DESK RESEARCH – ABSTRACT

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Educational Spaces 21. Open up! Project coordinated by Center For Citizenship Education in partnership with the THINK! Knowledge Society Foundation, Gesellschaft zur Förderung des Hanseatic Institute for Entrepreneurship and Regional Development an der Universität Rostock e.V. and Rektorsakademien Utveckling AB by the European Commission founds within the framework of ERASMUS+ Programme.

Chapter 1 EDUCATIONAL ENVIORNMENT AND EDUCATIONAL SPACES

Educational spaces as a learning environment

The OECD specialists define the educational space as follows (2006 / Kuuskorpi et al. 2011: 1):

"a physical space that supports multiple and diverse teaching and learning programmes and pedagogies, including current technologies; one that demonstrates optimal, cost-effective building performance and operation over time; one that respects and is in harmony with the environment; and one that encourages social participation, providing a healthy, comfortable, safe, secure and stimulating setting for its occupants".

In the narrowest sense of the definition, the physical educational space can be associated with the space of a traditional classroom. It its widest sense, it denotes the environment connecting the systems of formal and informal education, where learning can take place both at school and outside of it. The concept of the physical educational space is evolving; now it encompasses not only the physical structures, equipment and tools at school, but also the sources of information and the events that are not held at school, the students' participation being both physical and virtual. Physical space influences all four contexts of learning: its formal, informal, individual and social aspects.

Source: The future of the physical learning environment: school facilities that support the user, Marko Kuuskorpi, Kaarina, and Nuria Cabellos González, OECD, 2011.[u1]

However, our perception of education and learning changes depending on the perspective adopted: whether it is the micro- or macro-scale one. A school classroom and the level of the school classroom are but temporary, working terms offering a mental shortcut to the definition that seems to involve the actions undertaken within the framework of organised learning encompassing more than one student. However sometimes contrary to the intention of the person using those terms, mentioning a school classroom draws the attention of the listener away from the learning that takes place in workshops, on a school sports court, remotely, within the local communities or in other non-formal environments. Consequently, the terms quoted above can be seen as misleading in suggesting that our interest lies only in what happens within a given institutional unit (or at a given physical location) being a part of

the current organisation of the educational system and that we do place any focus on learning taking place in various configurations and in various contexts.

This is why some researchers (Dumont and Istance 2010) put forward the suggestion to refer to the educational spaces using the term 'learning environments' which covers the general scope of conditions in which learning takes place. The terms itself refers to the situation that is difficult to define, is of very general character and is opposed to the individual or specific conditions that could be taken out of the context of learning (i.e. the environment) encompassing the students and in which the lessons are taking place. Such understanding of the 'learning environment' also implies that its main characteristics are: its dynamic nature and the interactions (or mutual influence) between its four dimensions, namely between **the student** (or the learner, the one who is learning), **the teachers, the community and other learning professionals** (the entities assisting learning), **the content** (what is being learned), and the **objects, equipment and technologies** (namely where the learning is taking place and what objects assist it). The interactions between these dimensions and the dynamics that happens in the environment can be applied to different pedagogical approaches and various actions and activities related to learning that take place during the process. The understanding of the terms 'space' and 'environment' as presented above is the more general one than in the situation in which these terms would refer to the physical and technological conditions of learning. The learning itself should be understood as being "situated in a particular context, contextualized". The direct context of all learning-related events is what we would define here as 'the learning environment'.

What is modern education and learning, and what is the role of modern educational and learning environments?

Supported by the research results (Dumont et al. 2010) and taking into account the socio-economic transformations, one could elaborate seven basic and inter-related guidelines for modern education (learning).

First, **the educational (learning) environment should focus on the students (the learners) as the core participants of the process, should encourage their active engagement and develop the understanding of one's action as a learner.** Thus, the educational environments should inspire focusing on the students who are the main participants of the learning process. Learning-oriented environments encourage the self-regulation of students, which means that

they incite the development of meta-cognitive skills that enable the learners to monitor, to assess and to optimize the acquisition and the use of knowledge (De Corte 2010), developing as well the regulation skills of one's emotions and motivations in the learning process (Boekaertes 2010; Hinton and Fischer 2010). Additionally, a large number of researchers (William 2010: 327) draws our attention to the fact that the role of the teacher should undergo a certain transformation: a teacher should cease to be a "sage on the stage" and to become "guide on the side".

