100 For the list of design manuals see Chapter 4, p. 42

101 Schaffhauser, D.(2011) Eastern Mennonite U Dashboard Educates Residents on Energy Use. Campus Technology. Online: www.campustechnology.com/Articles/2011/03/30/Eastern-Mennonite-U-Dashboard-Educates-Residents-on-Energy-Use.aspx

Fig. 6.50.

18

ENERGY

18-11 light saving bulbs, green roof, perforated wals for sun protection, blinds, occupancy sensors, and windows that enable natural ventilation are features that help energy saving, are recognised by pupils as teaching tools.

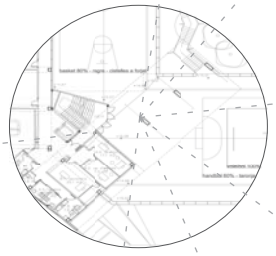
A SUMMARY OF THE EMERGING THEMES

- **ENERGY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES-

light saving bulbs

green roof

1 SCHOOL LAYOUT AND DESIGN



perforated walls for sun shade

blinds

occupancy sensors

windows enable natural ventilation

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

THEME 20: Cost-effectiveness

The analysis so far suggested that extensive preparations during the participation process, a sense of place, light, ventilation, water and energy saving technologies, and occupants knowledge and opportunity to control the can impact the cost-effectiveness of a school. So as not to repeat the discussion again please refer to the previously mentioned sections.

THEME 21: Maintenance and operation

The importance of tackling the maintenance and operation issues within the sustainable schools has been discussed under sections: safety and security, a sense of place, and light, ventilation, cooling and heating. So as not to repeat the discussion again please refer to the previously mentioned section

THEME 22: Flexibility and adaptability

Very simple design features, such as movable partitions, can help certain space be more flexible and adaptable. For example, playground of the day care in the civic centre, and lower playground of the school in Fort Pienc are separated by just one movable gate (Fig.6.51. M:FP 0.0 P:31). This very simple design feature helps teachers expand both playgrounds according to need and easily supervise both groups of children. They deeply believed that this help children know each other better, and easily transfer from day care to the kindergarten and school later.

Fig.6.51. M:FP 0.0 P:31
Moveable gate between the yards of the day care in the civic centre and the kindergarten in the school

On the other hand, **when the functional organisation of the adjoining facilities is not developed taking into account the complementing activities within them, the flow of learning can be seriously disturbed.** Even though just one glass wall separates the Fort Pienc school from the library in the civic centre, they have to go all the way around the block to enter it. The teachers admitted that due to this situation quite often some of the planned activities, which are started in school and should be complemented with the ones in the library, do not happen.

Additionally, it was discovered that when **the flexibility and adaptability of school spaces is not a product of strategic design, but of the lack of space, the quality of learning in those spaces could be compromised.**[102] Both the teachers and pupils in the Fort Pienc strongly agreed that the lack of space within the school forces teachers to constantly change venues for some classes and hold them in inappropriate spaces for the subject thought (Fig.6.52. M:FP 0.0 P:32). In this way the kindergarten bedroom is used for music lessons, the science classroom for dance lessons. This very often causes confusion with children.

Fig.6.52. M:FP 0.0 P:32
Music room and kindergarten sleeping room

Heft explains that fixed features and specific functions and are very important for children`s orientation.[103] Knowing that colour is one of the strongest visual signs [104], teachers and parents painted each floor in different colours. Though this helps to certain extent, still today, especially younger pupils could be found wandering lost. If we want to use the sustainable school building as a tool supporting exploratory behaviour, which is according to Spencer and Blades very important part of the learning process [105], we should avoid such conflicts.

What is more, **the constant change of various subjects in one classroom is affecting the identity of these school spaces and is an obstacle for the development of a sense of space.** Martin, 10, pupil, Fort Pienc, complained:

> *the science classroom should be the science classroom and should be used as the science classroom!*

102 Gaia also claim that when flexibility in design has to cater for uses other than educational can undermine the effectiveness of design for teaching purposes. Gaia Architects (2005) Design and Construction of Sustainable Schools. Vol 01 Lessons form School Buildings in Norway and Germany. The Lighthouse, p. 5

103 Heft, H. (1979) The role of environmental features in route-learning: Two exploratory studies of way-finding. Environmental psychology and nonverbal behavior, 3 (3), p. 172-185

104 Olds, A.R. (1978) Designing settings for infants and toddlers. In C.S. Weinstein & T.G. David (Eds.) Spaces for children: The built environment and child development (p. 117-157). New York: Plenum Press., p. 113

105 Martin, S.H. (2006) The classroom environment and children`s performance – is there a relationship? In Spencer, C. and Blades, M. (Eds.) (2006). Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press, (p. 91-107), p. 93-94

Different parts of a school should have their own and unique identity developed. Using different lights, shapes, materials, sizes, textures and smells, and taking into accounts the intended activities in those spaces we can easily create a flexible resource rich environments that are easy to manipulate.
Korpela suggests that resource rich environments provide many opportunities for pupils and teachers to create and manipulate the school environment according to both their identity and needs.[106]

Even when the architects develop flexible and adaptable spaces, the lack of support and understanding from the authorities can undermine the process.

> *What we as a school did was to include middle leaders* [heads of departments] *in discussing what they wanted… I personally think there is some merit in that. At least it gave people ownership in their space in their wings because they had a big say in how they are configured"*- Mark, 47, teacher, Silvedale.

Due to the tight and restrictive regulations and the lack of understanding by the authorities in the last version of the school design the number of flexible break-up spaces has been cut down. Brian, 61, teacher, Silverdale, explained:

> *The biggest frustration were limitation of spaces we could have. There is a strict formula set by the government how much square meters you can have and how many students… they did not allow to plan any future changes or increase of pupils… we might have a view but politicians also have it.*

The break-out spaces that have been built were characterised by both teachers and pupils as the most flexible and adaptable ones. Their opinion aligned with the ones Lippman. He argues that **flexible and adaptable spaces across the school enables pupils to learn according to their own tempo, socialise with their peers and teachers, and minimises the conflicts between the two groups.**[107]

> *Break out spaces constitute good spaces for flexible activities and have helped us with space…they allow different activities to take place. Students can now come to school and we do not have to shut them out as we used to in the old school. There is a more shared space which can be used outside of the lesson time. This makes pupils have ownership of the building and there are less rules. In old school we had rules about the ways in which pupils walked in and around the school. Imposing strict discipline, especially in the circulation spaces was causing conflict with the staff* – Jack, 53, teacher, Silverdale.

The majority of pupils agreed on what their friend said.

> *Break out spaces are good for doing work and relaxing. We sit there with our friends, work, have lunch, or talk to teachers* – Rosie, 15, pupil, Silverdale.

Though, just providing extra space is not enough.

106 Korpela, K.M. (1989) Place –identity as a product of environmental self-regulation. Journal of Environmental Psychology, 9, p. 241-256

107 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 119

Break out spaces work in theory… their intention was to be flexible. The mere design of the school creates chances and opportunities for learning everywhere. I think many flexible spaces in school could be used more effectively and we still learn and discover how to use them - Mark, 47, teacher, Silvedale.

The flexible space use scenarios, in order to appropriately support certain learning styles, should be joint teachers-pupils-architects effort and should be developed during the planning process.

Flexible and adaptable school spaces should:
- take into account various technical and furniture arrangements,
- be representative of the collective spirit in the school,
- be designed with the possibility to develop and evolve in relation to teaching, learning and socializing activities.

In this way flexibility and adaptability of a school space will not mean just a cost-effective use of space, but it will also impact the quality of teaching and learning.[108] Until today some studies explained the pedagogical significance of flexible and adaptable learning spaces.[109] However, many of those findings have still to be fully incorporated into school building standards. Additionally, they should be included in the education of architects so they can firstly, understand their pedagogical significance, and secondly, so they can incorporate them more skillfully into their design. Lastly, much more empirical evidence is needed so it could be better understood how the contemporary pedagogical theory could be supported by spatial arrangements.

108 JISC (2006) Designing Spaces for Effective Learning: A guide to 21st century learning space design. Online: www.jisc.ac.uk/uploaded_documents/JISClearningspaces.pdf

109 For the pedagogical significance of flexible and adaptable spaces see Chapter 4, p. 49

Fig. 6.53.

11 SCHOOL LAYOUT AND DESIGN

22

FLEXIBILITY and ADAPTIBILITY

22-11 Simple design features such as movable partitions can assist with creating flexible and adaptable spaces.

22-10 Design of flexible and adaptable spaces should be a product of strategic design which takes into the account intended activities with those spaces. Otherwise, the quality of the learning process could be undermined.

22-9 Constant change of various subjects in one classroom is affecting the identity of these school spaces and is an obstacle for the development of a sense of space.

22-6 Even when the architects develop flexible and adaptable spaces, the lack of support and understanding from the authorities can undermine the process.

22-5 Flexible and adaptable spaces across the school enables pupils to learn according to their own tempo, socialise with their peers and teachers, and minimises the conflicts between the two groups.

A SUMMARY OF THE EMERGING THEMES

- **FLEXIBILITY AND ADAPTIBILITY** AS A PART OF SUSTAINABLE SCHOOL DESIGN ISSUES -

10

EDUCATION

9 SENSE OF A PLACE

music room is at the same time sleeping room for kindergarten

6

PARTICIPATION

22-6 A flexible space use scenarios, in order to appropriately support certain learning styles, should be joint teachers-pupils-architects effort and should be developed during the planning process.

5

SENSE OF COMMUNITY

LEGEND

Social sustainability themes
1. Safety and security
2. Health
3. Physical activity
4. Food
5. Sense of community
6. Participation
7. Inclusion and equity
8. Cultural diversity
9. Sense of place
10. Education

Environmental sustainability themes
11. School layout and design
12. Construction and materials
13. Light
14. Ventilation, cooling / heating
15. Water
16. Waste and recycling
17. Transportation
18. Energy

Economic sustainability themes
19. New technologies
20. Cost-effectiveness
21. Operation and maintenance
22. Flexibility and adaptibility

Conclusions

Even through this study has its limits, some conclusions emerged in the previous analysis of the sustainability issues, such as:

- **Many environmental, social, and economic sustainable school issues are mutually interrelated.**
If we go back to safety and security and sense of community theme, we can see that the school environments where a sense of community was strong pupils perceived as safe.

- Social, environmental, and economic mutual interrelations make some school spaces multilayered.
For example, the sports fields were not described just as places where pupils and teachers practice sports, exercise, play and are physically active, but also as places where important bonds are formed, and where a sense of community could be cultivated.

- The way school design addresses some of the sustainability issues can directly or indirectly act pedagogically.
To illustrate, the raised beds and community garden present an architectural response to growing demand for places where children could learn experientially about healthy nutrition and plants growing. Engaging with these features through various activities, pupils can learn from those engagements. On the other hand, the way school design responds to a variety of safety and security issues indirectly contributes to the quality of the learning atmosphere within the school. No matter how interesting and attractive the design of some physical features might be, if these features are in the environment which pupils perceive as scary, unsafe or unpleasant, they will not engage with it, thus the learning will not happen.

- The visual identity of a school must clearly and transparently interpret wishes and ideas important for the members of the school and the local community.
Reflecting once again on the interview with the architect of Erika Mann school from Berlin we can see that the occupants could establish themselves as a community which, through school design, can communicate locally significant sustainability ideas.

- The layout, the design features, technical and technological installations should emerge from the contextual challenges, and should be in accordance with teachers` and pupils` teaching and learning activities, methods, and approaches, so as to be pedagogically valuable.
The situation with the solar water heaters in Fort Pienc illustrates this statement. Due to the tight and restrictive regulations architects could not provide a water harvesting system asked by the teachers. Barcelona is prone to droughts, because of the high temperatures. According to teachers the water harvesting system would have been an extremely important and valuable learning resource. What is more, as the school has two areas with raised beds for growing food, herbs and plants, steady source of water for irrigation would have been indispensable. However, the Catalonia Educational Department prescribed that each school can get two solar water heaters, and this is what at the end in the Fort Pienc school was installed. Today, due to his situation they are not used for learning.

Though Nair and Fielding suggest that teachers do not perceive the physical environment as a valuable educational component [110], the reason for this might be that their ideas and vision about how a certain space or its elements could be a pedagogical tool have not been translated into reality.

- Sustainable schools have not been defined just as physical entities. Instead, successful, inspiring places, able to act as "the third teacher" were the ones where place, participants in the learning process, and learning activities are well connected and mutually transforming. Pupils and teachers have not valued the places just for what they are, but also for what they can become through their transformations.

To illustrate, a very important factor impacting the pupil`s perception of safety in Fort Pienc school was the way teachers protected and respected pupils. Similarly, the teachers form from Silverdale school, when discussing what is the most important factor contributing to the sense of place in school believed that the people in the school make the place. In this case the participants in this study associated space with people and their relationships. Both the teachers and pupils in Fort Pienc valued the school garden and the places around the school, such as the Plaza, the patios, and the park, because they know how to use this space and adapt them for various activities. In this case the participants in this study associated space with activities occurring in them. In both cases they did not describe places as just physical entities, but as social and activity-based as well. The physical design of a school space in not the only factor determining how successfully a certain space can facilitate learning. Hes and Howard also argue that to what extent space fits the curriculum, the type of activities, and the engagement of teachers and pupils, impacts the pedagogical potential of certain space.[111]

- While designing sustainable schools architect`s design and intentions do not directly translate into desired behaviours, engagements and learning experiences of occupants.

Even when architects integrate design features and installation, which have pedagogical potential, they should not jump into assuming that by their mere presence pupils will learn. Choreographed space uses, taking into account the space, the actors, and the activities should be developed during the participatory design process. Later on during the exploitation phase of the sustainable school building the teachers and pupils could use these plans as support and stimuli, assisting them to skillfully and knowledgeably transform their school space according to their needs, wishes and teaching and learning methods. The transformation process during the inhabitation could become a learning process through which occupants explore, get to know well and master their environment. Additionally, building on the ideas of Brand [112] it could be argued that these knowledgeable modifications are one of the keys to the sustainability of certain school design.

110 Nair, P. and Fielding, R. (2005) The language of school design: Design patterns for 21st century schools. DesignShare.com, p. 84

111 Hes, D. And Howard, P. (2010) Using Construction of Schools Buildings as a Novel Approach to Teach About Sustainability. AUBEA 2010 - Proceedings of the 2010 conference of the Australasian Universities Building Education Association, July 2010

112 Brand, S. (1995) How buildings learn What Happens After They're Built. London: Penguin Books

Summary

Analysis and triangulation of the data obtained through interviews and workshops with architects, teachers and pupils led to creation of a series of key messages, which can potentially contribute to our better understanding of contemporary school design issues related to sustainability and pedagogy. Additionally, conclusions drawn at the end of the chapter imply that if we want to design sustainable schools able to incite, provoke and impact on learning we should not see space as just physical, but social and activity based. Design of school physical elements should be developed considering the teaching and learning activities and possible participants or actors in the learning process. As the idea that the schools can act as the third teacher is still under researched and poorly theorised, particularly in the arena of sustainability, the chapter that follows will further develop this idea, and theoretically frame it, so as to propose a better framework for analysing, understanding and designing pedagogically potent sustainable schools.

07

"Places teach us who, what, and where we are, as well as how we might live our lives."

- David A. Gruenewald

A NEW FRAMEWORK FOR DESIGNING SUSTAINABLE SCHOOLS TO ACT AS THE "THIRD TEACHER"

The analysis of the case studies results in the previous chapter revealed a myriad of relationships linking the sustainable school design and learning. Participants in this study explained how schools provide a rich experience for pupils, and which attributes of learning environments act as prompts or cues for learning [1], that is to say act as the "third teacher". More importantly, in describing which learning environments act successfully as the "third teacher" they mentioned three aspects: the physical location, the actors or participants in the learning process, and the learning activities. They did not think that just the physical environment impacts the learning, but the synergy of the three previously mentioned aspects.

Yet, the results of the analysis revealed that architects tend to see the school space as just a physical entity. The literature review, as well as the analysis in this thesis, suggests that led by this understanding architects so far produced a wealth of interesting school designs, aiming for them to be used as teaching and learning tools. However, the teachers` and pupil` observations imply that we should simultaneously consider the physical location, the participants in the learning process, and the learning activities, when designing sustainable school able to act pedagogically.

The idea that the schools can act as the "third teacher" is still under researched and poorly theorised, particularly in the arena of sustainability. Therefore, this chapter will theoretically frame the location - actors - activities - framework in order to propose a more comprehensive perspective for analysing and designing sustainable schools able to act pedagogically. As such this framework will be used in chapter 8. In order to understand this framework, and successfully apply it in the future we as architects should shift behaviourism to transactional constructivism so as to better understand what impacts the learning process; we should expand our understanding of what sustainable school 'space' is; we should develop better frameworks to analyse and design 'the space' of a sustainable school; and understand how pupils learn, derive meanings and attachments through experiencing the learning spaces. Exactly these steps will be explained in the following lines.

All of these steps are important because the conclusions from the analysis, are in accordance with Boy`s observation, suggesting that the gap between designed space, the experience of the occupants, and the learning outcomes does exist.[2] Hence, all interested in this topic should venture into adding to the discussion. This is a good way to establish and develop guidelines and principles, and build an extensive body of knowledge on the matter. It can bring us a step closer to a broader and more holistic understanding of the pedagogical potential of sustainable schools.

1 For in depth discussion about how schools can incite and provoke learning, thus act as the "third teacher" see chapter 4

2 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 104

The necessary shift: From behaviourism to transactional constructivism

If we want to increase the pedagogical potential of sustainable schools, we should change the way we understand both the learning process and the environments in which this process occurs. In other words, we should depart from the simplistic behaviourist stimuli-response approach. In the last ten to fifteen years such efforts could be observed in both fields – the field of learning theory and the field of architectural theory.

The learning process, as well as learning environments, have long been observed through the lens of behaviourism theory.[3] This theory delineates behaviour as an individual response to the stimuli in the environment. In this case it is assumed that knowledge can be brought to students by teachers. Traditional classrooms with rows of chair and tables facing the teacher is the traditional architectural response to this paradigm. Even today such response from architects could be observed. Approaching school design in this way suggests that some architects assume that specific design will result in a multitude of effects. This study also confirms that this approach is still alive. For example, in Silverdale school in Sheffield a part of the building was covered with the green roof which, as well as enhancing and encouraging habitat creation and balancing the building temperature, was intended to be a learning tool. Unfortunately, during the study only one student was aware that the green roof even existed. The provision of a certain space or features does not automatically lead to related learning, because environmental stimuli do not always result in the intended behavioural response. The physical environment can have an effect on the learning process and behaviour, but there is a myriad of other complex variables that must be taken into account. Barker and Gump argue that occupants and the spaces are interdependent and mutually informing.[4] This suggests that learners and learning environments are continually influencing each other, thus, the relationship between learners and learning spaces does not follow the deterministic pattern implied by behaviourism.

Research done by Boys and Lippman suggest that architects and researchers have tried to move forward considering experiential learning paradigm as a part of constructivist theory.[5] Experiential learning paradigm puts the accent on exploratory action learning and learners' activities. According to Von Glasersfeld learners engaging in the built and natural environments, through mental activities, construct knowledge.[6] Kolb adds that learning is not a straightforward stimuli-response situation, but a cyclical process of inspection, reflection, and abstraction.[7] Lippman criticises this approach because it does not address the issue of how learners learn in specific social and physical contexts, and how both the participants and the learning are transformed through that process. [8] As opposed to behaviourism the environment is here seen as passive, and the learner as active.

3 For more information see the work of Ivan Pavlov, Burrhus F. Skinner, or John B. Watson. A comprehensive review could be found in Baum, W. M. (1994). Understanding behaviorism: Science, behavior, and culture. New York: HarperCollins College Publishers

4 Barker, R.G. and Gump, P.V. (1964) Big School, Small School: High School Size and Student Behavior. Stanford: Stanford University Press, p. 3-10

5 For more information about constructivism see the work of John Dewey, Maria Montessori, or Jean Piaget mentioned in the chapter 4. For the architectural examples refer to Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons; and Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge

6 Von Glasersfeld, E. (1995) Radical constructivism: A way of knowing and learning. London, Falmer Press

7 Kolb D.A. (1984) Experiential learning experience as a source of learning and development. New Jersey: Prentice Hall

8 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 130

Social constructivism goes a step further, and acknowledges the significance of social encounters for learning. Building on the work of Vygotsky`s theory of proximal development [9], social constructivism stresses the importance of the culture and the context in which learning occurs, and the importance of pupils and teachers in the process of creating and constructing new meanings. According to Vygotsky learners do not just learn from experience, but they also learn from the perspectives of others through discussing ideas, opinions and beliefs. From these social interactions learners make sense of the problem and new concepts emerge.[10] Architects today have been trying to design spaces that support informal social interactions within learning environments. Alcoves, benches and tables alongside corridors, and in multi-functional spaces, such as the ones in Erika Mann school and Silverdale School, present an opportunity for learners to 'bump up against each other', stop, talk, exchange ideas and observe each other`s behaviours and attitudes.