Secondly, the researchers argue that **the learning environments should be founded on the basis of the social nature of learning and actively encourage a well-organised co-operative education and learning.** "Effective learning is not purely a 'solo' activity but essentially a 'distributed' one: individual knowledge construction occurs throughout processes of interaction, negotiation and co-operation" (De Corte 2010: 320). Even though the individual learning and experience are valuable, the learning is what happens during mutual interactions between the students and the environment. A number of research shows that co-operative learning in school conditions, provided it is properly organised, proves to be significantly effective (Slavin 2010). Group co-operation, adequately organised and structured, can largely contribute to school achievements, as well as behavioural and affective outcomes (Slavin 2010; Barron and Darling-Hammond 2010). Still, such solutions still stay on the margin of school activity, as a number of teachers, still too high, perceive co-operative methods as principally unstructured (Slavin 2010).

However, the ability to co-operate is a valuable skill and effect, the development of which should be supported regardless of its influence on the measurable achievements. In other words, the skill of co-operation and co-operative learning should be promoted as a 21st century competence regardless of its proved influence on the traditionally measured students' results. Co-operation, when taking the form of co-operative problem-solving or project realisation, reflects the real situations students will encounter later on in life. If school-based education will consist in students working solely on their own account, such students will be poorly prepared to successfully manage the modern socio-economic reality (Looney 2009).

Thirdly, **learning professionals working in learning environments should be sensitive especially to the key role of motivations and emotions in students' achievements.** The emotional and the cognitive dimensions of learning are inseparably connected one to another, which is why the understanding of students' cognitive development, motivation factors and

their individual character is essential. However, the standard educational thought puts far less importance on learners' beliefs and motivations compared to the goals defined according to cognitive development categories (Boekaerts 2010). Teachers must be aware of students' motivational beliefs and their emotional reactions in order to be able to manage the learning process: "Being highly attuned to learners' motivations and the key role of emotions is not an exhortation to be "nice" – misplaced encouragement will anyway do more harm than good" (Dumont and Istance 2010: 15). Some researchers compare paying attention to the emotive aspect of learning to a hike in the mountains (Schneider and Stern 2010): gaining knowledge can be compared rather to a difficult climb than to a feeling when once that we have reached the peak, we sit down, take a digital camera and take pictures to capture the view. Consequently, the turn to motivation aims at increasing the effectiveness of knowledge acquisition, not only at the increase of facility or pleasurability of the process.

Researchers present a number of strong arguments for the effectiveness of technologically-assisted approaches (Mayer 2010), co-operative learning (Slavin 2010), inquiry-based learning (Barron and Darling-Hammond 2010) and community service learning (Furco 2010), as such approaches have the power to motivate students and to engage them in the learning process. This results in a situation in which the student is motivated to learn, the encouragement is coming from the use of technology, or the very process itself or the substantial (curricular) contents of learning seem important, as is often the case of the inquiry-based or community service projects.

Forth argument is that **the learning environments shall be acutely sensitive to the individual differences among the learners in in, including their prior knowledge (Dumont and Istance 2010).** Students differ not only in the terms of a number of aspects important for the learning process (prior knowledge, abilities, beliefs on learning, learning styles and strategies, interests, motivation, faith one's own efficacy and related emotions) but also in social and environmental terms such as their cultural and social surroundings and backgrounds. The key challenge is to manage such differences and ensuring that students will be able to learn together within the framework of one common system of education and culture.

The basic quality of thinking is that people are trying to understand new information by comparing it to their prior knowledge and abilities (De Corte 2010; Schneider and Stern 2010). In a reversed scheme, learners who are not able to form such connections will

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encounter serious difficulties in performing new and challenging tasks. This shows that prior knowledge has a significant impact on the learning process and constitutes one of the resources thanks to which one is able to acquire new information, and is one of the most important individual differences between students. Prior knowledge is built based on various experiences and information from diverse sources, formal or not, namely based on the observation of one's everyday life, media, friends' circle, parents and based on the previous school education and learning. Understanding the differences in backgrounds, environments and starting points, paired with the ability to include a variety of perspectives in the learning process constitute an indispensable component of the improvement of the quality of education and learning. Learning environments should be able to include the said differences and to adjust the activities and actions to their impact.

Fifth recommendation is that **the learning environments should devise programmes that demand hard work and challenge from all students without excessive overload.** Learning environments are more effective if they account for the individual differences between students. However, even though the learning environments should require work and effort from all parties engaged, the research shows that the overload of work and the demotivating regime based on excessive pressure are equally ineffective, as they do not encourage effective learning. As stresses by Mayer (2010) and outlined by Schneider and Stern (2010), the most important requirement is that the learning limit should be constrained by the individual capacity limitations of human cognitive mechanisms. On one hand, this means that everybody need a proper, well-adjusted challenge in order to reach a bit beyond their current level of possibilities. This is why one should avoid a situation of engaging a person in a prolonged activity that is no longer a challenge for him or for her. On the other hand, the key question is that learning cannot exceed the limitations of human information processing capacity. For instance, learning with the use of new technologies faces the challenge of "capacity limitation", i.e. that in a given moment, a human being is capable of acquiring only a little part of the learning material, as well as the issue of capacity difference in the limited resource of working memory and the unlimited resource of long-term memory.

As highlighted by Slavin (2010), the research shows that co-operative learning proves to be equally effective in the case of all students. This should provide a satisfactory answer to teachers' concerns that such approach and the approaches similar to it would limit the opportunities for the best students. According to the outcome of the research, the best profit

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from co-operative learning (compared to the same group in traditional classrooms) to the same extent as the average and the weakest students. This partly results from the fact that the effective group learning methods encourage all students to work, regardless of their skills; and partly from the fact that the best students acquire knowledge and skills by supporting their weaker colleagues. As a consequence, well-devised group learning methods can offer an important solution for realising the principle on challenges for all students.

As the sixth principle, **the learning environments should "operate with clarity of expectations and deploy assessment strategies consistent with these expectations; [...] strong emphasis [should be placed] on formative feedback to support learning" (Dumont and Istance 2010: 17).** Assessment is a crucially important part of learning. Assessment method "defines the cognitive demands of the work students are asked to undertake (Barron and Darling-Hammond 2010), while the evaluation of the usefulness and the effectiveness of educational activities creates "the bridge between teaching and learning" (Wiliam 2010). When the assessment (or the grade) is authentic and consistent with educational goals, it becomes a powerful tool to support the learning process.

Formative assessment constitutes an essential part of the learning environment of the 21st century. Students need significant and regular feedback, useful also for the teachers, as thanks to them the teachers have the chance to know which students really make some progress and how the learning process should be organised. The research (Wiliam 2010) show that there is a strong connection between providing formative assessment and the effectiveness of learning. This is why the presented approach should be included in daily activities – to increase their effectiveness.

In the terms of the seventh recommendation, **the learning environment should "strongly promote "horizontal connectedness" across areas of knowledge and subjects as well as to the community and wider world." (Dumont and Istance 2010: 17).** The optimal learning creates knowledge that could be the object of the transfer of knowledge (Schneider and Stern 2010). This means that the complex knowledge structures are being gradually built by the hierarchical positioning of its basic elements. The specific learning objects should be assembled into larger structures and notions (Schneider and Stern 2010). The network of connections constructed as a result of the creation of larger systems allowing to transfer knowledge, to use in in various contexts and to solve atypical problems, constitutes one of the main aspects of the 21st century competences Research shows that often students cannot

transfer their understanding of one idea or relation from one domain to another, and even proves that changing the example in the same mathematical assignment can influence students' ability to solve the problem or to complete the assignment. The teacher obviously to himself or herself sees some features or information as parts of a bigger whole, while the students often perceive it as a chaotic and incomplete set of data (Schneider and Stern 2010). Therefore, helping students to gradually improve their ability to connect the growing number of information should constitute one of the essential goals of teaching.