Taking into account Altman`s holistic view that "the actions of one person are understood in relation to the actions of other people, and in relation to spatial, situational, temporal circumstances in which actors are embedded" [11], today we understand that learners and learning processes are inseparable and embedded in the physical and social contexts in which the learning occurs and which the learners occupy. This transactional constructivist view suggests that pupils do not passively respond and adapt to various environmental influences, but they actively engage in `reading` environmental messages. Lim and Barton describe this process of experiencing and reading places as being "facilitated within physical, social, and cultural contexts, where all the objects and events have specific meanings that are socially constructed as well".[12] This implies that transactional constructivism equally stresses the physical location, the participants, and the activities in the learning process.

Interestingly enough, much contemporary architectural "theory" stresses the same three aspects when defining space: the physical location, the participants, and the activities. To illustrate, architects and critics such as Koolhaas and Tschumi, advocate this idea and argue against representation- or image-based architecture.[13] This means that architectural space should not be seen as a static setting, because meaning making is not the result of just what we see in space. Boys adds to the discussion and explains that"spaces are not just settings in which behaviours are produced, but are understood as inherently performative and events based".[14] In other words we should speak of architecture as an event, instead of architecture as an object.[15] Architectural space can therefore be seen as a process, where "meaning making" occurs through our cognitive interactions with its physical and social aspects.

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9 Vygotsky, L. (1978) Mind in Society: The development of higher psychological processes. Cambridge, MA: Harvard University Press

10 Mayer, R. (1996) Learners as information processors: Legacies and limitations of educational psychology`s second metaphor. Educational Psychologist 31 (3-4), p. 151-161

11 Altman, I. (1992) A transactional perspective on transitions to new environments. Environment and Behaviour, 24 (2), p. 268

12 Lim, M. and Barton, A.C. (2010) Exploring insideness in urban children's sense of place. Journal of Environmental Psychology, 30, p. 329

13 For a much broader discussion see
Koolhaas, R. (1997) Delirious New York: A retroactive manifesto for Manhattan. New York: Monacelli Press
Koolhaas, R. and Mau, B. (1997) S, M, L, XL. New York: Monacelli Press
Tschumi, B. (1996) Architecture and Disjunction. Cambridge, MA: MIT Press

14 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 28

15 Tschumi, B. Le Fresnoy (1991-1997) National studio for contemporary arts, Tourcoing, France. Online: http: www.archined.nl/oem/reportages/fresnoy/fresnoy4.html

Taking into account the developments in the field of both learning theory, such as transactional constructivism, and the developments in the field of architectural theory, such as the concept of performative and event based architecture, learning process, as well as a design process, should align and reflect each other. Observing the learning process through the prism of transactional constructivism, and framing the space in which it occurs as event-based, suggest that if we want to design sustainable school able to incite and provoke learning, and act as the "third teacher", we should take into account the three aspects stressed as important by both the learning and architectural theory: the physical location, the participants, and the activities.

From sustainable school space to sustainable school place

"Places are sensible, alive, active and animate and with all their characteristics, they are able to enter into a relationship with the human beings"

- Merleau-Ponty [16]

In order to be able to devise a framework for analysing and designing schools which entails the physical location, the participants, and the activities, space should be distinguished from place.[17] Spaces are physical locations that could be easily found on a map. Providing only guidelines for dimensioning space, calculating the necessary energy reduction by employing specific technical equipment and construction features, many sustainable school building guides, standards and propositions explained in the literature review [18], define sustainable school space as Euclidean, mathematical and geometric space. De Certeau suggests that places, on the other hand, imply character, emotional attachment, sense of belonging, or people-space relationships.[19] According to him spaces are transformed into places through human presence. Thus, sustainable school environments should not be seen as a final products or objective phenomena, but they have to be read, interpreted and (re)constructed by their occupants. I believe that the extent to which sustainable school places are able to stimulate and encourage a multitude of interpretations and readings, is linked to their pedagogical potential. In order to engage with occupants, and to better understand their interpretations of the space, a new model for exploring, comprehending and designing sustainable school spaces will be proposed.

Dynamic location-actors-activities framework: a better way for understanding sustainable schools

In order to increase the pedagogical potential of sustainable schools we should examine the transactional relationships between the physical aspects of sustainable learning environments, their occupants and activities within them. For this purpose a dynamic location-actors-activities framework will be presented. This model was derived taking into account various aspects of successful and inspiring learning environments, that the participants in this research named as important aspects.[20] In order to theoretically frame this model the literature was explored and concepts emerged, which could aid its better understanding.

16 Merleau-Ponty, M. (1962). Phenomenology of perception. New York: Humanities Press, p. 55

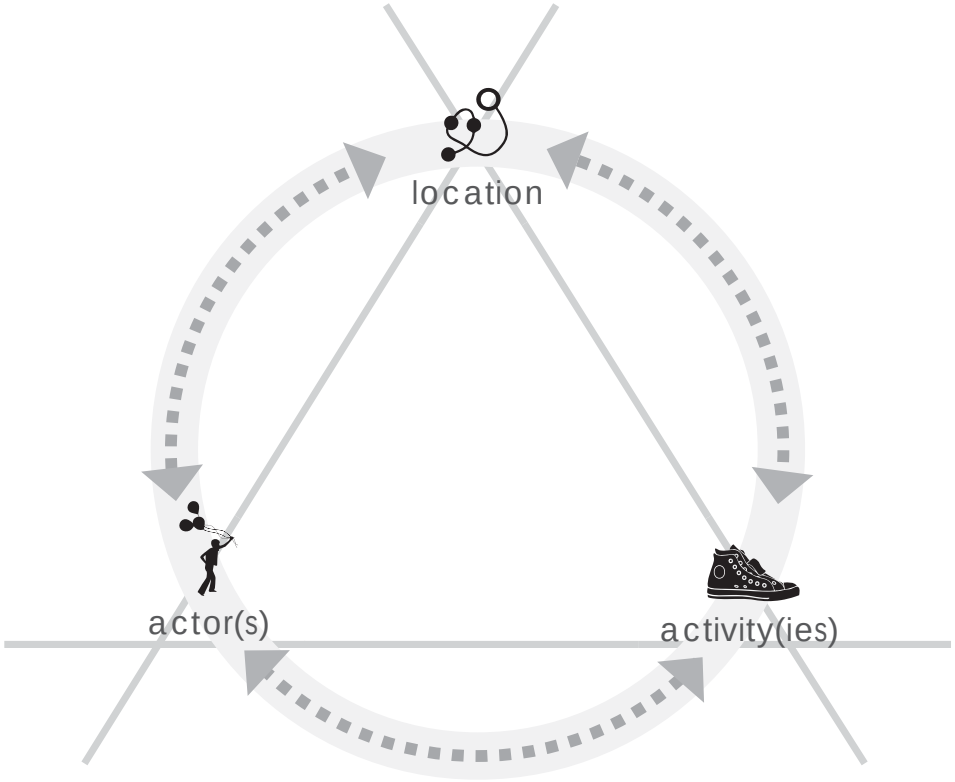
17 Malpas, J. E. (2004) Place and Experience: A Philosophical Topography. Cambridge: Cambridge University Press, p. 22

18 For a detailed discussion see chapter 4

19 De Certeau, M. (1984) The Practice of Everyday Life. Berkeley, CA: University of California Press, P. 117

20 For more information refer to conclusions in chapter 6, p. 148-149

Fig.7.1. Dynamic location-actors-activities framework for analysing and designing sustainable schools



Place = { location + activity + actor(s) }

Actors - Locations	how actors transform locations?	Locations - Actors	how locations transform actors?
Activites - Locations	how actvities transform locations?	Location - Activities	how locations transform actvities?
Activities - Actors	how actvities transform actors?	Actors - Activities	how actors transform actvities?

The dynamic location-actors-activities model implies that sustainable school space should not be seen as just a physical entity. Instead, it should be understood as a situated practice which can never fully exist without its occupants, their activities, and the context which they are part of and in which they live, work, and learn (Fig. 7.1.). Observing the space through such a trinary system is not a completely new thing. Lefebvre proposed a `spatial triad` as a better method for observing and analysing space.[21] This method analyses the complexity of a space by considering its three aspects: social and spatial practices, the design of the environment, and occupants` perceptions, engagements, and adaptation of both practices and design. Yet, sustainable school space observed through such a trinary system should not be understood as a static and a stabile construct. It is rather a dynamic assemblage, consisting of physical location, actors and activities, which are continually transforming each other.[22]

Additionally, not all the actors, engaging with a place could read the same messages and learn in the same way. A useful concept that fosters our understanding of the pedagogical significance of the person-environment relationship is Gibson`s concept of affordances. The author explains that affordances are "functional possibilities of the environment in relation to a person".[23] What is more, affordances are always context specific, different and unique for each individual and a specific group of people. This means that developmental opportunities of a certain environment are simultaneously determined by its physical and social characteristics, as well as by the characteristics of a particular individual.[24] Lastly, the way acquired knowledge will be distributed in one learning community could be understood with the help of Wenger`s concept of 'learning communities'. He argues that learning depends on the relationships between the people, their common goals and interests, and their regular interactions in order to exchange work, experience and insight. [25]

The pedagogical potential of sustainable school buildings should be developed considering learners, learning process and learning environment as dynamic concepts embedded one within another. Comprehending the sustainable school space is not enough. We should also understand how people learn from experiencing learning environments, and what might be the important steps on the way.

21 Lefebvre, H. (1991) The Production of Space. Translated by Donald Nicholson-Smith. Oxford: Basil Blackwell

22 'Assemblage' theory developed by Deleuze and Guattari, is rather a theory of society than of place. Refer to Deleuze, G. and Guattari, F. (1980) A Thousand Plateaus. Translated by Brian Massumi. London and New York: Continuum, 2004. Yet, paired with Dovey`s application for understanding space could indeed be theoretically and practically useful, aiding our understanding on the matter. For more information see Dovey, K. (2010) Becoming Places: Urbanism/Architecture/Identity/Power. New York/ Routledge.

23 Gibson, J. J. (1979) The Ecological Approach to Visual Perception. Hillsdale: Lawrence Earlbaum Associates, Inc. Publishers, p. 129

24 Heft, H. (1988) Affordance of children`s environments: a functional approach to environmental description. Children`s Environments Quarterly, 5 (3), p. 29-37

25 Wenger, E. (1998) Communities of practice: learning, meaning and practice. Cambridge: Cambridge University Press

Learning from experiencing the sustainable school environment

Local environment and local places, schools, neighbourhoods, or towns, have been recognised as valuable sources of knowledge by the concept called place-based education.[26] Yet, one of the biggest problems of contemporary standardised and globalised education is the fact, as Gruenewald puts it, it "essentially dismisses the idea of a place as a primary experiential or educational context".[27] Contemporary school architecture demonstrates the same trend by divorcing pupils and teachers from their local context, by the lack of awareness, connection to and appreciation for the context from which it emerges. If we want school architecture to act pedagogically and empower pupils, teachers, and local community members to actively engage in designing their sustainable future, we as architects should address the specificities of the local "experiences, problems, languages, and histories"[28] through design. Our design solutions should emerge from the specific contextual attributes.

Building on the idea that places constitute an important source of knowledge is important because Gruenewald stresses that the way humans experience places is "profoundly pedagogical".[29] Places teach us and places make us. Places constitute the centres of our experience, demonstrate how the world works and define our position in that world. From direct experience with a place, humans are able to learn.[30] To what extent the places will be successful `teachers` depends on the attention we give them and our understanding of how the places we inhabit shape our knowledge. [31]

Learning from experiencing the sustainable school environment: Important steps on the way

As argued in this chapter how a certain sustainable school will act as a "third teacher" and incite and provoke learning depends on not just the physical design of a school. It is impacted by constants transformations of the physical location, the actors in the learning process and the learning activities through which they engage. So that the learning from experiencing sustainable schools is better understood the text that follows will propose what important steps on that way might be.

Lippman argues that every learning starts with **perception** [32] (Fig. 7.2.). Being attracted to a certain feature, situation or opportunity in the learning environment pupils will start to actively explore learning possibilities through various activities.

26 Smith G. A. (2013) Place -based education: Practice and impacts, in Stevenson, R.B., Brody, M., Dillon, J. and Wals, A.E.J. International Handbook of Research on Environmental Education, New York: Routledge, p. 213-220

27 Gruenewald, D. 2003 The best of both worlds: A critical pedagogy of a place. Educational Researcher 32 (4), p. 7

28 McLaren, P., and Giroux, H. (1990). Critical pedagogy and rural education: A challenge from Poland. Peabody Journal of Education, 67(4), p. 163

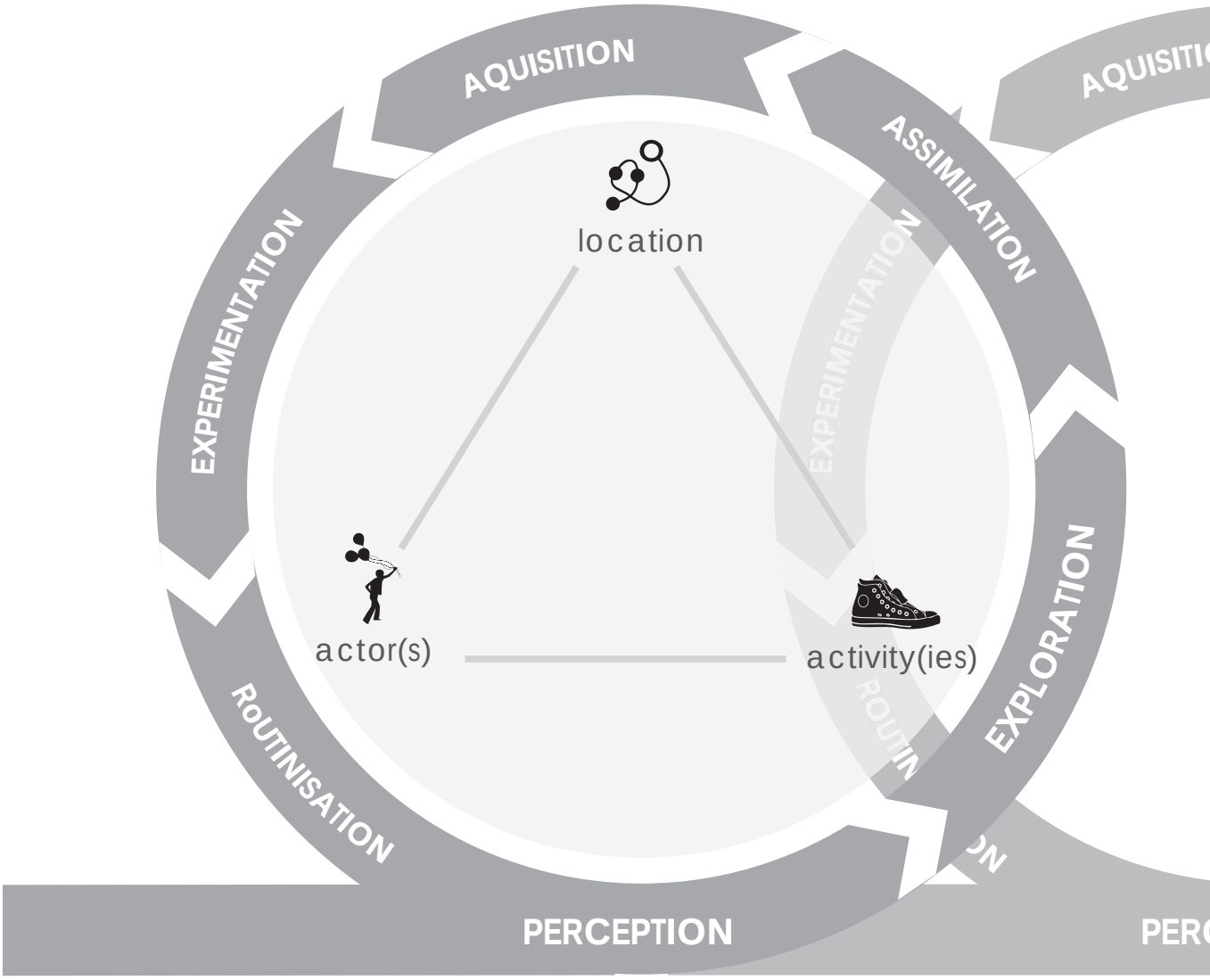
29 Gruenewald, D. (2003) Foundations of Place: A multidisciplinary framework for place-conscious education. American Educational Research Journal, 40(3), p.621

30 Weinstein, C.S. and David, T. G. (1987) Spaces for Children. The built environment and the child development. New York, Plenum Press

31 Gruenewald, D. (2003) Foundations of Place: A multidisciplinary framework for place-conscious education. American Educational Research Journal, 40(3), p. 619-654

32 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 131

Fig. 7.2.



*experiencing school spaces is **profoundly pedagogical**.*

over time

This process is

PERCEPTION

seeing, realising an opportunity for learning, experiencing

EXPLORATION

actively exploring and engaging with the learning environment

ASSIMILATION

gaining new skills and knowledge through satisfying, meaningful, experience

experiental learning cycle by Kolb

DIVERGING

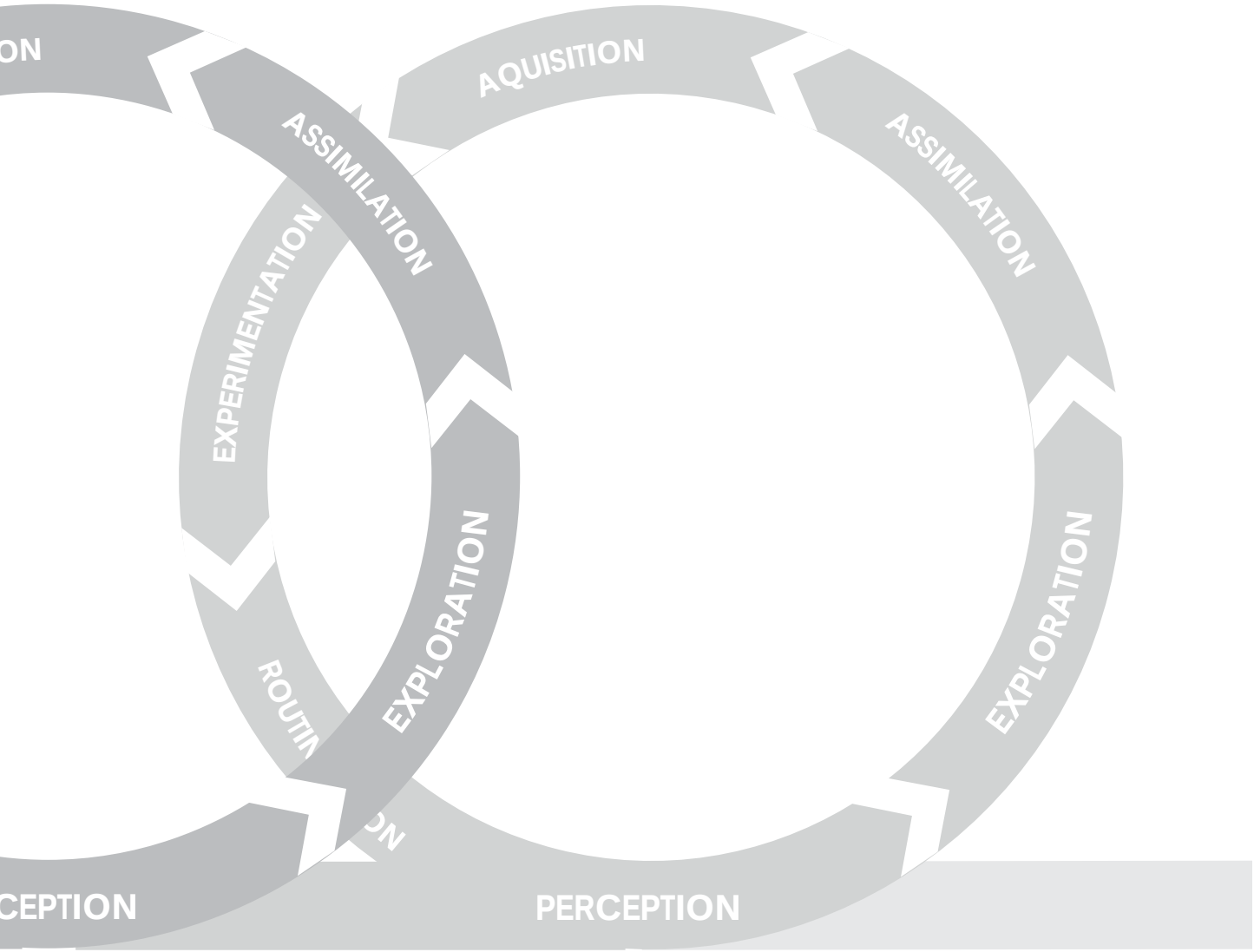
CONCRETE EXPERIENCE

REFLECTIVE OBSERVATION

having an experience

reflecting on an experience

ARNING FROM EXPERIENCING THE SUSTAINABLE SCHOOL ENVIRONMENT: IMPORTANT STEPS ON THE WAY



dynamic — multidimensional — fluid

continual — in-action — transactional — dialogical — on-going

AQUISITION

increased confidence, realisation of gained competences, know how to navigate the learning environment and engage

EXPERIMENTATION

playing with what is learned, trying out

ROUTINISATION

being too familiar with the activities and situations at hand, and start looking for new opportunities, experiences and learning activities

LATING — CONVERGING — ACCOMODATING

ABSTRACT CONCEPTUALISATION — ACTIVE EXPERIMENTATION

concluding, learning from the experience — trying out and playing with what was learned

Exploration and play provide a means for pupils to familiarise themselves with a place. According to Matthews they are energisers that support mastery of environments.[33] Through exploration children can increase place knowledge, and **assimilate** and integrate that knowledge.[34] Such engagements are vital as they present a form of thinking through doing; they are as Boys puts it, "a part of an ongoing creative process of intersecting of what is known with what is not, so as to investigate what might be".[35] This could be followed by **acquisition** step where pupils engaging in various activities, with different participants, around different design features, and successfully completing them, have their confidence increased. Lim and Barton argue that through this active process, involving problem solving, pupil`s gain important knowledge which can turn them into skillful, capable, strategic, competent, confident explorers, and participants in their school space.[36] **Experimenting** and playing with what they learned, and trying out new ideas pupils could easily master the certain situation at hand, and start looking for new opportunities. As pupils grow and develop, school design needs to continue to offer new place experiences and opportunities for exploration. In this way the occupants, the activities and the environment will reform each other perpetually.[37]

Whether we would like to stimulate learning about energy saving issues, or support the development of a sense of community and group cohesion, the role of sustainable school design as an 'environmental provocation' is very important. First, the design has to be intriguing, stimulating, and support imagination, and at the same time sufficiently clear and transparent, in order to attract pupils' attention. The design should neither be overly- complex nor too simple. If the design is too simple pupils could easily lose interest, or if it is too complex it might scare them away. Additionally, easily recognisable and pre-labelled spaces could present a danger to students as they could, as Boys suggest, "fall into standard assumptions about their place as a passive rather than active learners".[38] Pupils may even prefer familiar places due to the sense of security they offer. On the other hand, changing the standard routine of space use may undermine pupil`s confidence. Hart argues that familiarity as well as novelty of design features, and the way they are distributed across the school can either provoke or inhibit pupils` exploration and learning.[39]

Furthermore, it should be stressed that the process of experiencing learning environments, and learning from this process, should be seen as, dynamic, in-action [40] continually progressing and evolving over time. As pupils and teachers are always learning and changing, their relationships with the learning environment is also dynamic.

33 Matthews, M. H. (1992). Making sense of place: Children's understanding of large scale environments. New York: Rowman & Littlefield, p. 46

34 Cornell, E.H. and Hill, K.A. (2006) The problem of lost children. p.26-41 in Spencer, C. and Blades, M. (Eds.) (2006). Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press, p. 35

35 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 34

36 Lim, M. and Barton, A.C. (2010) Exploring insideness in urban children's sense of place. Journal of Environmental Psychology, 30, p. 336

37 Brand, S. (1995) How buildings learn What Happens After They're Built. London: Penguin Books

38 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 46

39 Hart, R. (1979) Children's experience of a place. New York: Irvington Publishers, p. 374

40 Graumann, C. F. (2002). The phenomenological approach to people-environment studies. In R. B. Bechtel, & A. Churchman (Eds.), Handbook of environmental psychology. New York: Wiley. p. 95-113

This is another reason why the physical environment of sustainable schools needs the capacity to grow, to be modified and adapted according to activities and participants; in other words it must be able to promote the flow of learning. Places have to enable different relationships to emerge and different learning experiences to be accommodated around activity settings. Physical elements of space, such as furnishing and equipment, could be used to promote or discourage encounters depending on the learning activity. For example sociofugal arrangements support individual work, while sociopetal arrangements encourage social activities and group work.[41] Moreover, no matter how competent and experienced the architect is, he/she can never anticipate all the teachers` and pupils' needs and intentions. Hence, adequate empty spaces, or unfinished spaces with some easily rearrangeable parts, for example, need to be included, as they offer the potential for new learning spaces and activities to be created. Approaching the problem of designing sustainable schools in this manner, means acknowledging the fact that the physical environment can "frame or invite behaviour" [42], but never totally influence and determine it.

Embracing the transactional approach to sustainable school design, and using the proposed location - actors - activities model could help us design sustainable schools able to act as the "third teacher" by supporting pupils to, through appropriate activities with their peers and teachers, engage, explore and transform their places, learn from those engagements, and develop the places over time.

Learning from experiencing the sustainable school environment: deriving meanings, attachment and identity

Places are infused with meaning and feeling - Rose [43]

Experiencing sustainable school space does not present just a learning process. Interacting with physical, social, and afterwards symbolic and imaginary features of a space pupils derive important meanings, and construct and cultivate identity on several levels: personal, group, school, and community. Discussing place identity we should understand that place identity is created by both individual and by groups; it is not universally shared and unique concept and outsiders can have very different interpretations; contextual variables (social, economic, cultural) impact identity making; and people, places and identities are ever-changing.[44] Participation with peers and teachers in various activities in a certain context helps meanings to be created, recreated and endorsed.

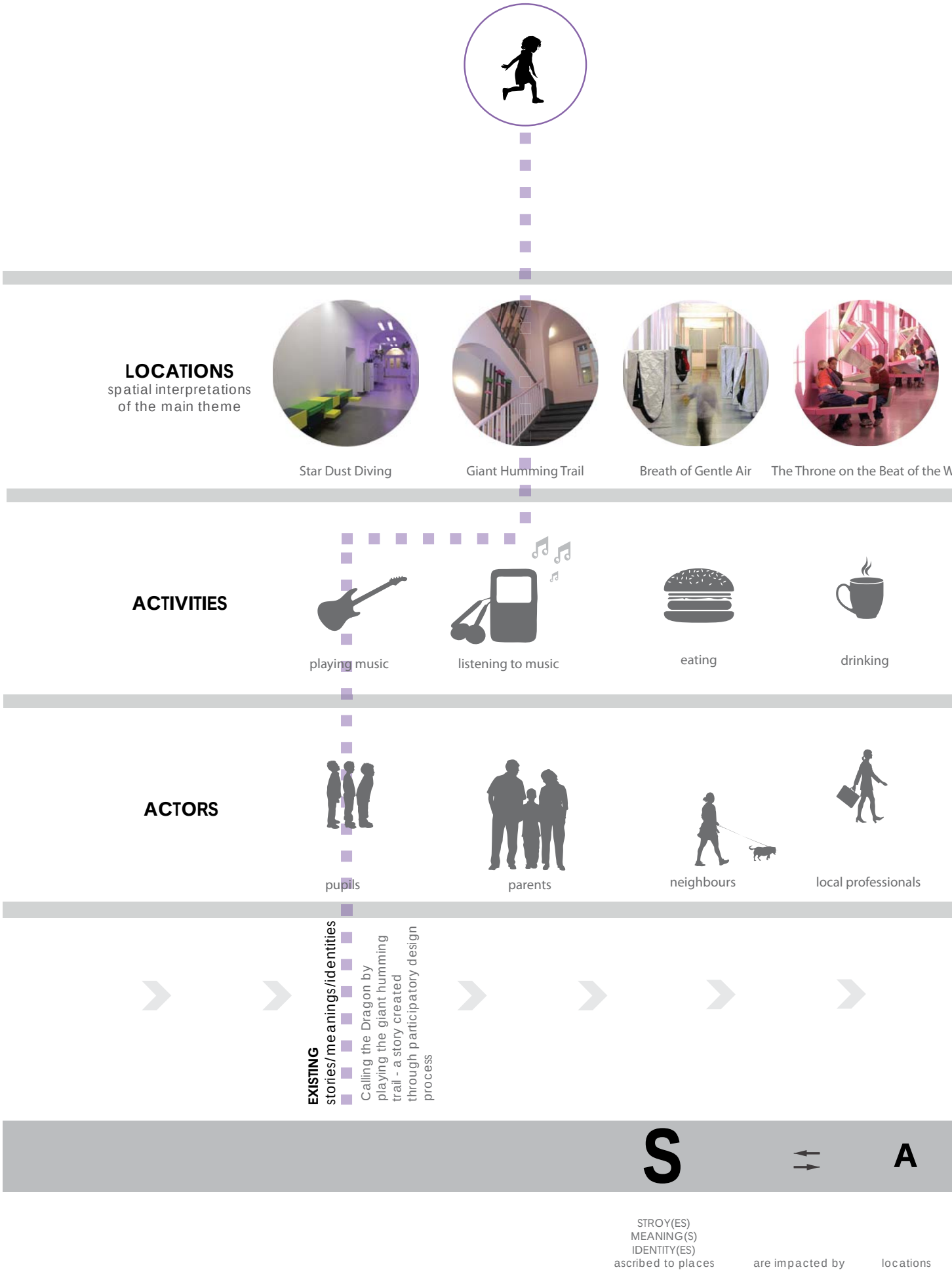
41 Osmond, H. (1966) Some physiatric aspects of design. In L.B. Holland ed. Who designs America? New York: Doubleday, p. 281-318

42 Lawson, B. (2001) The language of Space. Oxford, Architectural Press, p. 225

43 Rose, G. (1995) Place and identity: a sense of a place. In Massey, D. and Jess, P. (eds) A Place in the world? The shape of the world: Explorations in Human Geography. New York, Oxford University Press, p. 88

44 Discussing place identity we should understand several important aspects:
(a) place identity is created by both individual and by groups. See Allen, J. and Massey, A. (1995) Geographical Worlds. Oxford University Press: Oxford, p.55;
(b) it is not universally shared and unique concept and outsiders can have very different interpretations. See Proshansky, H.M., Fabian, A.K. and Kaminoff, R. (1983) Place identity : Physical world socialization of the self. Journal of Environmental Psychology 3 (1), p.57-83;
(c) contextual variables (social, economic, cultural) impact identity making. See Matthews, M. H. (1992). Making sense of place: Children's understanding of large scale environments. New York: Rowman & Littlefield, and Rose, G. (1995) Place and identity: a sense of a place. In Massey, D. and Jess, P. (eds) A Place in the world? The shape of the world: Explorations in Human Geography. New York, Oxford University Press,
(d) people, places and identities are ever-changing. See Lim, M. and Barton, A.C. (2010) Exploring insideness in urban children's sense of place. Journal of Environmental Psychology, 30, p. 328-337

Fig. 7.3.


LOCATIONS
spatial interpretations
of the main theme
Star Dust Diving
Giant Humming Trail
Breath of Gentle Air
The Throne on the Beat of the W
ACTIVITIES
playing music
listening to music
eating
drinking
ACTORS
pupils
parents
neighbours
local professionals
EXISTING
stories/meanings/identities
Calling the Dragon by
playing the giant humming
trail - a story created
through participatory design
process
S
A
STROY(ES)
MEANING(S)
IDENTITY(ES)
ascribed to places
are impacted by
locations

LEARNING FROM EXPERIENCING THE SUSTAINABLE SCHOOL ENVIRONMENT: DERIVING MEANINGS, ATTACHMENT AND IDENTITY

Chill Room

Snuffle Garden

Dragon`s Breath

Flying on the Dragon's Tail

A

writing

socialising

reading

playing

B

local artists

non teaching staff

teachers

C

RECREATED
stories/meanings/identities

Firing clouds are where the Dragon sleeps - a new story created by a pupil though engagements

STORIES / MEANINGS/ IDENTITY
derivation formula

A U B U C

U **B** U **C**

activities

actors

Lippman suggests that this process presents an opportunity for occupants to "develop understandings about themselves and their social environment, … and their identity".[45] For this reason we should not think that the sustainable school environment consists of only spatial and design attributes, but of meanings as well. We should consider how the sustainable school space cultivates meanings derivation and identity formation, because, according to Matthwes, meanings and identity can impact how occupants make sense and give significance to their environment.[46] **The architecture of a sustainable school should be developed to sustain, not just critical, but emotional and affective relationships with its occupants. Without emotional attachment occupants will not be attached to, thus care for their learning environments, and care is a prerequisite for the sustainable development.**

Once again we can use place - actors - activities framework to explain how through experiencing learning environments pupils could derive meanings, attachments and identity (Fig. 7.1.). For illustration purposes we could use explanations from the analysis part, section about a sense of place, where one girl in Erika Mann school, through engagements with the school space created a unique story about the space, and interpreted the space in a much different way, than it was envisaged by architects.[47]

If we once again frame the sustainable school place as a "series of situated, interpretative experiences"[48], it is proposed that **for sustaining such experiences over time creative dialogue between occupants and school space should be allowed. Shared experiences, meanings, and later on memories, created as a result of this dialogue, could contribute to a place identity that can reinforce important sustainability messages.**

Metaphors as central, though not often explicit, aspects of architectural design seem to be a good basis for pupils, teachers, and architects to engage in the discussion about school space during the design process, as they, as suggested by Jamieson, present a kind of common language.[49] Later on organising parts within an ordered main theme, or metaphor, is one way how the identity of a place could be created by using the design concept.[50] Using metaphors in this way can be indeed powerful, but dangerous tool as well. Metaphors and themes have to be interpreted and translated into an actual school design without treating architecture as image based, avoiding well recognized convention. To illustrate, if pupils during the participation process expressed the wish to have a wood-like school this should by no means mean painting trees or gluing up posters of threes on the classroom walls. Seeing architecture as performative and event-based, implies that interpreting phenomenological aspects of the `learning in the woods` story (for example leaves falling in autumn, bending branches under the heavy wind) would probably be a much better approach.

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45 Lippman, P.C. (2010) Evidence based design of Elementary and Secondary schools. Hoboken: John Wiley and Sons, p. 21

46 Matthews, M. H. (1992). Making sense of place: Children's understanding of large scale environments. New York: Rowman & Littlefield

47 See chapter 6, theme 9: a sense of place, p. 126

48 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 109

49 Jamieson, P. (2008) Creating new generation learning environments on the university campus. Woods Bagot Research Press. Online: www.woodsbagot.com/en/Documents/Public_Research/WB5307_U21_FA-7_final.pdf

50 Wolfe, M., & Rivlin, L. (1987). The institutions in children's lives. In C.S. Weinstein & T.G. David (Eds.) Spaces for children: The built environment and child development (pp. 89-114). New York:Plenum Press, p. 92

Additionally, in order to enable affective engagements, architecture of sustainable schools should be developed to engage all senses. Using their own senses, occupants can experience various physical and social qualities of the school space, turning the physical space of the school into the "lived" one.[51] By moving around, seeing, smelling, touching and hearing pupils explore the space, acquire, process and structure environmental knowledge, test spatial, bodily and cognitive boundaries, and communicate. When all five senses are engaged, they can reinforce each other, dramatise spatial experience and provide emotion-charged environment.[52] In other words, sensations and movement stimulate pupils to feel, receive and respond. Additionally, such experiences give possibility to pupils to connect the real world with the world of imagination, material aspects of the place with the symbolic[53] and serve as a mean of transportation from "boring ritualised life in school to their magic world".[54] These personal, 'magic worlds' enable pupils to call a school place their own. **An environment that allows and invites sensory experience carries subjective and personal meanings, and enables important affective engagements for occupants**.

Moreover, **engaging in and with such a sensory space, pupils name them, tell stories about them**; that is to say, use words which have the power to render objects and impart a certain character to them. As Tuan explains "when it is named – a place promises to open up to other places".[55] This is because naming means recognition, communication and claiming territory[56], it is a way to distinguish a place from a larger whole, and the most importantly is one of the basic steps in the construction of place identity. By naming a certain place, that place becomes personally significant for a child**.** On the other hand, as children tell each other these names, part of their space becomes shared in meaning.[57] Hart suggests that names that children assign to places are directly descriptive or functional.[58] For example, in Erika Mann school they are derived from the participatory design process with pupils. The name of the spaces around the school are a kind of poetry around which different stories and tales are woven. Stories, beside names can convey the relationships between school, occupants and their identity [59], and they have the power to tell everyone what they and their community stand for and are indispensable pedagogical, socialization, inclusion and integration tools.

In turn these stories influence how children learn, interact and make sense of a place. Attachments, meanings and emotions derived from environmental experience with a place can be so strong and from the central part of the identity of the people having the experience. It is because "part of how you define yourself is symbolized by certain qualities of that place".[60]

51 Soja, E. W. (1996) Thirdspace: Journeys to Los Angeles and Other Real-and-imagined Places. Malden: Blackwell

52 Tuan, Y.F. (1977) Space and place. The perspective of experience. London, Edward Arnold Publishers Ltd

53 Matthews, M. H. (1992). Making sense of place: Children's understanding of large scale environments. New York: Rowman & Littlefield, p. 45

54 Derr, T. (2006) Sometimes birds sound like fish. In Spencer, C. and Blades, M. (Eds.)Children and their environments: Learning, using and designing spaces. Cambridge: Cambridge University Press, p. 114

55 Tuan, Y.F. (1991) Language and the Making of Place: A Narrative-Descriptive Approach. Annals of the Association of American Geographers, 81(4), p. 684

56 Ashworth, G.J. and Graham, B. (eds) (2005) Senses of Place: Senses of Time. Burington, Ashgate Publishing Company

57 Hart, R. (1979) Children's experience of a place. New York: Irvington Publishers, p. 342

58 Ibid, p. 342

59 Cronon, W. (1992) A place for stories: nature, history and narrative. Journal of American History, 78 (4), p. 1347-1376

60 Rose, G. (1995) Place and identity: a sense of a place. In Massey, D. and Jess, P. (eds) A Place in the world? The shape of the world: Explorations in Human Geography. New York, Oxford University Press, p. 89

What is more, working and interacting with each other, as well as the physical elements of a learning environment, pupil's identity is formed and transformed. **Through this process pupils are not just developing their own identity, but are participating in developing identities of their peers, identity of the group and identity of the school space. The relationships between the pupil and other people in school and objects impacts how the pupils defines him/herself and the environment as well**.[61] In this way place-identity impacts self-identity and vice versa.

Additionally, occupants` lived experience, feelings and meanings are different. Through time, these experiences, feelings and meanings are accumulated embracing the past and present. Hence, place identity should be seen as, according to Proshansky, Fabian,and Kaminoff, a "potpourri of memories, ideas, feelings, attitudes, values, preferences, meanings, and conceptions of behaviour and experience".[62] This potpourri is in flux, constructed and deconstructed over and over again within places by various participants. Therefore, identities are neither fixed or given, nor ascribed, but negotiated between multiple places and multiple participants.[63] For all of these reasons space does not have a single reading, and it does not represent just a single thing. **Developing the design of a sustainable school as transactional, that enables a multitude of readings, could sustain the affective and dynamic occupant-place relationships over time, out of which personal and place identity could spring.**

Furthermore, pupils spend days and years in schools and it is to be expected that **if places allow to be experienced by the mind, body, and soul, the meanings derived from that experience will "rub off on personal impressions and moods".**[64] In such spaces pupils could find models for their lives. Exactly this statement should encourage architects to think how transactive design should reinforce important sustainability messages and allow them to develop over time to become main pillars of the school and their occupants identity and ethos.