Meaningful real-life questions also play a central role in maintaining the importance of learning by supporting both the engagement and the motivation. The approaches of inquiry-based and community work-based learning offer a number of examples of how to achieve the said goal (Barron and Darling-Hammond 2010; Furco 2010). The effective learning environment cannot stand in opposition to the influences and the expectations of the students' family and local environment, to the contrary, they should all interact and co-operate (Schneider, Keesler and Morlock 2010). This shows why the meaningful real-life problems play such an important role in increasing the useful aspect of learning. Inquiry-based and community work-based learning again provide a number of examples on how to reach that goal.

Designing educational spaces

Designing a new educational space is a great challenge for both the designers and institutions of education. Both have to be aware that the solutions introduced should enable the unit constructed in the given local community to provide education to the young for the next decades to come, and that the current conditions are those of a high-paced development of civilisation. There is a real risk that apart from the their visual aspects, the solutions in place will have little in common with a modern and multi-functional educational space. This has been confirmed by the British experience during the realisation of the government programme Building Schools for the Future (2006-2010), during which it became known that such an ambitious plan of construction and rebuilding (or replacement) of modern school buildings lacks the designers with sufficiently in-depth knowledge on education or that the participation of the schools' employees was too little. This is why the first stage of work, the concept stage, is of such importance: it is in this stage that the discussion on school's place in the community within the coming decades should be started (even if in a small group), a couple of key

questions should be asked and search for answers initiated. A successful design of an educational space should be opened with a debate in the course of which the vision of the "school of the future" will be determined in details. The debate should not be discarded also in the context of modernising the existing buildings: educational visions, especially if elaborated in a larger group, facilitate the realisation of the initial goals and help us to understand the challenges to be faced by the school youth in this particular school.

Instead of starting with the design of the physical space, try to understand what educational programme would you like to realise in this particular school and whether the existing structures offer an assistance or are they rather a hindrance? (Rudd et al. 2006: 3) Designing a school of the future should start with designing the learning first, not the physical space where learning happens. Education should come first, architecture should follow. The questions to be asked are: 'What education do we want in the future?' rather than: 'What school buildings do we need?'; 'What types of learning processes and relations would we like to support?' rather than: 'How many classrooms would we need for this building?'; 'What competences do we want to develop?';'What tools and resources are available to support the learning?' (Rudd et al. 2006: 3–4).

The second group of questions should concern the place of school in the local community. We should ask about the relation to the community (formal and informal), about the cultural context (school as a cultural centre of the community), about the opportunities to co-operate with persons and institutions within the local community.

Additionally, assuming that it is the learner that is central to learning, we cannot overlook the question of personalising the learning process. We are designing the school of the future for the students of the future, so the questions to be asked are: When do students learn?; Where do they learn?; What do they learn?; With whom? and How? (Rudd et al. 2006: 5–6). Let us try to find the answer to the following question: "To what extent will the design of new learning spaces enable, encourage and facilitate more personalised educational experiences?" (Rudd et al. 2006: 7).

Equally important questions are: "To what extent will the design of new learning spaces allow curriculum flexibility and experimentation? How will they enable us to reconfigure resources, expertise and knowledge in different ways to meet the changing educational goals of the 21st century?" (Rudd et al. 2006: 9). We should also remember that when we are thinking about a

learning space, we are not only thinking about the process of acquiring information and transforming it into knowledge, but that we want to design a space that develops the skills and shapes the attitudes of co-operation (collaboration),innovation, initiation and knowledge co-construction (Van Note Chism 2006 / Rudd et al. 2006: 9). In a certain way, the new space of education should additionally stimulate the transformation and the development of new pedagogy of the 21st century.

Elaborated by Marcin Polak based on: Tim Rudd, Carolyn Gifford, Jo Morrison and Keri Facer, "What if... Re-imagining learning spaces", Futurelab, 2006. [u2]

Important contexts for designing spaces

Research, development of the educational unit, the review of good and bad practices, and reflection – this is what should underlay all actions within the area of education. Designing spaces at the service of learning should be preceded by analyses of at least three areas of school operation:

1. Understanding the local learning culture Every school operates within a determined and specific local and cultural context so it is impossible to universally apply every single solution to every single school. The design has to take into consideration the goal of learning and the functions that a given school fulfils in a local community in the terms of clearly defined goals, as the school design shall support the school's mission and goals. One should also remember that the conditions designed could serve as a powerful tool to support the learning.

2. Defining what is needed to create a 'good' learning environment We should look into the fact of how the elements of a physical space could effectively influence teaching and learning at school. We should also identify the barriers (physical and on the level of administration or management) that make it difficult to introduce innovation, and pay attention to the effectiveness of teaching. Moreover, we should always take into account the core users of this environment: students and teachers, regardless of the type of education: experimental or more traditional.

3. Understanding the indirect relationships at school in the terms of policy, pedagogy and environment Learning and education do not exist in a legal and social vacuum: they are influenced by various legal regulations having final impact also on learning and the environment where it occurs. These can cover regulations on financing, payroll and salaries,

employment, social policies etc. A better understanding of this complex system could will allow us to design buildings that will be more functional and supporting learning even better.

Source: 21st Century Schools. Learning environments of the future, CABE, 2004. [u3]

Rebuilding schools as a change to change our thinking in matters of education

Rebuilding a school with the only purpose of it being more pleasant to the eye and looking more modern may be fulfilling the right goal. We should rather focus on transforming school by not only changing its physical space indoors and outdoors but also by introducing various teaching approaches, modern teaching methods, by building relations at school and beyond it (i.e. in the terms of co-operation with the local community), by changing the organisation of the teaching process with the use of diverse tools, including technology. The reflection on modern learning space should provide us with an impulse to see the school transformation from 'learning institutions' to 'learning communities' in which what we are taught, by whom, when, with whom and how becomes a flexible notion, it is defined and developed based on the educational needs of the moment and the possibilities. The physical reconstruction of space should be co-ordinated to the same extent with the planned 'reconstruction' of learning methods and approaches among our students: by all means we should take care of adjusting then to individual needs and to the world in which the educational process is anchored.

> Transformation is not merely modification, tinkering with the shell, the interior or outdoor spaces. This would be a wasted opportunity both in terms of the level of investment and the potential to create new, improved and dynamic learning spaces that this once-in-a-generation programme offers. We can only really say transformation will have been achieved if we see marked changes in approaches to learning, teaching practices, relationships and school organisation; when we see a fundamental shift away from what might be described as schools as 'learned institutions' to the development of 'learning communities' where what is learnt, by whom, when, who with and how becomes more fluid, emergent and evolves based on need and opportunity.
>
> - Tim Rudd, Futurelab

Increasing our chances for a successful transformation as described above entails directly engaging students in the modelling process of this new educational space that would fulfil all expectations. Participating in the process of designing the space offers the students the opportunity to take part in a number of educational situations and to develop a number of

skills and competences related to team work, project management, communication, co-operation, creativity, design, discussions, debating, thinking and arguing, and decision-making.

From the learning point of view, the best use of new locations, equipment, lighting, technologies and teaching methods will take place when the whole school community (in particular the students and the teachers) will be able to colonise the whole available space for learning purposes.

"The current social context is one where we see a convergence of parallel developments in technology, education, [communication] and design, which means increasingly [more] people have the technological means to determine how they learn, where they learn and with whom they learn." (Luckin 2008 in Futurelab 2008: 13). As a result, the importance of the physical location where learning is meant to happen seems to be decreasing, while the importance of mental comfort and individual preference that can facilitate the initiation of the learning process seems to be growing. The educational task for the future (that becomes less and less predictable) is to prepare the learners for that they could always keep their advantages: the human capital advantage (networks of people), the advantage of places or location (also in its virtual reality terms), the advantage of information and tools to help them learn effectively.