In addition, **when a community is also involved in the school design, in the building process (such as doing simple technical work) and later on the school life , the space created could become an important component of community identity and useful part of an integration strategy**. Boys explains that metaphors, names, stories woven around a place identity can be "powerful expressions of social reality".[65] They can present a "communal situation"[66] depicting the condition of the community within the school, and within the local neighbourhood. Observing the Erika Mann school, the symbolic connection between the story about the Silver Dragon and the struggling multinational community trying to counter their problems and reinvent themselves through redesigning and opening up the local school could be seen.

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61 Weinstein, C. and David, T.G. (Eds.), Spaces for children: The built environment and child development (pp. 89-114). New York: Plenum Press, p. 90-91

62 Proshansky, H.M., Fabian, A.K. and Kaminoff, R. (1983) Place identity : Physical world socialization of the self. Journal of Environmental Psychology 3 (1), p.59

63 Malone, K. (2007) Child Space: An anthropological exploration of young people's use of space. New Delhi: Concept Publishing Company, p. 215

64 Walden, R. (ed) (2009) Schools for the Future: Design proposals from Architectural Psychology. Goettingen: Hogrefe, p. 16

65 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 25

66 Heaney, S. (1980). The sense of place. In Pre-occupations: Selected prose 1968–1978. London: Faber and Faber, p. 149

Today, in the whole community the Erika Mann school is called School of the SIlver Dragon. Interviews with the architect revealed that all community members identify with the school and are very proud of it. According to Dovey this is because the space "that mixes people of different social identities is in general less likely to reproduce those identities and more likely to promote the new identity formation".[67]

Lastly, it should be understood how incoming pupils, teachers, and community members accept and perceive the sustainable school. As the way occupants make sense of their space is inextricable from the sense of the time, the key to answering this question could lie in seeing identity as a heritage. Ashworth and Graham believe that heritage is tightly related to "material artefacts, mythologies, memories and traditions".[68] In this process the transactional design of the sustainable school could play the pivotal role. **Through interactions with the space, through the way occupants use the space, think and feel about it a shared history is created, and brought to life through the stories occupants tell. In this way transactive school design is the stimulus for creating new meanings, identities and for carrying the shared history of a place; that is to say, a witness of the past and a resource for the present.**

If we want the architectural design of a school to be embodiment, as well as stimuli for the creation of school identity, it should outgrow and stop being just an "imagery of a design metaphor" because "the representational image necessarily or transparently" does not "translates into an equivalent everyday lived experience".[69] By using the location - actors - activities framework proposed in this chapter, we could overcome the challenge of seeing space as image-based, and start understanding it as social, and activity based as well. The framework could assist us to increase the opportunities for creative dialogue between the school space and the occupants. To what extent a certain school space is sensory, engaging, responsive, aesthetically pleasing, provocative, interesting, pleasant, and meaningful, will determine how the occupants interact with the space and with each other, name their place, and tell stories about these places. Engaging and playing with physical elements mimicking interesting parts of the stories around the metaphor (such as folding and unfolding benches that by the way they are pulled up/down and by the sound they make mimic the flapping of the dragon`s wings in the Erika Mann school) as well as with the ideas behind the design, will help the occupants be active participants in the process of meaning making and identity cultivation, which both are central for affective occupant-place relationship.

Taking the previous discussion into consideration, it is proposed that the identity of a school should be seen as continually evolving construct, dependant on the meaningful and affective relationships between the occupants and their learning environment. The ability of a school design to include its occupants in their joint identity formation and transformation, could have significant impact on the extent to how their relationships will be sustained over time.

67 Dovey, K.(2010) Becoming Places: Urbanism/Architecture/Identity/Power. New York/ Routledge, p.110

68 Ashworth, G.J. and Graham, B. (eds) (2005) Senses of Place: Senses of Time. Burington, Ashgate Publishing Company, p. 4

69 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 118

Summary

If we want the sustainable school architecture to act as the "third teacher" that is to say, be able to impact on the learning and development of children, and transmit important sustainability messages, it should be seen as performative and event based. Using the location - actors - activities framework could assist us to analyse and design such schools. Considering all three aspects when designing pedagogically potent sustainable schools is important because what a pupils could learn from experiencing environments is neither a transmission of knowledge from teachers to pupils, nor active learning which takes into consideration the learning activities only, but "a negotiated process located at the interface between the physical and social context, the participants and their activities".[70] This implies that the interplay of the physical environments, participants in the learning process, and the learning activities equally determine the success of learning from the environmental experience. **As suggested by Gruenewald, this is important "so that the education of citizens might have some direct bearing on the well-being of the social and ecological places that people actually inhabit** (accent added)**".**[71]

Additionally, in order to minimise the gap between planned space, design intentions, actual lived experience and learning outcome, we have to unpack the "multiple, layered, and dynamic, components and relationships through which learners, learning, and spaces intersect".[72] For this purpose we should develop better models for understanding and examining sustainable school space. Using the dynamic actors-activities-location construct for observing, analysing and designing sustainable school space might be a step towards that goal. Approaching the sustainable school space with this framework in mind could help us to incorporate "the principles of sustainable development into the very sense of a place"[73], and acknowledge that school place is in the constant state of becoming.

Therefore, designing a pedagogically potent sustainable school place which leaves the opportunity for children, to through acting upon the environment, develop a critical and emotional relationship with it, still remains a radical challenge for architects. In spite of the difficulty of this challenge, we all must venture into offering our solutions. **Competent and knowledgeable engagements of children with the school environment do not lead just to intelligent transformations of the environment. They also impact the learning about social and environmental responsibility, and lead to intelligent transformations of the learners themselves.**[74]

Taking into consideration a series of key messages developed through the chapter 6, together with the theoretical location - actors - activities framework proposed in this chapter, this study will now continue by exploring the context of the school in Serbia in chapter 8 so that the designs ideas for transforming the school into more sustainable and pedagogically valuable could be developed.

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70 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 76

71 Gruenewald, D. 2003 The best of both worlds: A critical pedagogy of a place. Educational Researcher 32 (4), p. 3

72 Boys, J. (2011) Towards creative learning spaces: Re-thinking the architecture of post-compulsory education. London: Routledge, p. 117

73 Dovey, K.(2010) Becoming Places: Urbanism/Architecture/Identity/Power. New York/ Routledge, p. 105

74 Hart, R. (1979) Children's experience of a place. New York: Irvington Publishers, p.347

08

"Knowing is not enough, we must apply. Willing is not enough, we must do."

- Johann Wolfgang von Goethe

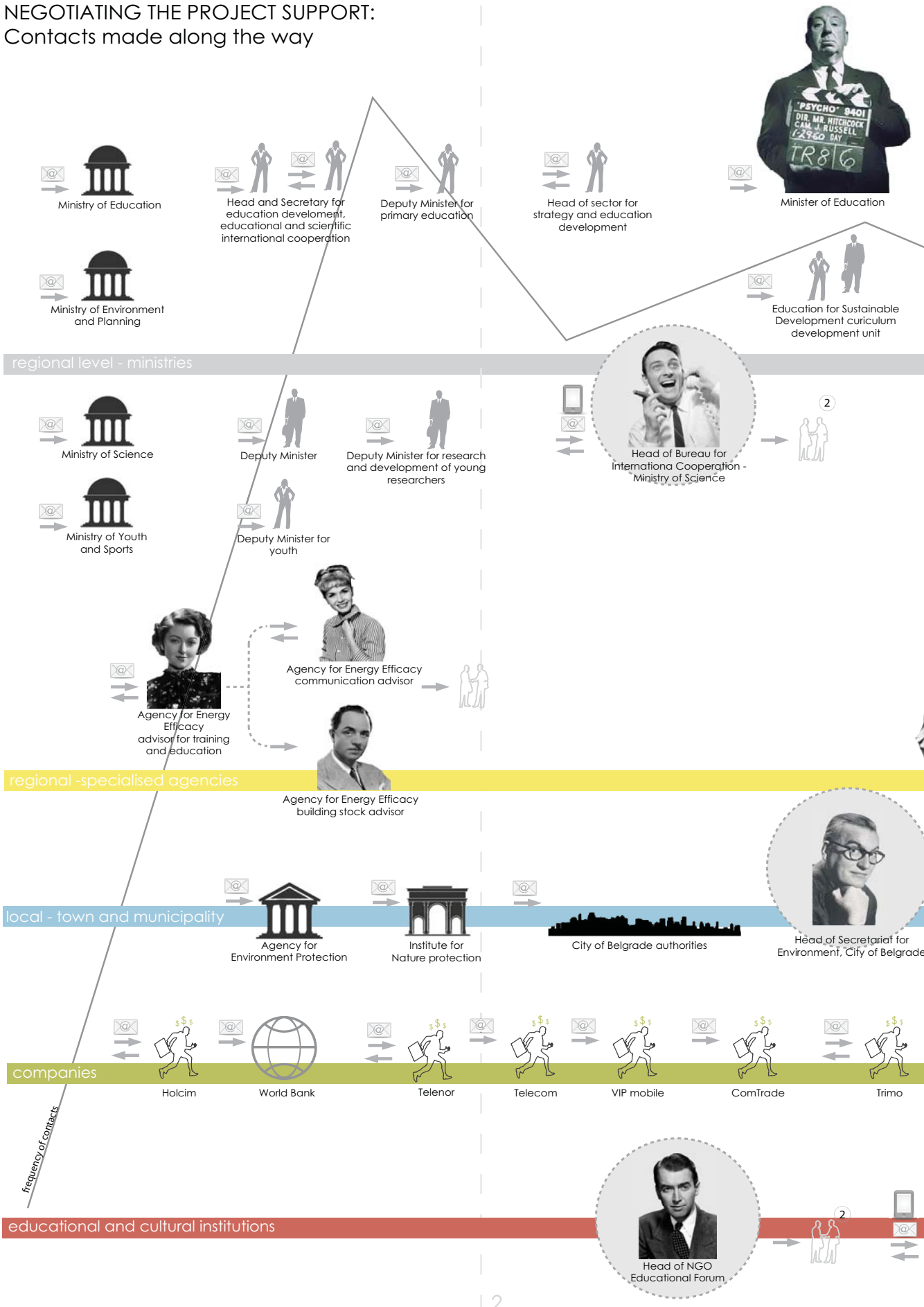
DEVELOPING DESIGN IDEAS FOR PRIMARY SCHOOL SIMEON ARANICKI-FROM SERBIA

The analysis in this thesis revealed a myriad of relationships linking the sustainable school design and learning. One of the most important messaged emerged in the analysis was then theoretically framed in chapter 7, so that a better framework for analysing and designing sustainable schools to act pedagogically is proposed. Taking into consideration the local policy, criticism and proposals from the teachers and the pupils, key messages from the analysis, and the proposed framework, this chapter will develop a series of design ideas for transforming one school in Serbia, the primary school Simeon Aranicki from Stara Pazova, into a more sustainable and pedagogically valuable one. This is important because the countries like Serbia are still not implementing contemporary research findings into the design of schools. If we in Serbia want to increase the tempo and the quality of the ongoing educational reform, we should implement the available knowledge into the design of schools more effectively. For this reason I have teamed up with primary school Simeon Aranicki from Stara Pazova, Serbia. The school desired to be remodelled into a more sustainable one, and contacted me during the spring in 2011. I have considered this as a great opportunity to implement some of the research findings and interpret the gained knowledge through design.

Negotiating the support for the project I have contacted various authorities in charge, both at the state and local level. After more than hundred calls and e-mails, thirty meetings, I have not been able to secure the financial support needed for carrying out the workshops (Fig. 8.1.). The biggest problem was the lack of the understanding about the importance of implementing the state of the art knowledge into the school design. This is when I founded the ARQubator - a voluntary, non-profit and non-governmental association. The association aims to actively involve children, young and grown ups, in projects connecting architecture and education, in order to improve the living conditions in the natural and built environment, and in that way contribute to a more sustainable future (Fig. 8.2.). With architecture students from the School of Architecture, Union University – Nikola Tesla,Belgrade, Serbia, I have organised all the workshops in the school. With the help of the socially responsible companies we managed to secure the financial help, organise the workshops with the teachers and pupils, and at the end produce a series of design ideas for transforming the school.

The design ideas were informed by the findings arising from this study, yet the decisions were always rendered through a series of important contextual variables. Taking into consideration the location - actors - activities framework the developmental potential and challenges of both the macro location - the town, and the micro location - the school was explored. Together with the future actors in the learning process the teachers and the pupils, school space was evaluated from the perspective of sustainability and pedagogy. At the end we developed a series of design ideas and discussed what kind of learning activities teachers and pupils could organise in each space proposed. As this study advocates the pedagogical potential of sustainable schools, the main intention behind the development of design ideas was tackling the locally identified sustainability challenges through school design, while considering how the newly proposed spaces could act pedagogically.

Fig. 8.1.


NEGOTIATING THE PROJECT SUPPORT:
Contacts made along the way
Ministry of Education
Head and Secretary for education develoment, educational and scientific international cooperation
Deputy Minister for primary education
Head of sector for strategy and education development
Minister of Education
Ministry of Environment and Planning
Education for Sustainable Development curiculum development unit
regional level - ministries
Ministry of Science
Deputy Minister
Deputy Minister for research and development of young researchers
Head of Bureau for Internationa Cooperation - Ministry of Science
2
Ministry of Youth and Sports
Deputy Minister for youth
Agency for Energy Efficacy communication advisor
Agency for Energy Efficacy advisor for training and education
regional -specialised agencies
Agency for Energy Efficacy building stock advisor
local - town and municipality
Agency for Environment Protection
Institute for Nature protection
City of Belgrade authorities
Head of Secretariat for Environment, City of Belgrade
companies
Holcim
World Bank
Telenor
Telecom
VIP mobile
ComTrade
Trimo
frequency of contacts
educational and cultural institutions
Head of NGO Educational Forum
2
2010

Head of Department for European Integration and projects and programmes in education

Deputy Minister

Head of School Modernization Project

Head of investment sector, student standard and procurement - Minstry of Education

*"Children to design schools?!?!?! *+*&#@! You must be out of your mind! They do not know school building standards!!!"*

"Dear child what you are talking about is distant future!!!"

2

Head of Education Secretariat and Head of Finances, City of Belgrade

3

Ytong

US Steel

Serbia Gas

Ading

3

Potisje-Kanjiza Tondach

3

Museum of Pedagogy

7

Primary school "Simeon Aranicki"

12

2011

LEGEND

e-mail contact

phone contact

contact responded

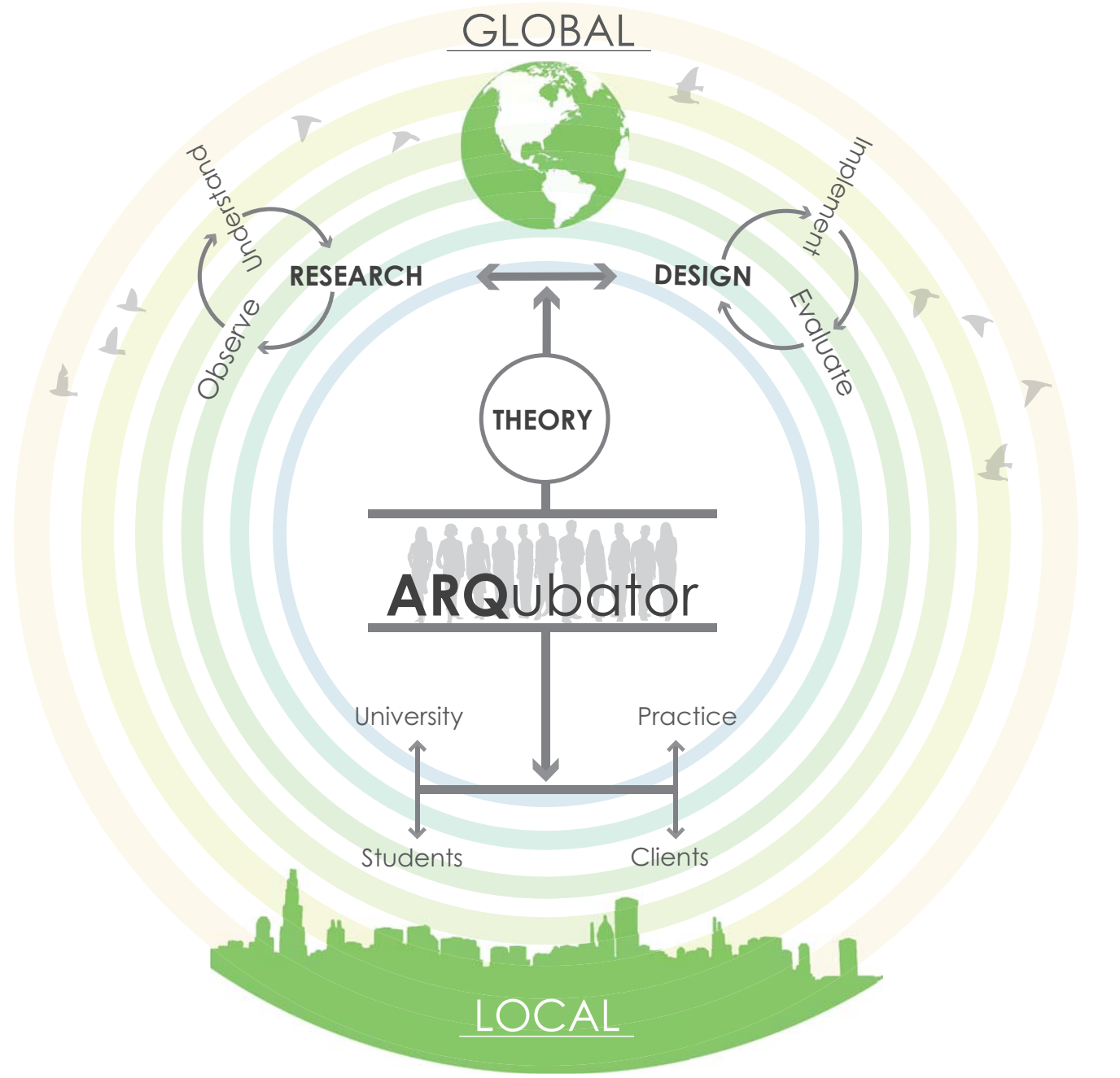
main supporters

meeting

no. of meetings

financial support

Fig. 8.2. ARQubator modus operandi and team members



ARQubator - architectural incubator / architecture + education /

www.facebook.com/arqubator

Each of the design ideas that will be presented should be read together with the design portfolio. Taking into consideration the location - actors - activities framework for each design idea, firstly important contextual or location parameters were explored: educational goals, local sustainable development goals, and micro and macro location challenges. Secondly, actors` or teachers` and pupils` criticism and ideas for improvement were explained. In the thesis they are presented in the form of a text, and in the design portfolio in the form of a graph. In both the thesis and the design portfolio they could be found under the heading "researching the issues".

The second step of presenting the design ideas in both the thesis and the design portfolio could be found under the heading "developing the ideas". In the thesis the idea was described, while in the design portfolio a photo collaged rendering was placed as the visual representation of each idea. On the photo collaged renderings local motives that inspired the design were mapped, together with teachers and pupils evaluation and comments about the design proposals. Beside the renderings sketches of teaching/learning activities taking place in newly designed and proposed spaces were shown. Using the key messages from the analysis it is suggested how each of newly designed spaces, together with the actors taking part in proposed activities, could act pedagogically.

Stara Pazova then and now

Stara Pazova is both a town and a municipality in the Srem District of Vojvodina, the Serbian autonomous province on the North. The municipality consists of seven settlements (Belegiš, Vojka, Golubinci, Krnješevci, Nova Pazova, Novi Banovci, Stari Banovci, Surduk) and the town Stara Pazova as the main centre. Today the total population in this 351 km^2 large settlement is 65.508 people, where 18.429 people live in the main centre Stara Pazova.

Stara Pazova through history

Exploring the history of Stara Pazova was seen as important so that the context could be understood and that a series of inspirational motives could be found, and later interpreted through design. The most important years and happenings were presented on the graph (Fig. 8.4.) and explained in the text that follows.

Eneolithic settlements (Copper age, approximately 5.000 b.c.) found on the current territory of Stara Pazova[1], Roman castrum Burgenae excavated in the current settlement Stari Banovci (Flavian period 69-96 a.d.), as well as many other **archaeological sites form antique period** (fortresses, necropolises, rustic villa, ceramic workshops, aqueducts, city thermal spas and pools, hippodrome, three naves temple) suggest that this space has been inhabited even in the prehistoric and antique times.[2]

1 Popovic, D. (1996) Vučedolska nalazišta u centralnom i istočnom Sremu. Starinar, 47, p. 213-221 (Popovic, D. (1996) Vucedol sites in central and eastern Srem). Online: www.scindeks-clanci.ceon.rs/data/pdf/0350-0241/1996/0350-02419647213P.pdf

2 Piletic, D. (1972) Preliminarni rezultati istrazivanja rimskog kastruma Burgenae u N. Banovcima, Vesnik Vojnog Muzeja 18, Beograd, p.7-26 (Piletic, D. (1972) Preliminary survey of the Roman castrum Burgenae in N. Banovci, Military Museum Gazette, 18, Belgrade, p.7-26)

Until 1486, when the Hungarian king Matthias Corvinus appointed Djordje Brankovic as the Serbian despot, and gave him a few settlements in Srem as his feudatory, there was no written evidence about this settlement.[3] The old village "Sanac Pazuha", 2 km north from the current settlement, towards the Danube, was one of them. The next available data is from 1670, when the Serbian orthodox church was consecrated by the Serbian Archbishop Pavle Nenadovic.[4] This church, erected on the highest plateau in the area, became the backbone of the current town Stara Pazova. Later on during the War of the Holy League (1683-1699), and the invasion of Turks from the South, the first large migration of Serbs from Kosovo occurred, led by the Archbishop of Pec and the Patriarch of Serbs Arsenije III Carnojevic.[5] One group of these Serbs settled in the old village. The next significant factor that influenced the development of Stara Pazova is the settling of Slovaks, which occurred due to the "Kolonisten Patent" issued in 1763, by Maria Theresia and her son Joseph II. Wanting to strengthen the defence line of the Habsburg Monarchy, the queen and her son opened the eastern borders for immigrants.[6] Strong incentives and very fertile land were a good reason for already oppressed evangelist Slovaks to relocate. From 1760 until 1770 due to the often flooding of the Danube, both Serbs and Slovaks moved the old village and settled around the highest plateau where the Serbian church and the school (built in 1730) were.

At the same time more Serbs form Lika, Croatians, Hungarians and Rumanians moved in. Through the time the Hungarians and the Rumanians completely assimilated. Everyone started building **Pannonian type houses** (first from reed plastered with mud, later on from hammered straw-clay mixture between two planks, and at the middle of the 19th century from bricks) according to the strict urban planning. On **elongated plots houses were followed by workshops, storage rooms and agricultural land**.

Each ethnic group formed their own streets – Serbians current Vuka Karadzica and Svetosavksa, and a few years later current Nikole Momcilovica and Pere Ninkovica street; Slovaks current Cirila i Metodija, Kralja Petra I Karadjordjevica and Karadjordjeva street; Hungarians Kertiz street [7] (Fig. 8.3.). As the settlement was growing new street parallel and perpendicular to the existing ones were built. From 1770 till 1792 the Stara Pazova with the Serbian school, the Serbian Church, the Slovaki Evangelist Church (built in 1771), Slovaki school (built in 1774) developed its basic physiognomy, that until today remained pretty much the same. It is known that it 1784 Stara Pazova had 59 Serbian families with 426 people and 98 Slovaki families with 1348 people.[8] Around 1792, Stara Pazova became the official name of this settlement which, at the end of the 18th century, outgrown the status of a village and turned into an important border settlement.

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3 Popović, D.J. (1950) Srbi u Sremu do 1736/7. godine - istorija naselja i stanovništva. Beograd: Srpska akademija nauka (Popovic, D.J. (1950) Serbs in Srem until 1736/7: The history of settlements and population. Belgrade, Serbian Academy of Sciences)

4 Aranicki, S. (1995). Pravoslavna srpska parohija u Staroj Pazovi krajem godine 1911. [s.n.], Stara Pazova, prvobitno objavljen od strane Srpska manastirska štampa, Sremski Karlovci, 1912 (Aranicki, S. (1995). Serbian Orthodox parishes in Stara Pazova in late 1911. [s.n.], Stara Pazova, originally published by the Serbian monastery press, Sremski Karlovci, 1911)

5 Ibid.

6 Šago, J. (1991) Hronika Stare Pazove. Misao, Istroijski Muzej Vojvodine (Šago, J. (1991) Chronicle of Stara Pazova, Misao, Vojvodina Museum of History)

7 Ibid.

8 Ibid.

Another factor that impacted on the physiognomy of Stara Pazova and boosted the local economy was the 1801 state order about growing mulberries.[9] **Mulberry trees** started to be planted in two rows along wider streets, and a special plot of land for cultivating mulberries was designed across the current Hviezdoslavova street, or at that time Dudarska street (Mulberry street). People started using mulberry for juice and schnapps production, and leaves for growing silk bugs. In 1830 the first craft shop for unwinding silk cocoons started to operate.[10] In the years to come this Serbian and Slovak community was flourishing culturally and economically. In 1827 the Serbian orthodox church was rebuilt, well-known food and livestock market on the main square started to operate, many public draw-wells were drilled across the settlement, and in 1878 **the oldest cultural institution was established – Serbian reading club**. At about the same time, two the most prominent people entered the cultural scene of Stara Pazova. In 1874 Vladimir Hurban Vladimirov (1884-1950) was appointed as a priest in a local Slovaki Evangelist church.[11] Beside being inspiring priest he was one of the greatest artists in Vojvodina at the time. In his short stories, poems and plays he skillfully captured the life and history of his town. Additionally, in 1896 **Simeon Aranicki**, whose name carries the school under this study, was appointed as a priest in Serbian Orthodox church. Together with Vladimirov they documented and described the life in Pazova as it was.

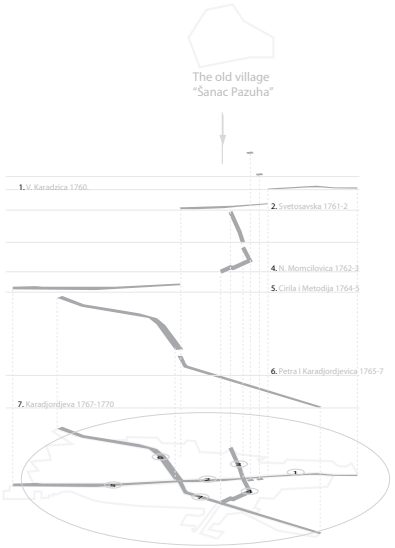


Fig. 8.3. Formation of streets in Stara Pazova through history

In 1883 the railway passed through Stara Pazova and turned it into an important transportation hub, cultural, merchant and crafts centre.[12] Even the famous "**Orient Express**" was passing here. Soon after that in 1896, and only sixteen years after the electric bulb was invented in USA, Stara Pazova started to use electricity. **The steam mill** was erected specifically for producing the electric power. With the municipal building, court building, four brick factories, two doctors, pharmacy and veterinarian Stara Pazova took the shape of typical small town in Vojvodina. At the end of the 19th and the beginning of the 20th century, the streets were cobbled and the wealthiest local landed gentry family Petrovici built the first savings bank and the hotel.[13] This was followed by erection of another important cultural institution in this town, the **Slovaki cultural centre**, which was designed for an amazing number of people for that time – 1300.

The perfect position of Stara Pazova in peace times, on **a very fertile land** close to the Danube, avenged to the local community in the war times. In both the First and the Second World War the defence line of the German army was passing right through this municipality. During the socialist regime, when the planned economy regimented economic and industrial development, and the stronger accent was on industry than agriculture, the strongest developmental attribute of Stara Pazova - the exceptionally fertile land, was not developed to its fullest potential. However, during this time some important institutions were built such as schools, the health care centre and the new library. Then again during the war in 1991-1995 in Bosnia and in 1999 in Kosovo population inflow was such that it changed the ethnic mixture, the urban morphology and the local architecture as well.

9 Ibid.

10 Vojvodina Slovak Cultural Intitute (2012) Vladimir Hurban Vladimirov. Online: www.slovackizavod.org.rs/sr/licnosti/6804

11 Šago, J. (1991) Hronika Stare Pazove. Misao, Istroijski Muzej Vojvodine (Šago, J. (1991) Chronicle of Stara Pazova, Misao, Vojvodina Museum of Histroy)

12 Ibid.

13 Ibid.

Fig. 8.4.Demography and development of Stara Pazova through history

1760
Move form old village to the highest plateau near the Serbian church

1763
"Kolonisten Patent" issued by Maria Theresia and her son Joseph II

1770
400

1770
The village has 64 houses and 400 people + 98 Slovaki families

1771
Construction of Slovaki evangelist church

1774
Construction of Slovaki school

1784
1,774

1784
59 Serbian families with 426 people, 1384 Slovaki, Hungarians move in

1800

1801
The state issues declaration that mulberries and silk bugs must be cultivated

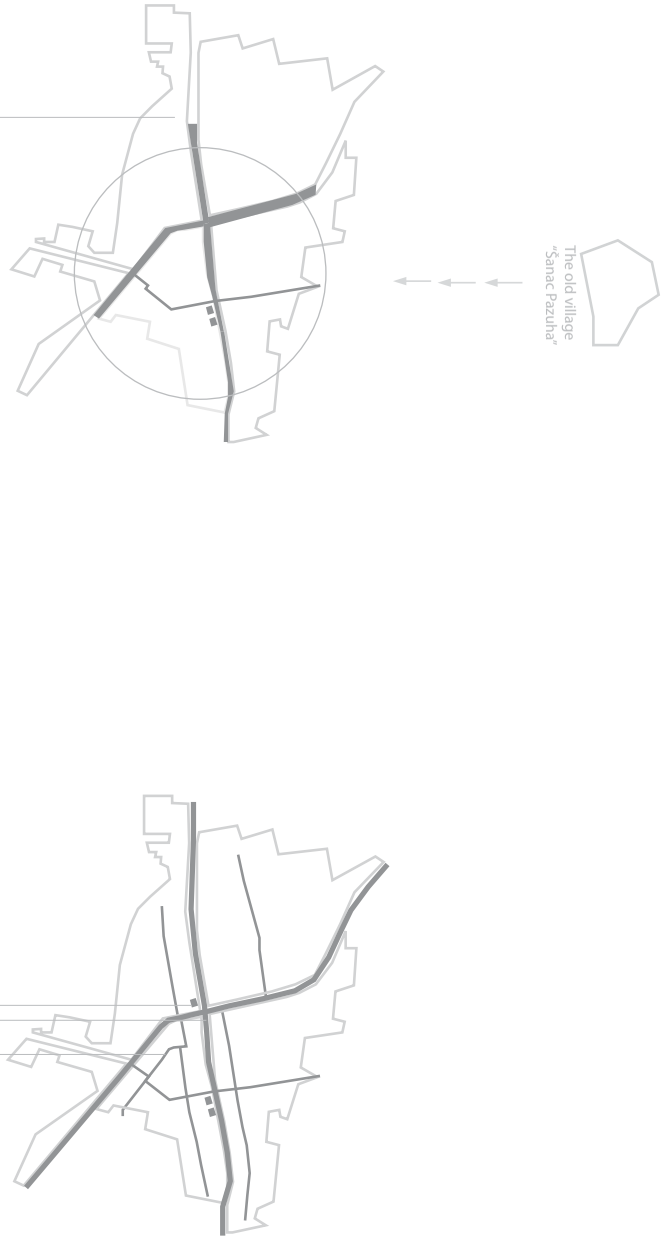
1827
New Serbian orthodox church

1850

1850
Well-known food and livestock market blooming on the central square

1869
4,132

1860
Drilling of village draw-wells



1869
4,132

1860
Drilling of village draw-wells

Hurbanovi

1874
Vladimir Hurbanov Vladimirov, member of famous local family, become the priest of the Slovaki evangelist church

1878
Serbian reading club - the oldest cultural insitiution in the town

1880
4,628

1883
The railway was passes through Stara Pazova

1885
Catholic church

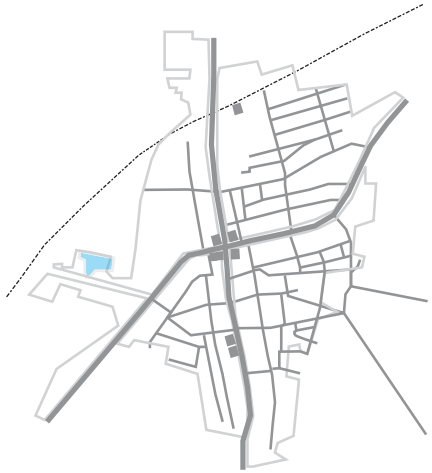
1889
Court house

1890
5,838

1895
Steam mill for producing electricity

1900
6,674

1901
Cobble on streets



1905
Savings bank and the hotel built by the wealthy gentry family Petrović

1910
7,339

Petrovići

1919
First football club "Zmaj" founded

1921
7,751

1928
Slovaki cultural centre for 1300 people

1931
8,536

1945
Technical school

1982
Construction of the library and the health care centre

1991
Refugee migration to the city afther the 1991-95 war

1999
Migration of people from Kosovo due the political instability in that region

1948 9,193
1953 10,103
1961 12,089
1971 13,776
1981 16,217
1991 17,110
2002 18,645
2011 18,429

1950

Ethnical groups in Stara Pazova

Serbs 56,19%

Slovaks 31,37%

Yugoslavs 1,92%

Croats 1,77%

Roma 1,47%

0% 20% 40% 60%

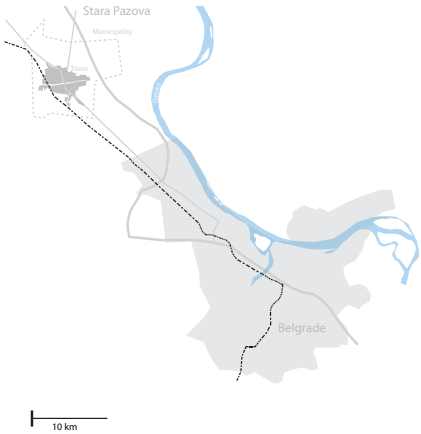


Fig. 8.5. Distance form Stara Pazova to the capital of Serbia - Belgrade

Stara Pazova today – developmental potential and challenges

Despite the troubling times, due to which Stara Pazova today has developmental challenges, there are also many developmental potentials. This town is located on a very important European transportation corridor "Corridor 10". It is 15 km away from the European E-75 highway connecting the town with Belgrade and Novi Sad (Fig. 8.4). The town has its own train station. The municipality has 30000 ha of very fertile land (Fig 8.6.).[14] Thus, agriculture and livestock have great predispositions to be developed in future, especially because of the proximity of the two big consumption centres Belgrade and Novi Sad, (Fig. 8.6.). Additionally, this town has 496 ha of industrial land with full infrastructure (Fig. 8.6.). Many worldwide famous companies, such as Husqvarna, Nestle, Volvo, and many more, are already here. With 800 enterprises and 2500 craft shops Stara Pazova continues to be a well recognized place of entrepreneurs in Serbia. Tourism in Stara Pazova has also great potential. Settlements on Danube could be great for development of marines, beaches, golf fields, fishing and hunting. Unspoiled rural ambient could be used for village tourism. Many well preserved old houses could be turned into ethnographic museums. The proximity of the Fruska Gora hill, and the protected nature reserve Obedska bara, together with the intact nature should evolve in future.

Furthermore, the cultural scene in Stara Pazova is quite rich for such a small town. The local cultural centre, amateur theatre, libraries, numerous folklore ensembles, and a long list of cultural manifestations are good examples of the richness of this multicultural community. Opportunities for sport and recreation also exist. An array of sport clubs (9 for football, 6 volleyball, 3 for handball, and 7 for basketball), some public and private sports fields, and opened and closed pool operate in Stara Pazova.

These are just a few potentials of this town that require tremendous efforts to be fully developed in the future. Realising this the municipality authorities in 2009 started to develop the **2010 – 2020 Stara Pazova Sustainable Development Strategy**.[15] The first part of the strategy explores and well documents many challenges, while the second part devices an action plan divided into a series of thematic actions. It is very positive that the challenges have been discovered through a participatory process with the citizens. Secondly, the strategy builds on the National Sustainable Development Strategy and the Millenium Developmental goals. Lastly, some of the proposals from the plan address some of the problems of educational reform described at the beginning of this thesis, such as:

- increasing the functionality of educational institutions through improving the technical and organizational capacities, introducing lifelong learning for teachers, development of new educational concepts, and building new educational institutions,
- enhancement of education about ecological problems,
- development of infrastructure and mechanisms for affirmation of mentally and physically challenged kinds and youth,
- promtion of local culture,
- inclusion of NGO sector in implementation and development of the strategy, and many more.

14 Official presentation of municipality Stara Pazova. Online: www.starapazova.eu

15 Strategija Odrzivog Razvoja Opštine Stara Pazova od 2010. do 2020. godine. (2009) Republika Srbija, Autonomna pokrajina Vojvodina, Opština Stara Pazova (Sustainable development strategy for the Stara Pazova Municipality form 2010. to 2020. (2009) Republic of Serbia, Autonomous Province Vojvodina, Municipality Stara Pazova) Online: www.starapazova.eu/images/stories/PDF/strategija-odrzivog-razvoja.pdf

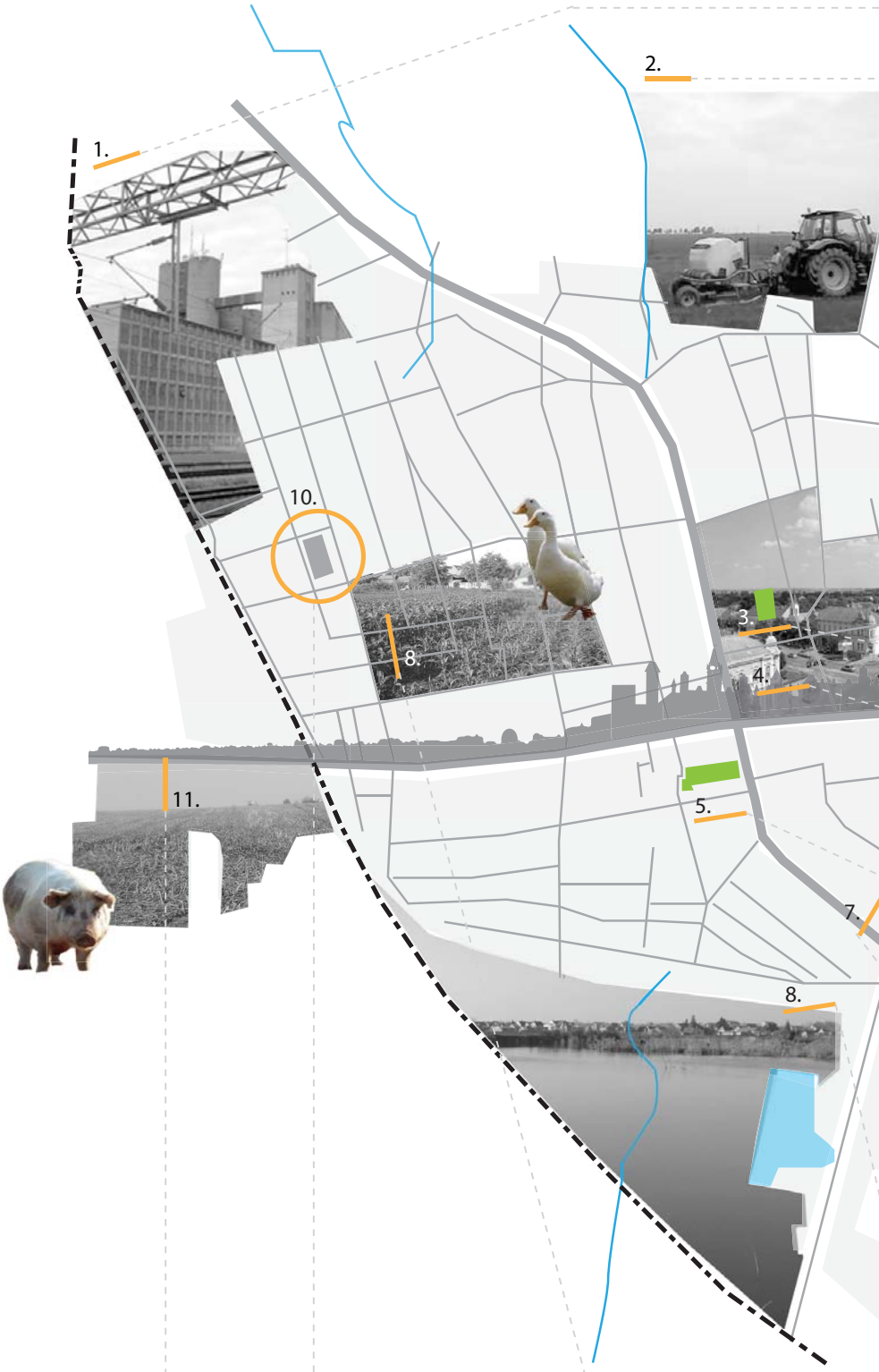
Yet, the strategy is not without its flaws. It is problematic that:
- all the teachers and pupils, and some citizens interviewed during this study were not included in the development of this strategy, and not aware that it exists;
- the activities proposed by the plan are very prescriptive and top-down;
- a large number of the organization, institution and companies that will participate in the implementation of the strategy are determined by the plan leaving very little space for the competitions;
- the application procedures and financial mechanisms through which local citizens, schools, NGOs, could propose different projects and actions were not developed;
- there is no expert body established for the evaluation of the project proposals;
- all the activities are strictly divided into social, economic, and environmental without overlapping ones, and without the possibility for such activities to be proposed.