Challenges, or the universal questions we should continuously try to answer

Considering the change of the learning space, we should look for the answers to the following questions:

Challenges

- What more do we need to know about the relationship between how people learn and the use of digital technologies to enable us to design, plan, prepare and construct learning environments which will enable learners to be prepared for 21st century life?
- What small steps can we currently take to use technology in a more innovative and creative way to develop synergy between formal and informal learning?
- How do we create a climate for the education workforce to innovate and be creative within a system which is "internally consistent and self-sustaining"?
- How do we create the capacity for thinking within the complex and pressurised process of current redesign programmes?

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- How do we ensure we spend the enormous investment wisely and that it will support learning transformation?" (Harrison 2008 / Futurelab 2008: 20).

Elaborated by Marcin Polak based on: Transforming Schools for the Future? A collection of provocation papers, Futurelab, 2008.

Questions for the designers

The choice of the designers team is of key importance for the success of learning modernisation process in a given local community. The British experience of the government programme of Building Schools for the Future showed that a reason why the modern design of schools often failed was the lack of designers with educational experience paired with the lack of communication between the designers and the groups that should be interested in the project, namely th teachers, representatives of the local community, parents and students themselves, or rather the lack of their engagement. The questions below could help us choose the right team which would be really able of designing a school of the future in your region.

1) Why do you want to design a school or an educational space?

2) How long have you been designing and constructing schools?

3) What does the term '21st century learning' mean to you? Why should we be designing environments for 21st century learning?

Describe your design approach and philosophy. What educational theory or theories guide your design approach? What projects have you done that show your theory reflected in the design?

5) What is a collaborative space? How do you imagine [such a space]?

6) How do collaborative places support constructivist learning?

7) What is a flexible learning environment? How does flexibility support collaboration? Are collaborative spaces differentiated? Why? Are these spaces integrated? Why?

8) How has information technology influenced the learning environment, both positively and negatively?

9) What technologies would you recommend for the learning environment and why? How does spatial design support the technology within an active learning environment? And vice versa?

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10) Tell us about a special feature or features of the learning environments that you have created to support teaching and learning.

Source: Choosing the Right Classroom Design Team (And 10 Key Questions to Ask), Peter C. Lippman, JCJ Architecture, New York [in:] THE Journal, http://thejournal.com/Articles/2013/03/12/Choosing-the-Right-Classroom-Design-Team-And-10-Key-Questions-to-Ask.aspx?p=1, 2013. Questions 1 and 5 modified according to the requirements of the present paper's author. The remaining questions quoted in their entirety.[u4]

Chapter 2 SOCIO-CULTURAL DIMENSION OF SCHOOLS

What is a 'community of learners' and why is it essential? Introducing the notion.

The notion of the 'community of learners' is understood here as the social context and environment or background of learners. A community can be defined as a group of people united by a common aim and shared values. Moreover, the standards of communication between its members are established within the community, while the community itself often constitutes the decisive factor in the terms of the so-called 'school climate'. As a consequence, a good community is such a community in which its members communicate and interact in such a way that that their understanding for each other' goals and values becomes deeper. A community in that sense can include, among others, students, teachers, other school workers, parents, representatives of the local community etc.

It leaves us no doubt that the community of learners is an effective tool impacting the quality of education and strongly influencing educational decisions made by its members, which is why the whole society should foster the creation and take care of the quality of educational communities. One can name two principal reasons. First of all, **learning is a social process** that reaches its highest effectiveness when realised within a well-functioning community. The research quoted in the next part of the present paper confirms the undoubtedly positive influence of the communities on the educational process. Strictly speaking, regardless of the differences between theoreticians on what actually is effective education, a large majority of researchers agree that a key role in learning is played by the interactions within class, school and local community. It is important to mention that as normally highlighting the role of the

social environment in learning is not in line with the traditional, one-way teaching in traditional, closed classrooms. Secondly, **learning within a community is essential in preparing students to live in the world outside of school, especially in the terms of their professional life.** School graduates should be equipped in the adequate co-operation skills in order to be able to work with other people. The employers keep on confirming the importance of such skills and value communicational competences of young graduates. This proves that a good school should be open to the community and be able to create mechanisms supporting co-operation skills in the school's students.