Stara Pazova is a place with many opportunities, but a place with many challenges as well. It is very positive that this municipality is one among only twenty in Serbia that has put an effort to research and identify local challenges, and propose actions that could lead to a better future. However, what seems problematic is the difference between what is written on a parer and how in real life the sustainable development actions are implemented . It is strongly believed that in Stara Pazova, as well in Serbia generally:
- the mainstream education is not well connected to the National Educational goals [16], National Sustainable Development strategy, and Local Sustainable Development Strategies ,
- pupils and teachers are not informed and included in tackling the local challenges and developing local potential through education;
- the notion that the school architecture should be developed to support the national and local sustainability strategies does not exist,
- the idea that such sustainable schools have the pedagogical potential and that they should be an integral part of the strategy for renovating the educational process is non-existent.

As the introductory chapter suggested sustainable schools are a crucial part of educational reform. Yet, the success of educational reform in Serbia is questionable when the school design does not address the locally significant sustainability issues and educational goals. Therefore, the question is whether towns like Stara Pazova could expect to successfully implement the proposed actions from local sustainable development plans and educational goals, when they are not connected to the curriculum and embodied in the school design?

16 For more information about the National Educational Goals refer to Chapter 2, p. 14 or online: www.mp.gov.rs/page.php?page=101

Fig. 8.6. Stara Pazova today - urban morphology



11. Agricultural land parceled into big plots on the west

10. "Simeon Aranicki" the school under study

9. Typical back garden for growing food

1. Industrial zone on the north-west

2. Agricultural land parceled into small plots on north and east

3. Sport club "Jedinstvo"

4. Cultural institutions in the city centre

5. The only park and public playground in the city centre

6. Unfinished houses of the immigrant families from Bosnia and Kosovo

8. Gajiceva bara - swamp for fishing and swimming

7. Typical Pannonian style houses

Developing design ideas for the Primary School Simeon Aranicki

As it was explained in chapter 6 primary school Simeon Aranicki has been built in 2009 as a part of the School Building Modernisation Programme.[17] As all the other schools from the Programme, the layout of the school is a standardised one, which has been repeated throughout the programme, and adapted to multiple locations. [18] Since the school started to operate the teachers, the pedagogue and the school head teacher realised that the physical space of the school did not quite fit their educational agenda. This was the main motive for to school staff, led by the head teacher, to start searching for adequate partners to help them firstly develop their ideas, and secondly find financial support for the transformation of their school.

While working with the school our first step was a critical evaluation of the current school space from the point of sustainability and pedagogy through game Spector - Sustainability Inspector. The most important conclusion, as with the other school case studies explored, were mapped on a Sustainability HotSpot Analysis Map. This was followd by the creative modeling workshops were pupils suggestde improvements for their school. The design ideas (Fig. 8.7. - Fig.8.17.), presented in the text that follows, were developed through participatory collaboration with teachers and pupils. I have developed 3D models, produced renderings and photo collages so that the spaces propsed look as realistic as possible.

We believed that all the state and local educational authorities should be informed and involved in the process. Therefor, we used the photo collages of the design ideas as a tool for informing the state and local authorities, the potential partners and sponsors, such as firms and companies, especially the locally based ones. The design ideas were also used as a consultation tool with the teachers and pupils during our second round of workshop, where they had an opportunity to constructively criticize them, propose and explain in greater detail how they would like to use these spaces. As rarely before they had an opportunity to see such design, they instantly wished to have the design ideas built. However, the most important questions arisen out of our discussion are left on the presentation of the design ideas.

For all of the previously mentioned reasons the design ideas should not be seen as finished design proposals. These ideas are for inspiration and discussion, but do have the potential to be developed into a full design proposal when the right partners are found, and the finances secured. Therefore, the design ideas were developed taking into consideration location - actors - activities - framework, and exploring:
- the macro challenges arising from the town and municipality, and the micro challenges arising from the school location and the current building condition,
- teachers` and pupils` ideas for improvement that inspired the school design,
- the corresponding National Educational Goals;
- the issues and activities proposed by the 2010 – 2020 Stara Pazova Sustainable Development Strategy,
- evidence about pedagogical potential of a school space from the analysis part of this study, as well as to ask questions in order to be further developed in the future.

17 For more information see Chapter 6 , p.87-90

18 For more information see Chapter 3, p.26

Due to the fact the school is quite new and the budgetary constraints likely the proposals have tried to minimize impact on the structure of the school but to be capable of transforming the school. A decision was made with the teachers that the more ambitious plans for an additional floor were not formalized. The school wanted to concentrate on spaces that could be built within and around the existing school building. When these were implemented and tested for their impact on teaching and learning, then we would start to seek greater financial support required for the larger scheme.

A Cladding - Changing the identity of our school and improving energy - efficiency

Researching the issues

Both the teachers and the pupils complained about very hot and stuffy classrooms, particularly on the west side of the building.[19] Additionally, some classrooms were characterised as too bright, causing eyesore and headache, especially to children. Part of the roof above the central hall is covered with plexiglass. It is causing leaking problems during the autumn and winter, and as it cannot be opened, overheating problems during the spring and summer months. What is more, occupants believed that the ventilation is not very well in the building and suggested remodeling the building and applying the principles of cross ventilation in the future. As at the moment almost all classrooms have one split system air conditioner, they considered them to be neither cost-effective, nor sustainable. The teachers believed that the school was built from aerated concrete blocks, which was not a good choice of building material, due to their unpleasant smell and low ability to act as insulation. They explained that, as aerated concrete blocks were promoted as building materials not needing insulation, the insulation was not built in. Lastly, though the PVC windows are double glazed, what worried them is their negative health impact.

At the beginning of the joint work with the school, the architect and the construction company were asked for technical description of the building and the drawings. Until today this request is pending and the school did not obtain those documents. The school had one print copy of the technical drawings for the school. The comparison with the built condition showed that probably during the building phase these drawings were significantly changed. Additionally, the monthly or annual costs for water, heating and electricity could not be obtained. Due to the lack of this data no serious analysis of the building condition, its sustainability and environmental impact could be made. Consequently, no advices could be developed so that the quality of light, insulation, ventilation and cost-effectiveness is improved.

Developing the outline brief

Being aware of this situation it was agreed with the teachers that a proposal for cladding the whole building was done in a way that the current facade remains intacted until the previously mentioned necessary data is obtained in the future. Yet, the design should try to improve the degree of thermal insulation, energy-efficiency, and through an interesting architecture stand out in the neighbourhood, contribute to a sense of place and new identity for the school. It should also be tested whether some parts could be built from timber.

Developing the ideas

The idea for remodeling the façades was inspired by the workshop with the pupils and their model called green wave (see model no. 1 Green wave – Dynamic learning). Building on this idea it is proposed that the whole school is clad with a wavy mesh consisting of faceted planes with moveable blinds where the windows are, so that each segment of blinds could be separately put up and down (Fig. 8.7).

19 For the design ideas see design portfolio, p. 11

According to the pupils the wavy mesh should signal to the neighbourhood the dynamic learning principles employed in this school, while the green colour should signal their environmental consciousness.

Remodeling the façade was very important for them so it can contribute to the sense of a place in the future, and transmit the message that

this school is like no other- Ivana, Milos and Bojan, age 12 and 13, pupils.

Key messages from the analysis suggest that the design of façade is crucial for communicating a sense of place when design features build on occupants` ideas, wishes and beliefs.[20] Together with the trees, planned to be planted around the school, this cladding should protect the school from the very strong wind "ko-sava", known to cool the buildings additionally during the autumn and winter months. Movable blinds could allow users to regulate the high summer temperatures. In this way the occupants are provided with an opportunity to regulate the amount of brightness, reduce the glare in the classrooms, making their working and living conditions more pleasant. Analysis from this study demonstrates the importance of enabling the occupants to regulate environmental parameters [21] for creating a pleasant working atmosphere. Lastly, as pupils pick up environmental clues with ease [22], it could be argued that newly clad and remodeled façade in the future could serve as a useful teaching tool about energy-efficiency issues.

When the necessary data about the exact built in materials, construction and technical description are obtained, this design idea will be further developed. Then it will be closely examined how simultaneously the ventilation, the insulation and the aesthetics of the façade should be improved and made more cost- and energy-effective.

Fig. 8.7. New cladding for the school

20 For detailed discussion see Chapter 6, p. 123

21 For detailed discussion see Chapter 6, p. 131

22 For detailed discussion see Chapter 6, p. 139


Fig. 8.8. Amphitheater

A1 Amphitheater – Learning through drama and play

Researching the issues

In the whole town of Stara Pazova one of the greatest problems is the lack of public spaces for children. For example, there is only one park in the town centre. Additionally, all the cultural institutions are concentrated there. These facilities are far away from the school, limiting their use only during the weekends, when children could be accompanied by their parents. The way school playground was designed and equipped is not contributing to the solution of this problem. The teachers explained that:

> *The playground is completely empty, the front playground is never used, there is nothing for children to do* – Boba, 38, teacher.

Pupils agreed on this adding that:

> *It is monotonous, we need some interesting play space* – Bojan, 10; Sanja; 12; Jana, 7, pupils.

Although, the teachers want to leave the school playground open after school hours, they are afraid to do so.

> *They* [children] *climb over the school fences and jump, they swing on the school gate, and climb the fire escape stairs… when they are left alone in the playground they get hurt* – Ana, 32, teacher.

> *We need equipment in the playground which they can use safely without having us teachers constantly supervising them* – Ivan, 49, teacher.

Furthermore, the lack of trees and green areas is *affecting the microclimate around the school* – Nikola, 39, teacher, while the lack of equipment prevents them to take the teaching and learning into the playground.

> *We need adequate equipment for learning in the playground…a place where pupils could have fun and play, but learn at the same time* – Petar, 54, teacher.

> *I would like to organise a play, to turn some parts of the books children read during lessons of Serbian and literature into play… we do not have adequate space in the school for that, a stage or something* – Milena, 46, teacher.

Lastly, teachers expressed their concern in relation to the pupils in a wheelchair.

> *They are constantly left on a side…none of the furnishing is quite right for them. We want them to participate and be part of the group* – Bojana, 46, teacher.

Due to the previously mentioned challenges the first design idea upon which pupils and teachers agreed was necessary was an amphitheater in the playground. It could be used from September to November, and March till September, and therefor was worth exploring. Additionally, we all agreed that the amphitheater could be a useful reminiscence on archaeological sites from the antique period, where among other things an old amphitheater was excavated.

Developing the outline brief

The amphitheater should be built of solid sustainable and durable material, suitable for standing outside, which does not wear off easily, and provide seating space for at least two classes at one time (approx. 80 pupils) (Fig. 8.8). [23] It should be tucked into the newly planted line of trees where members of local cultural and folklore ensembles, drama and acting clubs, as well as neighbours could come and work with children.

According to teachers, they could start to work there on developing learning through drama and play - an approach which benefits are well recognized in the world.[24] It should enable children to play, be safe, secure, accessible for pupils in wheelchairs, and open at all times. In this way they could start to develop new ways of teaching and learning, have a place for cultural happenings, collaborate with the local community, enabling children to develop creativity, artistic and cultural literacy. Taking into consideration all of the previously mentioned issues when designing the amphitheater means relating it to very important National Educational Goals and the Local Sustainable Development agenda.

Developing the ideas

Due to the teachers` concerns about the noise, the amphitheater could be positioned in the far northeast corner of the playground, away from the main building, so it can be used even when there are classes in the building. The amphitheater could have only two sides so as not to be closed towards the main walkway in the playground and allow easy supervision. The design was inspired by the pupils` idea of having an open classroom in the school playground.

> *We would like to have a classroom in the nature, where we could sit under the shade, learn, perform and play among the trees* – Anja, 7; Bojan, 7; Una, 9, pupils (Box no. 9 “Classroom in the nature”).

The canopy behind the amphitheater is therefore a geometrical interpretation of the tree modeled by the pupils working on the model titled ”A classroom in nature”. Beside the fixes seats, cubes of different height could provide comfortable seating for children of different ages. They could be made of recycled plastic produced by a local manufacturer. The cubes could enable smaller groups for socializing or learning to be formed, they could be used for playing and building various structures, and become elements to divide the space between groups engaging in different activities. If pupils in wheelchairs are to use the amphitheater other pupils could easily seat themselves around them. As seating arrangements can impact on the feeling of inclusion [25] it is hoped that in this way disabled pupils will feel as part of the group and not left aside. The question of inclusion should be tackled through school design because this research suggests that participation of everyone in the activities on the playground affects the feeling of inclusion, further weakening or supporting the sense of community.[26]

23 For the design ideas see design portfolio, p. 13

24 For more information about this concept see Framer, D. (2012) Learning through drama in primary years. Norfolk: Drama Resources

25 Meyer, L. (2011)The Impact of Inclusion on Children’s Lives: multiple outcomes, and friendship in particular. International Journal of Disability, Development and Education, 48 (1) p.9-31

26 For detailed discussion see Chapter 6, p. 117

Through performing, socializing, playing, learning and working with local professionals and neighbours the amphitheater space could be a useful platform for learning and development. This research shows that on playgrounds pupils can learn as well. The joint use of spaces and well structured activities around them support the knowledge exchange, as well as the development of a sense of community.[27]

The early design idea for the amphitheater in the playground need to be explored in greater detail, looking at similar designs throughout the world and their pedagogical potential, in order to refine the initial idea and further explore how the school playground can be redesigned and equipped to become suitable platform for new forms of learning?

27 For detailed discussion see Chapter 6, p. 106-107

A2 Chill space – Learning and socialising under the energy producing canopy

Researching the issues

The lack of appropriate spaces and equipment for learning and playing in the town and the school playground, accompanied by the lack of shade and tall vegetation, was once again mentioned as a problem by pupils and teachers. Milena, teachers, 46, said:

> *When pupils go out they just run around all the time. We need spaces to stimulate play and learning… reading space or spaces where they can listen to music and relax…places that are fun for them and interesting, but where they could learn at the same time*.

Moreover, in this school, as well as, across the city, less than 1% of all gathered waste is recycled. The town of Stara Pazova has not achieved an organized collection of separated waste. Teachers explained that collecting and storing waste suitable for recycling is a problem, due to the lack of storage space and the fact that collected waste will anyway be disposed to landfill with all the other domestic waste. Predrag teacher, 37, suggested:

> *It would be good if we collect a certain amount of recyclable waste, but first determine for what we could use it for…what could we make of it*.

Additionally, both the teachers and the pupils strongly agreed that they are not able to distinguish sustainable form non-sustainable materials. Boba, teacher, 38, seeing that some schools across the world have addressed this challenge of building with sustainable materials, and making them very visible, wished that the same could done in their school. Lastly, all the teachers believed that awareness about renewable energy sources must be raised.

Developing the outline brief

A special part in the playground should be designed to provide an opportunity for relaxing, listening to music, playing, whilst learning about recycling, sustainable materials, and renewable energy. Such place should also be well shaded. A PV panel could be integrated into the design and used for demonstrative purposes. Some of the materials used could be sustainable or made from recycled material, and easily visible. The overall design should raise awareness about the importance of sustainable development, support recycling and renewable energy sources, contribute to the education about ecological challenges, support both pupils and teacher to become responsible citizens, and in this way respond to a series of National Educational Goals and Local Sustainable Development agenda.

Developing the ideas

The main inspiration for the design of the chill space came from the pupils` story about a school that lives in synergy with nature. The main character of their story was a wise Whispering tree.

> *In our school lives the Tree of wisdom, the music around it prevents the boredom, listening it whispering with the Sun, we learn all day long, its` magic dust is falling on our heads, helping us the world around to comprehend.* - Milica i Stevan, age 11 and 12.

Fig. 8.9. Chill space

Spatial interpretation of this story is the chill space which consists of an array of three shaped canopies (Fig. 8.9).[28] This design also builds on the motive of Mulberry trees, planted in the surrounding area more than a hundred years ago, some of which are still alive today. The main canopy tree is fixed while the others could be moved along the tracks. They all should be built from treated locally sourced timber. When the shade for a larger group of people is needed the canopies could be moved together, or when one or two people want to sit in peace, read or just relax, the canopies could be separated. On the main canopy tree a PV panel, electricity production and consumptions readers are attached, which could be used for learning. Additionally, a music playing device is installed which could be used for listening and playing the radio music, or to which pupils could attach their mobile phones, iPods and headphones. Under the canopies there are chairs which could be locally produced out of plastic gathered by pupils and teachers. So that intimacy levels could be regulated, the 'chill space' is visually divided by raised grass surfaces from the main walking promenade. These wedges form interesting semi-barriers and slopes to sit on and play. For the intimacy reasons the tree shaped canopies could be moved away from the main canopy, allowing the occupants to separate themselves from the larger group and read, relax or discuss sensitive and important things to them privately.

Taking out some of the technical design and technology teaching and learning activities, and organizing them around tree shaped canopy with the solar panel, could be a good opportunity for pupils to actively learn about alternative ways of producing energy, and monitoring its consumption. Collecting plastic bottles, remelting and turning them into chairs, with the help of local specialized companies, and making the canopies of the locally sourced wood, could help pupils learn about sustainable materials and creative use of recycled materials. Additionally, monitoring energy consumption and production, and reporting the data back to the peers and teachers, pupils could exercise their ability to effectively use technologies, analyse and communicate information. Designed to be interesting and engaging for pupils, the 'chill space' could potentially allow children into the playground after school hours, reduce their time wandering around after school due to the lack of facilities, helping prevent troublesome behaviour. According to this study, structured activities around the 'chill space' could enhance the opportunity for privacy levels to be regulated, impact on the bonding of the teachers, pupils, neighbours and allow knowledge exchange.[29]

Lastly, the space was designed to be jointly used by various groups at the same time – teachers and pupils, or different groups of pupils engaging in different activities. Joint use spaces can alter the power balance, contribute to a positive learning atmosphere and support a sense of community.[30] In such relaxed atmosphere pupils could freely learn and socialise with their peers and teachers.

In future it should be examined how the school playgrounds could be redesigned to engage pupils in independent learning about energy and recycling issues, so that the design idea for chill space is developed in greater detail.

28 For the design ideas see design portfolio, p. 16

29 For detailed discussion see Chapter 6, p. 106

30 For detailed discussion see Chapter 6, p. 105

A3 and C2 The Tunnel and the Slide – Playing and having fun

Fig. 8.10. The tunnel

Researching the issues

Though the town of Stara Pazova has quite a few sport fields, there are two problems in relation to this. Firstly, the admission to many of them is not free of charge. Secondly, one playground and a two or three public basketball fields, according to pupils are used by the oldest kids most frequently. Similarly, in the school playground the football and basketball fields are dominated by older children. Due to this situation the younger ones complained:

> *We can use the fields only when they* [the older children] *are not there. Most of the time there is nothing for us to do…no place for us to play…as if this is not our school also.* – Ivana, Srdjan, Milos, age 7 and 8.

Teachers believe that the lack of equipment for interesting, stimulating, physically challenging, but safe play activities, is causing children to misbehave, climb on the fire escape stairs, lower parts of the roof and jump over the school fence.

Developing the outline brief

Both the teachers and the pupils agreed that slides, labyrinths or tunnels could be incorporated into the design for their future school playground. Milena, 46, teacher, suggested:

> *We could have slides alongside the stair…it would be so much fun*.

Play equipment the slide and the tunnel should support pupils to be more physically active, to play, have fun, socilaise, find their place on the playground, and strengthen the group cohesion – important National Educational Goals and Local Sustainable Development agenda which must be tackled through design. Incorporating some sustainable or recycled materials, if possible, would be a bonus. Both structures should be stabile, safe, secure, giving the children the possibility to use them alone without the necessary assistance of the grown ups.

Developing the ideas

The design for the slides and the tunnel was inspired by the pupil`s model in the box no. 4 named by “Jump into nature”, and the little verse woven around it:

> *Up and down, the excitement is binding, through our school, we are sliding and gliding*- Katarina and Tamara, age 7 and 8.

The slides could be going from the roof terrace to the school playground. The tunnel could be positioned right across them on a grass field (Fig. 8.10.).[31] Old truck and tractor tyres could be used for building the tunnel. In this way it an interesting place for the pupils to play hide and seek, climb, jump from, and crawl through could be created.

Incorporating the tunnel and the slides into the school playground could provide the pupils with the opportunity to be involved in interesting physical activities. As the key messages from the analysis suggest, the playgrounds are not just places

31 For the design ideas see design portfolio, p. 19

important for exercise, but for learning, as well.[32] As pupils pick up environmental clues with ease[33] seeing the tunnel made of used old tyres could be a chance for them to learn how old things could have a new use. What is more, unequal ownership of certain parts of or within the space impacts whether certain pupil feels included and treated as equal.[34] Feeling of inclusion or exclusion can be developed through (physical) activities on sports fields and playgrounds, thus further weaken or strengthen the sense of community.[35] For this reason interesting spaces and activities, such as the slide and the tunnel, could be incorporated into the future design of the school playground so that the younger pupils do not feel excluded.

As with the other design ideas, the design for the tunnel and the slides should be further developed taking into consideration how should the school playgrounds be redesigned to provide physically challenging, but safe and secure playgrounds. Additionally, it should be explored could parts of those playgrounds be made of recycled materials, which could constitute environmental clues signaling the importance and the possibilities of recycling.

32 For detailed discussion see Chapter 6, p. 98

33 For detailed discussion see Chapter 6, p. 139

34 For detailed discussion see Chapter 6, p. 117

35 For detailed discussion see Chapter 6, p. 117

A4 and A5 Tree houses – Climbing, changing the viewing perspective and observing the neighbourhood

Fig. 8.11. Three house

Researching the issues

The design of tree houses responds to the same macro and micro contextual challenges as the design of the slides and the tunnel – the lack of public play spaces for younger children, both in the town and the school playground. As during the design of the chill space, primarily but not solely, the needs and ideas of older pupils (age 11-14) were taken into consideration, the design of the tree houses responds to the requirements and wishes of the younger ones (age 7-11).

Developing the outline brief

The tree houses should be accessible to children at all times, enable independent play, be safe and secure, promote the development of social skills and physical abilities, as well as learning. They should constitute a good platform for children to be taken out of the streets, and help prevent further social problems. They should enable viewing of the surrounding area. As with all of the other designs they should be made of sustainable material.

Developing the ideas

During the school modeling workshop one group of pupils told the story about the spinning tree as their main play pal.

> *Spinning tree, spinning tree, on your platforms we like to climb, it is because they drive us, all the way around* - Anja, Luka, Goran, age 9 and 11.

Their main idea was to have a house on a tree that spins and enables them to see the whole surrounding area from a higher platform (Fig. 8.11.).[36] Changing the viewing perspective, and being able to see things from above, was a very strong fascination observed among many pupils. It could be due to the fact the town Stara Pazova lies in one of the flattest parts of Serbia, and the fact that this whole area is among the ones with the lowest tree coverage. This means that children do not have opportunities to climb the trees and observe the surroundings. Due to the teacher's concern for pupils' safety the playhouses are not on the trees. The houses are on the ground, while the cutouts from the main structure, which could be made from locally sourced timber, take the form of abstract tree shapes. Besides providing the light, they enable vista on the surrounding playground and enable pupils to regulate the levels of privacy – have a space for doing things on their own. At the same time they increase the transparency of the houses and enable teachers from the outside to see inside the houses, and more advertently keep an eye on pupils. Balancing pupils` opportunity to do things on their own, with the teacher's concern for their safety is a must. Otherwise, as this study demonstrated [37], pupils opportunity to practice independence, solve problem on their own, and develop crucial social skills, could be severely jeopardized. This design aims to offer interesting playful spaces for the youngest, so as not to feel excluded.

36 For the design ideas see design portfolio, p. 22

37 For detailed discussion see Chapter 6, p. 93-94

Both houses could have stairs leading to a higher platform, where views of the surrounding area are opened. Climbing the stairs in both houses, and going down the rope in the smaller one, could present an opportunity for pupils to be more physically active. Additionally, a rather inexpensive spyglasses are planned for the second tree house, which could enable the pupils to observe the surrounding area from a higher platform, as they highly desired it. The spyglasses could hopefully be a fine tool for pupils to start observing more closely their immediate environment- turning the playground into an important platform for learning

Through further development of this design idea it should be seen how could the school playgrounds be redesigned to become fun, engaging, but safe environment for play, learning, and development of social skills, crucial for lives in turbulent times in multiethnic communities. Additionally, if such spaces are open for children after school hours, could they engage them in interesting playful activities, and contribute to better social cohesion.

A6 Raised beds – Learning about local food and animals

Fig. 8.12. Raised beds

Researching the issues

One of the greatest challenges of Stara Pazova is finding the employment for the local population in the municipality. Favouring the employment opportunities, as well as the lifestyle, in two very close big cities Belgrade and Novi Sad, is a well observed trend.[38] The interviews with the pupils in the school confirmed this. Working in the fields of agriculture and livestock, which have the greatest developmental potential, is very unpopular among the young. Today, quite large plots of land remain uncultivated or are rented very cheaply. The way this problem is addressed through the curriculum and school design is not contributing to the solution. Teachers in the school observed this problem, and expressed the wish to have a small garden in the school playground. Primarily the biology teacher stated her interest in running the program around the raised beds in the future.

Developing the brief

Teachers wished to have raised beds in one part of the playground, and suggested using them to teach about local fruit, vegetables, herbs, while collaborating with nutritionists and local farmers. Growing food with local farmers or learning about animals, which could be brought occasionally from the numerous farms in the vicinity, could be according to biology teacher, Anja, 39,

> *superb and engaging firsthand experience.*

Activities around the raised beds should be connected to the ones around composting bins and the ones in the kitchen and school canteen. There should also be one shed for keeping the necessary tools, positioned in the vicinity of the beds.

Together with the teachers it was decided that the design and activities around the garden should raise awareness about healthy lifestyle, animal protection and preservation, development of communication skills, and supporting collaboration with the local community and the parents. It should be a place where local farmers could work with the pupils so that the competitiveness of the agriculture is improved in future, organic farming popularized and entrepreneurship of the young pupils supported. Additionally, senior citizens and pupils` grandparents, who have a substantial amount of knowledge as they lived in the times when people lived off the land, could pass their knowledge to the pupils there. Lastly, developmentally challenged pupils should be included in the food growing programme through simple manual work. Addressing all of these requirements through proposing a design idea for raised beds, means responding to very important National Educational Goals, and Local Sustainable Development agenda.

38 Strategija Odrzivog Razvoja Opštine Stara Pazova od 2010. do 2020. godine. (2009) Republika Srbija, Autonomna pokrajina Vojvodina, Opština Stara Payova (Sustainable development strategy for the Stara Pazova Municiplaity from 2010. to 2020. (2009) Republic of Serbia, Autonomous Province Vojvodina, Municipality Stara Pazova) Online http://www.starapazova.eu/images/stories/PDF/strategija-odrzivog-razvoja.pdf

Developing the ideas

The inspiration for developing the design for the raised beds came from the modelling workshop, where pupils talked about a school where they could grow their own food and learn with animals. A short verse written by pupils Lazar, Darko, Misa, Ogi, age 8 and 9, clearly demonstrates this.

> *Healthy and fit we must stay, growing our own food, is the right way to do it, hip hip hooray!*

The raised beds could be positioned in the far south-west corner of the playground (Fig. 8.12).[39] In this way they could be just across the kitchen and the canteen in the school, and the composting bins positioned across the rare kitchen exit. They could be right behind the bike sheds, and the shed for the garden and bike repairment tools. There could be in total three different beds, which according to the type of plants and the depth of their roots could have different height. It could constitute a place where pupils could plant various types of food with their biology teachers, local neighbours and farmers. Also, local farmers could bring a few farm animals and teach children how to care for them, and feed them with some of the food grown in the garden.

Key messages from the analysis suggest that food growing activities present great learning and socialising opportunities, where pupils could demonstrate their skills and abilities. [40]Additionally, they can be a valuable learning tool only when the learning activities around them are well structured, connection to the curriculum is clear, and the roles and responsibilities of teachers, pupils and community members are well defined.[41] Therefore, in the future learning activities need to be further developed around the raised beds, with the help of the teachers, taking into consideration the curriculum.

Further development of this early design idea for the raised beds should examine, by comparing and contrasting successful designs of food growing and planting areas in schools across the world, how they could present a valuable and stimulating learning resource for the whole community, so that the main developmental opportunity of Stara Pazova – the agriculture and livestock, is made more attractive to the future generations.

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39 For the design ideas see design portfolio, p. 25

40 For detailed discussion see Chapter 6, p. 102

41 ibid.

A7 Bike Shed – Riding a bike to school and reducing CO_2

Fig. 8.13. Bike shed

Researching the issues

Promotion of cycling to school and work is steadily gaining momentum in Stara Pazova. Although, this town does not have a proper cycling tracks many kids cycle to school. High traffic volume could only be observed in the two main streets. The neighbourhood around the school is surrounded by rather low traffic streets, thus parents allow children to cycle to school. Being aware of this situation, in 2010 teachers initiated a project with the local authorities to build a safe and secure cycling track connecting the town centre and the school. Yet, the problem is that the lack of appropriate bike storage in the playground discourages some kids to cycle to school, as they are afraid that their bicycles might get stolen.

During the workshop with children and teachers both groups suggested to have a bike shed. For children the way they travelled to/from school was a serious inclusion issue. Some pupils today are driven to school by car, although they live just around the corner. Masa, pupil, 10, commented:

> *Some pupils come to school by car, and they live just around the corner, they do not live far away…they just want to stand out of the crowd and tease other pupils.*

Secondly, they enjoy cycling to school and they were aware that travelling to school by car is polluting the planet. During the workshop pupils modelled a school in which the main activity is experimenting how different types of transportation, using different types of fuel, should be developed so that the planet Earth is less polluted. To better illustrate their idea Ivan and Milan, age 9 and 10, wrote the following verse.

> *As an electric, freakish, blue wave, we travel to school at the speed of light, we roll the pedals, we cycle, for the health of our planet Earth, we are ready to fight!*

Developing the outline brief

The bike shed and the activities around it should be designed in a way to support children to cycle to school, counter the inclusion issues, stimulate the learning about sustainable transportation and be safe and secure. They should support pupils to use contemporary communication technologies, analyse data and share knowledge, support teachers to open up to educational innovations and in that way build on the National Educational Goals and the Local Sustainable Development agenda. The shed should be constructed of sustainable locally sourced timber, provide storage for at least 10% of the total number of pupils in the school, have a place for repairing the bikes and storing the necessary tools.

Developing the ideas

The bike shed could be positioned near the main entrance on the playground. It should be designed to attract attention, and clearly signal to pupils where the bike storage is (Fig. 8.13).[42] Therefore, the silhouette of a bike carved into the shed should be properly sized and coloured. There could be also a small storage space for keeping the tools for repairing. It could be also used for storing the garden tools.

The main idea is that the shed is not used only for bike storage, but also for learning about CO_2 production from various typed of transportation. One touch screen computer could be installed in the shed and connected to the internet. In this way pupils and teachers could connect to various internet based CO_2 calculators, where interesting activity learning plans, designed around types of transport used for travelling to school, could be downloaded and uploaded. In this way the bike shed could become much more than just safe and secure bike storage which encourages both teachers and pupils to cycle to school. It could become an engaging learning tool.

As suggested in the analysis, providing a safe and secure bike storage spaces is very important if we want to encourage pupils to cycle more .[43] Additionally, joint physical activities, as well as structured activities developed around the bike shed could increase a feeling of inclusion, impact the bonding of the teachers, pupils, neighbours and speed up the knowledge exchange [44].

Further development of this design idea should investigate how bike sheds could become engaging learning platforms, which promote learning about CO_2 emission, unite students, strengthen the team spirit, and promote cycling as an important physical activity.

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42 For the design ideas see design portfolio, p. 27

43 For detailed discussion see Chapter 6, p. 138

44 For detailed discussion see Chapter 6, p. 98

A8 Experimental houses – Exploring the local habitat

Fig. 8.14. Experimental houses

Researching the issues

Outside the school walls there are very few educational opportunities for the children in Stara Pazova. The only educational centre, beside the school, is the library in the town centre. However, the pupils honestly admitted that they rarely use it. Additionally, there is no equipment in the school for exploratory learning, and the learning is never taken outside the school walls. Being aware of this, teachers stated that they would like to take the learning from the classrooms in the school playground, to have engaging places to support practical, active and independent learning styles. Ivanka, 49, teacher, explained:

> *We need spaces and equipment so that the pupils could work independently*, while Bojan, teacher, 37, added:
>
> *It would be also good if we could take the learning into the playground*.

Developing the outline brief

A place in the school playground should be designed where researching and protecting the local habitat could be introduced in a child-friendly manner. The activities around such space should support pupils to discover, analyse and communicate information using contemporary technologies, develop communication skill by working alone, in a group or with local experts, and in that way explore the challenges of the protection and preservation of the local habitat and its biodiversity. Such a small eco corner should also support teachers to explore and apply new educational concepts. They should be built of sustainable and durable materials that weather nicely, provide safe and secure storage for the equipment, and if possible be powered by electricity produced from some alternative energy source.

Developing the ideas

Considering all of this the experimental houses were proposed for the north-east corner of the front playground (Fig. 8.14). [45] The idea came from the modelling workshop where a group of pupils designed a series of houses for experimenting, learning and storing data about locally significant animal and plant species. Two wings of each house could be moveable, so that the houses could be opened and the materials in them made available. The houses should be equipped with materials for exploring, analysing, sharing and storing the data about the local habitat, such as magnifying glasses, less expensive microscopes, writing boards, computer. In this way experimental houses could constitute a good place for independent and flexible learning. The teachers could introduce a certain topic about local habitat in the school and send the students to explore these issues in the playground. In experimental houses they could observe and analyse various types of animal and plant species, discuss with peers or local community biologists, environmentalists, and other relevant professionals acting as guest teachers. After gathering and discussing their findings they could put their data in the computer so as to form the school`s local habitat database.

45 For the design ideas see design portfolio, p. 29

Having such spaces across the school is very important, as analysis in this study suggested that flexible and adaptable spaces across the school enable pupils to learn according to their own paste, and socialise with their peers and teachers.[46] Equally important for bonding and knowledge exchange are well structured activities, thoughtfully designed around these spaces.[47]

Therefore, in future an array of learning activities should be developed in greater detail, in order to assist children to use the space effectively, explore the local habitat, and actively participate in its preservation.

46 For detailed discussion see Chapter 6, p. 144

47 For detailed discussion see Chapter 6, p. 102

B1, C4, and D3 Corridors – Adventurous pathways through our school

Fig. 8.15. Rainbow corridor

Researching the issues

The design of corridors and the way they are used have been characterised as problematic by both the pupils and the teachers. The corridors have been used only for communication between other spaces in schools, and for spending five to fifteen minutes between the classes. Beside a few benches there is no other equipment. In these monotonous corridors, according to pupils, there are no opportunities for interesting activities. Teachers believed that this is causing children to climb on the benches, jump from them, inscribe their names. Today, the signs of petit vandalism are obvious.

Developing the outline brief

Both the teachers and the pupils agreed that the corridors should be redesigned. They should be remodeled to incorporate seating spaces where pupils could socialise, where teachers and pupils could sit and talk, and where parents could sit when waiting for either pupils or teachers. If possible storage space and lockers for pupils should skillfully be integrated within the seating space design. Yet, the new design should be much more than just a few benches. It should be made interactive as much as possible in order support the children to actively explore their environment, learn, communicate, bond and develop a sense of place. Once again sustainable materials should be used, resistant to wearing off. The new design for the seating elements should be made modular, allowing to be built sequentially, according to the money available. The colours used should be bright and vivid, just as the spirit of the children in this school.

Developing the ideas

Together with teachers and pupils it was proposed that each floor design is different in order to respond to as many as possible ideas and suggestions of the pupils (Fig. 8.15).[48] Once again the inspiration for remodeling was drawn from the workshops with the pupils. Luka and Petar, age 9 and 10, proposed a school where the learning happens between the stars (see Box no. 11. Space school – Learning among the stars). Taking their proposal into consideration the seating spaces, with the storage above, along the corridor on the ground floor could be developed. The seats and the tables could be opened and closed. The main idea is that the seats could be connected to the star theatre projectors.[49] When the seats are opened and pulled down various star constellations could automatically be projected onto the opposite wall and the ceiling.

The design idea for the corridor on the first floor came from Igor and Ivan, age 10 and 11. Their ideal learning scenario took place also in the outer space (see Box no. 8. NLO school – Riding the light wave). Their learning partners were extraterrestrial creatures, with whom they communicated via differently coloured light signals. Building on this idea a series of seating, in combination with storage spaces, were proposed. One set of seating spaces, named by the pupils 'the Lightship', could consists of two back-to-back seating places. The seats could be moveable, enabling the pupils to slide forward and be seen from the corridor, or slide backwards into the light ship. Moving the seat forward, the pupils could have the opportunity to turn on "excite" or "energise" modes or atmospheres,

48 For the design ideas see design portfolio, p. 31

49 Today star theatre projectors could be obtained quite inexpensively. For more details see www.hocuto.rs/poklon/zvezdani-teatar/2211

consisting of an appropriate light colour and music.[50] These modes could light up the whole ship into the same colour, signaling that the pupil seated is in a mood for chatting and socializing. On the other hand, moving the seat backward into the ship, the pupils could turn on “calm” or “relax” atmosphere, signalling to their peers that they are in a mood to tranquillise, read a book, or listen to relaxing music alone.

The design idea for the corridor on the future second floor was inspired by the model developed by pupils Petra and Anja, age 10 and 11. They proposed bright school which colours could be changed according to pupils wish. Fascination with the opportunity to change and modify light was once again present. The combination of seating and storage space could take a form of a rainbow tunnel. The tunnel could be formed from equally distanced arches. The space between two arches is taken by one storage space. The idea is that when a pupil opens his/her storage, the arch gets light up, by one colour of the rainbow spectrum, marking the pupil’s presence.

Balancing the movement, as a way of exploring and experiencing school space, with retreat places, for contemplation about what was experienced, was an integral part of the redesign strategy in order to support the children to actively explore their environment, learn, communicate, bond and develop a sense of a place. The analysis part of this study suggested that the design of corridors impacts how teachers and pupils learn, bond and communicate[51]. In order to stimulate rather than hinder these processes, spaces in the corridors should allow the levels of privacy to be regulated[52], promote equal ownership and joint use by all pupils and teachers.[53] When reading, writing or just socializing in these newly designed spaces children could always be within calling distance of the teachers, enabling the teachers to easily monitor, but not invade pupils’ privacy and independent learning [54]. Additionally, structuring and further developing the activities around these overspill spaces, will be a crucial next step, as they enable pupils to engage in learning activities of their own interest. Lastly, as the design ideas for corridors are translations of pupils ideas and wishes, they could potentially contribute to the development of a sense of place, which is important, as their school so far was described as characterless.

Through further development of these design ideas it should be closely examined what are the best ways of animating corridors, redesigning them to become learning spaces, and how could we use their design features to create pleasant atmosphere and regulate our moods.

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50 The impact of light therapy (phototherapy or heliotherapy) and music therapy for regulating moods, developing communication, social, motor and educational skills have been well documented and explained. For discussion on light therapy see Golden, R.N., Gaynes, B.N., Ekstrom, R.D., Jacobsen, F.M., Suppes,T., Wisner, K.L. and Nemeroff, C.B. (2005) The Efficacy of Light Therapy in the Treatment of Mood Disorders: A Review and Meta-Analysis of the Evidence. Am J Psychiatry, 162, p.656–662; and Tomlinson , J., Derrington , P. and Oldfield, A. (eds.) (2011) Music Therapy in Schools: Working with Children of All Ages in Mainstream and Special Education. London: Jessica Kingsley Publishers.