What makes the co-operative learning effective?

Co-operative learning methods are one of the most frequently evaluated alternative options for the traditional teaching methods that are still used at schools today. Using such learning techniques is nearly sure to bring about some emotional outcome. As stressed by a number of researchers (???[u5]), students truly enjoy group work and they strongly prefer school subjects that make use of co-operative methods, while additionally such methods increase their sense of success and achievement. The co-operative learning approach additionally allows the students to increase the number of their acquaintances from different ethnic groups and to become increasingly acceptable of others (Slavin 1995). In the terms of students' achievements, school outcomes are highly dependent on how the teacher uses the method. "In general, two elements must be present if co-operative learning is to be effective: **group goals** and **individual accountability** (Slavin 1995; Rohrbeck et al. 2003; Webb 2008). That is, groups must be working to achieve some goal or to earn rewards or recognition, and the success of the group must depend on the individual learning of every group member."(Slavin 2010: 170).

Why are those two components so important? Answering this question requires us to consider a certain alternative: in some variants of co-operative learning students work together in order to answer a set of questions or to accomplish a task. In such circumstances, better students have no motivation to take some of their time and to explain some of the issues to their weaker colleagues or to ask them for their opinions. When the group task is doing or making something instead of learning something, weaker students' participation can be perceived as an obstruction rather than something that helps. In such a case, it is easier to give each other answers or solutions instead of explaining notions to each other or passing on skills.

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However, if the group task is to make sure that every member of the team have learned something, then it is in the best interest of every student to take some time and to explain given notions to their team members. The results of experiments on group behaviours among students (in group-based co-operative learning) are convincing enough by demonstrating that this type of activity is most beneficial to those who give and who receive detailed explanations (Webb 2008). What is more, the same research has shown that giving and receiving answers or solutions deprived of a proper explanation has negatively influenced students' achievements. Group goals and individual accountability motivate the students to properly explain the material and to be serious about learning together instead of simply giving each other the right answer.

The analysis of results of 99 studies on co-operative learning in primary and high schools over the period of at least 4 weeks was compared to the results obtained by control groups. As described by Slavin (1995/2010 and 2010:172): "Of sixty-four studies of co-operative learning methods that provided group rewards based on the sum of members' individual learning (...), fifty (78%) found significant positive effects on achievement, and none found negative effects (Slavin 1995). The median effect size for the studies from which effect sizes could be computed was +.32) (i.e. nearly one-third of a standard deviation separated co-operative learning and control treatments). In contrast, studies of informal group learning methods which used group goals based on a single product from the work or provided no rewards, found few positive effects, with a median effect size of only +.07." The analysis of experiments comparing different approaches presented similar results. Group goals based on the sum of individual achievements constitutes an indispensable element of co-operative learning models' effectiveness (Chapman 2001 / Slavin 2010).

Co-operative learning methods prove to be equally beneficial for all students. There is a little number of studies that seem to show higher effectiveness of co-operative methods in the case of some specific groups of students, yet the results of the vast majority of research confirm that all learners profit the same. Parents and teachers sometimes fear that co-operative learning will limit the progress of the highest achievers, although there is no research-based proof to that. The strongest students benefit from co-operative learning to the same extent as their weaker and average colleagues (Slavin 1995/2010).

Researchers generally agree that the co-operative learning positively influences students' achievements, yet some controversies persist in the matters of defining the reasons and

methods of influence in that case, and of establishing what circumstances or conditions have to be provided in order for the influence to take place. Various groups of students analysing the influence of co-operative learning on their achievements seem to adopt very different assumptions and as a result, to explain the outcome obtained in unrelated or even contradictory terms. Slavin (1995/2010; Slavin et al. 2001) have identified four major theoretical perspectives that are currently used by the researchers interested in the subject of influence of co-operative learning on students' school outcomes. The said perspectives are: motivationalist, social cohesion, cognitive-developmental and cognitive elaboration perspectives.