51 For detailed discussion see Chapter 6, p. 105

52 For detailed discussion see Chapter 6, p. 107

53 For detailed discussion see Chapter 6, p. 106

54 For detailed discussion see Chapter 6, p. 124

B2 Exhibition entrance – Who we are and what we stand for

Fig. 8.16. Exhibition entrance

Researching the issues

Local people of Stara Pazova today are a mixture of locals and non locals – the refugees who settled here after the wars in Bosnia and Kosovo. The mixed ethnicities do not thrive on cultural hybridity, as it was the case hundred or two hundred years ago, but quite the opposite, suffer from it. A small number of cultural facilities, such as the cultural centre and the library, as well as the local happenings, are concentrated in the town centre. Therefore, the biggest problem today is that the rich and diverse cultural heritage is not easily read and observed, and the local children are rarely introduced to it. Children who are distanced from cultural resources have limited opportunity to expand their educational and cultural horizons.[55] Exposure to different cultures stimulates children to ask questions, investigate, and explore cultural beliefs. In this way a child can become more reflective, broad- and scientifically minded. [56] Evidently, the opportunity for children in Stara Pazova to see the other ways of living, attitudes, and values, is undermined. This is not compensated through the curriculum, and most importantly for this study, through school design. During the school design phase pupils and teacher were not consulted and given a chance to, by creating the identity for their school, contribute to the identity of this neighbourhood, where social cohesion is undermined. When discussing with pupils and teachers what the school building itself is telling about the local cultural heritage, both groups managed to distinguish only one feature – the picture of the Simeon Aranicki in the hall. Inability of children to understand the importance of roles that all ethnicities played in the development of Stara Pazova through history, today results in discrimination and many inequalities, about which children and teachers blatantly spoke. Children of the ethnic minorities, such as Roma or Slovaki, are harassed, socially and emotionally excluded, and social cohesion within the school is undermined. To what extent this town and the school are adequate platforms for supporting and contributing to the rich cultural heritage, and to what extent they are able to act as stimuli for inclusion is questionable.

Developing the outline brief

Being aware of the situation, teachers wished to have a space in the school that will transparently demonstrate and celebrate the local ethnicities. Such place should help the school to become an important cultural centre, which can regularly host various exhibitions, show collaborations of the pupils and local artists, and other professionals, and possibly act as a stabiliser within the community. Today there are just a few moveable exhibition panels, without specially designed place for them. Moreover, the school has a significant collection of locally important artefacts and no proper place for displaying them.

55 De Castro, L. R. (2006) Circulating in the city: From routes to projects, from diversion to conversion. In Malone, K. (2007) Child Space: An anthropological exploration of young people's use of space. New Delhi: Concept Publishing Company, p. 44

56 Taylor, A. (2009) Linking architecture and education: sustainable design for learning environments. New Mexico: The University of New Mexico Press, p.36

For this reasons, with teachers and pupils it was decided that there should be an exhibition space in the school. It should be positioned in a place accessible for all, easily observable, and designed to attract attention. It should promote the collaboration with the local community, contribute to the development of personal and national identity, and the respect for other nations, and enable students to develop research and analytical skills, communication and presentation skills. It should also be a platform to support teachers to apply new educational concepts and new concepts for promotion of culture. All of this suggestions correspond to the National Educational Goals and the Local Sustainable Development agenda.

Developing the ideas

The current entrance hall could be remodelled to serve as an exhibition space (Fig. 8.16).[57] The inspiration for the design came from the modelling workshop where pupils, while redesigning their school, turned its central part into a big exhibition space (see Model no. 1. Hocus, Pocus, Preparandus – exhibition spaces). This was very important for them because their

> *work with local artists is never shown, and things we make or bring to school are not very well displayed*– Sinisa, 12, pupil.

Additionally, elongated plots with the Pannonian type of houses were a motive reinterpreted through design. The urban morphology of the neighbourhood was transponed onto the walls, so that multiple square exhibition spaces, coming out of and in the wall, were created. Through the exhibition of artifacts, already collected in school, occupants' knowledge could be enhanced and visibility of different ethnicities, that constitute the town, increased. The opportunity for exhibiting the artifacts is crucial because "the attributes of otherness are fundamental to representation of identity, which are constructed in counter-distinction to them".[58] As places can hold our culture and our identity[59] , the walls in the entrance hall could be redesigned to tell locally important stories. The square exhibition boxes coming in and out of the wall, which could be used for exhibiting the material, were complemented with an unbroken narrative on a timeline below. The timeline marks locally significant dates, leaving one side empty, so as to allow and invite the occupants to continue marking important dates in the future.

Changing the exhibitions by taking and adding parts, arranging and rearranging artifacts under different themes, could contribute to reinventing the local culture and making its segments more visible and apparent. The ongoing collection and display of artifacts can play an important role, as the artifacts represent the identity of local ethnicities. These different objects could have the power to tell the stories, so crucial for constituting new identity.[60] The artifacts in this way could become representations and evidence of harmonious life from the past and present, constituting a good starting point for the joint future. The opposite wall, completely covered with mirrors was developed as a negative of the first one. The mirrors will optimistically increase the teachers` and pupil`s awareness about their presence in the school.

57 For the design ideas see design portfolio, p. 35

58 Ashworth, G.J. and Graham, B. (eds) (2005) Senses of Place: Senses of Time. Burington, Ashgate Publishing Company, p. 53

59 Gruenewald, D. (2003) Foundations of Place: A multidisciplinary framework for place-conscious education. American Educational Research Journal, 40(3), p. 625

60 Ashworth, G.J. and Graham, B. (eds) (2005) Senses of Place: Senses of Time. Burington, Ashgate Publishing Company

Additionally, seeing their reflection in the mirror, with the wall celebrating local culture behind them, they could become more aware that they all are a part of the school ethos and culture, no matter what their religion, age, sex and nationality is. This space aims to symbolically transmit the message that as all people have their reflection in the mirror, they should be equally treated and valued.

As the school already works with the local artists, the exhibition entrance could provide an adequate space for displaying their work and curating exhibitions with locally significant themes. The evidence from the chapter four suggested that school space can act as a bonding agent between these parties, and platform for knowledge exchange when the spaces are jointly used by school and neighbourhood members [61], when the activities around the space are well structured [62], and when there are design features that stimulate interactions [63]. Additionally, the evidence suggested that school space can act pedagogically and "teach" about local culture by skillfully interpreting occupant national and cultural features [64]. Through analysing, ordering and categorizing various artifacts for exhibitions, alongside the school staff, local artist and professionals, pupils could develop research and analytical skills, and by presenting the results, they could practice communication and presentation skills. In this way pupils could apply their skills and knowledge, learn at their own paste, and better communicate with their peers and teachers . In addition, this design tries to tackle the lack of a sense of place. Addressing this issue through the design of the entrance and reception areas, is crucial because they are very important for communicating a sense of place[65]. Creating and recreating the new history and ethos of the school could be achieved when design features are interpretations of occupants ideas[66], when the design arises from local challenges, and is representative of the local communal situation[67].

Further development of this design should explore in greater detail whether and how the school could become the new cultural centre in the neighbourhood, able to act as local stabiliser.

61 For detailed discussion see Chapter 6, p. 105

62 For detailed discussion see Chapter 6, p. 116

63 For detailed discussion see Chapter 6, p. 105

64 For detailed discussion see Chapter 6, p. 124

65 For detailed discussion see Chapter 6, p. 123

66 For detailed discussion see Chapter 6, p. 124

67 For detailed discussion see Chapter 6, p. 125

Fig. 8.17. Roof garden

C1 Roof Garden – Flexible learning about alternative energy sources

Researching the issues

As explained before, the educational opportunities for the children outside the school are very scarce in this town. Realising this, teachers suggested that some not well used spaces across the school should be redesigned, so that the pupils could use them both during and after school hours. The very large roof top was named by both the pupils and the teachers as a space suitable for remodeling.

> *The space could be used as a learning space, but there should be some corners for free time activities…maybe reading, listening to music, relaxing* – said Boba, 43, teacher, while Bojan, 37, teacher added

> *If we manage to have the PV panels on the roof, they should be somehow connected to the activities on the roof. The roof should be green, like a small garden.*

During the modelling workshop a group of pupils echoed these sentiments.

> *We learn about solar panels, electricity production, green roof, plants and insects that inhabit those roofs only from books… we want to see them!*– Marko, 13, pupil.

After complaining on passive learning about environmental issues, they suggested having a space for independent learning and researching. According to them such space should also have a part where they could discuss what they learned in

> *relaxed and friendly atmosphere*– Ana, 11, pupil.

Developing the outline brief

The green roof should be a place where pupils could learn about ecological issues, improvement of ecosystems, benefits of green roofs, production and monitoring of energy created by PV panels. Besides, a space for rest and relaxation should be included. It should be safe and secure for pupil`s independent use, accessible and open during the school hours.

Developing the ideas

Pupils model titled Research station XYZ (see model no. 4. Research station XYZ – Learning through research) inspired the ideas for the roof garden. Having flexible space, which can easily combine learning and relaxation activities, was a priority for them.[68] In one corner of the roof movable and easily rearrangeable seats could be placed. Additionally, energy readers connected with the PV panels on the roof could be installed and used as tools for learning. Flexible seating should enable the learning activities to be organized around energy readers, or moved aside and used for rest, relaxation, reading and socialising. Learning activities, such as analysing the data collected from the site, discussing and presenting the conclusions, could provide the pupils with an opportunity to advance analytic, presentation and communication skills. The space on the roof garden could allow different groups of pupils and teachers to simultaneously learn, socialize or relax, in groups or alone.

68 For the design ideas see design portfolio, p. 37

Such space could encourage the teachers to try applying new learning concepts and engage pupils in active learning about locally significant environmental issues in a child friendly manner. The evidence from the chapter 6 suggests that such flexible and adaptable spaces across the school enable pupils to learn according to their own paste, socialise with their peers and teachers.[69] Additionally, jointly used spaces, which allow the levels of privacy to be regulated, impact learning and bonding between pupils and teachers.[70]

In the future similar designs from across the world should be examined in detail, so it could be seen how unused space pockets around the school could be remodeled into effective learning spaces.

Summary

This chapter explored in detail the history, and the contemporary developmental potentials and challenges of the town Stara Pazova, Serbia, so that the context of the school to be transformed could be understood. Taking into consideration the location - actors - activities framework the developmental potential and challenges of both the macro location - the town, and the micro location - the school were explored. Together with the future actors in the learning process the teachers and the pupils, school space was evaluated from the perspective of sustainability and pedagogy. At the end a series of design ideas were developed, and it was discussed what kind of learning activities teachers and pupils could organise in each space proposed. The design ideas were informed by the key messages developed in the chapter 6, yet the decisions were always rendered through a series of important contextual variables. Once again it should be stressed that the design ideas should not be seen as finished design proposals. These ideas are for inspiration and discussion, but do have the potential to be developed into a full design proposal when the right partners are found, and the finances secured.

69 For detailed discussion see Chapter 6, p. 144

70 For detailed discussion see Chapter 6, p. 107

09

CONCLUSIONS AND RECOMMENDATIONS

Designing sustainable schools to act as the third teacher: potential contribution

As an architect from Serbia, concerned for the current condition of our schools buildings, through this research I ventured into answering the questions:
- how should we develop architectural design for schools to be more socially, environmentally and economically sustainable, and
- how could such schools, designed with sustainability in mind, impact on the learning process, incite and even provoke learning, and raise awareness about sustainability issues?

The results of this thesis suggest that understanding the global challenges impacting school design, as well as how our countries reform all aspects of education, so as to meet these vital challenges is very important. At the beginning of this research, it was explored how school design in Serbia responds to changes in various areas of educational reform, such as: educational goals, regulations, teaching and learning methods, curriculum, and governance. So that we in Serbia could approach school design more critically, it was equally important to comprehend the history and the influences shaping school design. Developing the discussion about these issues new insights were produced, potentially valuable for architects developing school design, as well as for teachers and pedagogues.

Researching the state of the art knowledge from various disciplines was another important step. It led to discovering the gap in the existing literature. The synthesis of existing facts on sustainability, sustainable schools, and sustainable schools as the “third teacher“ broadened the understanding of these issues in school design context.

Merging two perspectives, such as sustainable schools and schools acting as the “third teacher”, this research discovered that not much empirical evidence could be found, as well as tailor-made tools for evaluating how sustainable schools can act as the third teacher. Seeing this rather as an opportunity to contribute to both, instead as an obstacle, this research demonstrated the importance of developing new tools, which can potentially lead to the development of new knowledge.

Taking this insight into consideration, this thesis combined several research approaches, developed innovative research tools, and consulted teachers, pupils, and architects from other countries. In this way the importance of learning from success and mistakes of schools designed to be sustainable and pedagogically valuable was suggested. Describing in detail the research steps and tools could provide architects and researcher alike with valuable tool, which can used in different school settings. Hence, this research has the potential to contribute to both the development of our understanding of the subject matter, as well as to the quality of research tools available.

Additionally, the value of multidisciplinary approach for tackling the questions of designing sustainable and pedagogically valuable schools was demonstrated. The insights of teachers, pupils, and architects were analysed and triangulated with contemporary literature from the field of school design, pedagogy, developmental and environmental psychology, and education. This resulted in much broader understanding of sustainable school design and their pedagogical potential, and development of key messages to inform the design.

Yet, school designs from one country cannot be literally translated and copied to another context. This thesis demonstrated that the most important messages from teachers, pupils, and architects should be theoretically framed, so as to develop better and improved frameworks for analysing and designing pedagogically valuable sustainable schools. The location – actors – activities - framework developed in this study suggests that in order to design sustainable schools able to act as the third teacher, and to incite and even provoke learning, in depth research and understanding of the context and location of the school is needed. Participants should be included in developing and critiquing both the location and design ideas; and together with teachers and pupils teaching and learning activities should be designed around spaces in the school. The synergy of these three aspects has the opportunity to impact on the way a sustainable school can inspire learning.

At the end this research suggested that another important step is developing designs which build upon evidence base. The final result - a set of design ideas is a test of the research framework developed, and a spatial interpretation of the research findings.

To summarise, the results of this research could potentially contribute to methodology, theory, practice, and policy. The tools developed during this research: the game Spector, mapping, modeling and consultation tools depict the best the synthesis of various research approaches and designs adopted by an architect/researcher. Both tools and approaches could be useful to architects and researcher interested in evaluating and designing learning environments with users. As such they present a contribution to existing research tools and methodological approaches.

The location-actors-activities framework developed in chapter 7, together with the key messages developed in chapter 6, contribute to the existing theory and potentially aid our understanding about how sustainable schools can act as the “third teacher”.

Additionally, describing in detail all the steps made along the way potentially useful knowledge for practice is produced. These steps could be valuable for practitioners who see research as inextricable from design, and vice-versa; and who wish to base their creative designs on evidence, use it to stimulate users to actively contribute to the quality of both design/research processes and the quality of built environment.

Lastly, the key messages developed in chapter 6 present possible contribution to policy. They are based on evidence, and presented in a clear and straightforward manner, thus could easily inform or be a part of a policy document assisting decision making about designing sustainable schools acting as the “third teacher”.

Lessons learned

Taking the research by design route offered at the Sheffield School of Architecture, enabled me to not just expand my understanding of the subject matter I was interested in, but also to be introduced to a different way of working and thinking as an architect. I learned to approach design in a different way, merging research and design into one iterative process, constantly informing each other. Additionally, I started to appreciate a participatory approach to both design and research, which, when designed and organised properly, can be educational for both the architect and the participants. Lastly, I have learned to analyse and synthesise large quantities of data, and direct them toward proposing and developing design solutions.

Limitations

As explained in the methodology chapter one of the limitations of this study is that the initial observations in the Erika Mann school from Berlin were not followed by the interviews with the teachers and pupils. However, the architect of the school has been talking with the teacher and pupils over the last eight years, since the school was remodelled, and their opinions were interpreted by the architect, and communicated through this research.

Additionally, the number of pupils and teacher interviewed in the school did not constitute a representative sample. Therefore, their opinions are not representative of the whole teacher and pupil population in schools. Due to the small number of schools designed in this way so far, the time needed for transcribing and analyzing the results, only one school from England, one from Germany and one from Spain were explored. This research is qualitative and representativeness of sample and generalizability were not sought, but deeper insight in how sustainable schools are designed to act as the “third teacher”. Therefore, the intention is not to generalize the results to represent a whole school and a whole country.

This research could also have benefited from exploring school design in other countries across the Europe, especially Scandinavian countries, which are known to have one of the best educational systems and interesting school designs developed with sustainability in mind.

The next steps: recommendations for future research

During this research several research question and areas have been identified that could be further explored, either by myself or other researchers interested in the same or similar problems.

Firstly, all the previously mentioned limitations could be turned into new research questions and explored in future. To illustrate, pupils and teachers from Erika Mann school from Berlin could be interviewed, a representative sample of teachers and pupils in all schools explored could be constituted, and much broader sample of schools could be included, especially from Scandinavian countries. In this way more empirical evidence about the pedagogical potential of sustainable schools could be created.

Additionally, a thorough review, classification and explanation of all the influences impacting on the school design in Serbia through history is a theme worth exploring through another PhD research.

At the end of this research together with teacher and pupils from Simeon Aranicki school in Serbia a series of design ideas for transforming their school into a more sustainable and pedagogically valuable one was developed. The principles that guided the decision making process came from the synthesis of the local policy, context, architecture, pedagogy, knowledge from the literature and analysis, participation, and were combined with the implicit knowledge of an architect and subjective views. However, the design ideas presented remain as researched creative solutions in visible form and not as finished, ready to build proposals. Although, they have the potential to be developed as such when financial support is found.

Therefore, an important task for the future of this research could be changing the strategy for negotiating financial support. Instead of negotiating with the Ministry of Education, the focus could be turned on a local level – the municipality and the local socially responsible companies that could be able to, either financially support the project, or offer their services, manpower, building materials, or building and construction tools and machines.

When some of the design ideas are further developed and built, it would be worth exploring through a post-occupancy study to what extent can they impact upon learning. Equally interesting would be researching what children learn, and what particular skills and abilities they develop through engagements with these designs. Today, we could not claim that the design ideas proposed in this research could definitely impact the learning process. Yet, what could be concluded is that the participatory design and evaluation process raised awareness of both teachers and the pupils in the school about locally important sustainability issues and inspired action. Teachers from the school in 2012 organized an eco group for extra-curricular activities for pupils. Just one year after the group was established the school won the first place at the national competition for the most environmentally conscious school in Serbia. Additionally, the pupils self-initiated the project and created a film on the importance of inclusion of their physically impaired and developmentally challenged peers. The film won an award at the competition called “Create the world without the differences” organized by the Ministry of Education.

This research has established that the educational dimension of the participatory design and evaluation processes is important and useful for architects, teachers and pupils. Therefore, the NGO ARQubator will continue to engage pupils, teachers, architects, architecture students in similar projects. Additionally, we will strive to team up with other relevant professionals, such as educationalists, pedagogues, psychologists, as well as students studying for those professions, in order to encourage the multidisciplinary academic debate, and improve the quality of both design and education.

So that the larger number of schools could potentially benefit from the findings of this study, it should be explore could they inform current school building standards. Meetings with the Ministry of Education in Serbia revealed that money for modernising school building standards is already obtained from one EU loan. Therefore, negotiations have already started with the Ministry, and will be continued, so that the change of standards is initiated and their quality improved.

To conclude, during this research, once again, children proved to be able to sum up our work and our goals in a very concise and straightforward manner, probably much better than us adults. Before the workshop with the children in school in Stara Pazova began, the head teacher asked me to explain different levels of university education, and what it means to be a doctor in a certain area. Starting the first workshop with the younger pupils age 7-10, I tried to explain that if you are very much interested in a certain field you can explore it in –depth, make conclusions to advance it, and in that way become an expert. I added that the issues of school design are the once that interest me the most, and that I believe we in Serbia could together develop even better school that the existing ones. After an hour another teacher came in the classroom where the ARQubator members and I have been working with children. Not knowing who we are, and what we are doing, she asked me to explain. I introduced myself and started to explain what this project is about. After a minute or two a little boy, without even turning his head from the school he was modelling, concisely explained:

"*She wants to be a doctor in architecture. This means that she wants to cure the schools, and she needs our help*."

Whether we in Serbia will be able to 'cure' the schools depends on whether we will be able to expand our knowledge, surpass the perceived boundaries of our profession, actively agitate for change and implementation of the state-of –the-art findings, so as to modernise our regulations and standards. Also we need to collaborate with our colleagues from various relevant professions, such as pedagogues, psychologists, educationalists, and most importantly, start to value the perspectives of people for whom and with whom we design.

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