According to the motivationalist perspective, the motivation for the completion of the task is the most crucial in the terms of influence on the learning process and other processes (for example: planning or helping others) that are driven by the student's motivation of personal gain or self-interest. The researchers who support this approach focus mostly on the structure of goals and rewards. The social cohesion perspective presumes that the effectiveness of co-operative learning is highly related to the cohesion of the group. This approach states that the students help each other to learn because they care about the group and its members, benefiting from the fact of belonging to a group in defining their own identity (Johnson 1999; Hogg 1987 / Slavin 2010).

Both perspectives focus on the interactions between group members and presume that interactions enhance learning, and, by analogy, students' achievements. The cognitive-developmental perspectives attributes these beneficial effects to the processes described by Piaget or Vygotsky (Slavin 2010: 171–172). The cognitive elaboration approach is based on the principle that students have to engage in some form of cognitive restructuring or detailed analysis of the new material to initiate knowledge acquisition. Researchers choosing this perspective believe that co-operative learning facilitates this process.

School community and Information and Communication Technologies

Effective use of communication tools is a key to the creation of a strong and durable learning community. Information and Communication Technologies (ICT) provide a number of communication solutions and constitute an ideal platform for sharing information in a community, both in a school classroom and beyond it. Technology also broadens **the spatial scope** and **the timeframe** of the learning process. The refection of the socio-cultural aspect of

a school shall additionally account for the role of ICT tools. As outlined by Bickford and Wright (2006: 4.10), two attitudes could be encountered: "At one extreme, physical learning spaces may no longer be necessary if an academic program is delivered online, while at the other extreme, face-to-face classes can occur in a variety of physical spaces that take advantage of technology in or out of the space. At these extremes and all the hybrid possibilities in between, technology should be used to foster learning by building community as well as creating and sharing knowledge within the group while allowing interaction to take place in and outside the formal classroom setting."

The ICT can enhance the school community in more than one way. First of all, ICT can render the communication outside of the classroom more effective by implementing such tools as e-mails, forums, blogs, social media and Wikipedia. Another role to be played by the ICT is to take the process of gathering information outside the classroom, enabling the use of more innovative and more active pedagogical methods (i.e. flipped classroom). Thanks to the use of the IT solutions, it becomes possible to share the learning content outside of the school time, which allows the teachers to use their classroom time to practice and to discuss the given material.

Yet, one can easily note that the communication tools are not sufficiently used during classroom time, which is related to the fact that teachers often lack knowledge on the opportunities offered by ICT tools and applications (Bickford and Wright 2006).

School community and the physical space

A number of researchers (i.e. Tharp and Gallimore 1991[u6]) state that the creation of a school community is closely connected to the design of the physical space. In other words, there are such solutions concerning the physical space that can support the creation of a school community and of a specific school climate. It seems impossible to prove it to be a close correlation, i.e. the changes in the architectural space could be favourable to the creation of a school community and of the school climate, yet it is not always the case.

In general, the requirements in the terms of co-operation stimulating space (or: collaborative space) could be summed up in three main points (Tharp and Gallimore 1991 / Lippman 2013): **First of all**, learners should have access to peers of greater, equal, and lesser ability. **Secondly**, interactions between students and teachers should freely occur in the daily routine.

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Last, investigating an array of activities should be permitted and the school is responsible for providing the proper infrastructure for such activities.

Characteristics of the co-operation stimulating space (collaborative space)

According to Tharp and Gallimore (1991 / Lippman 2013), the co-operation stimulating space (collaborative space) is a space where:

- learners have access to peers of greater, equal, and lesser ability;
- where transactions between students and teachers, verbal and otherwise, occur in the daily routine;
- where investigating an array of activities is permitted;
- and where low levels of adult supervision give students considerable freedom in what they accomplish and how they accomplish it.

Such space could be shaped with the use of physical elements that could for example divide the classroom into smaller learning spaces, and technological tools in the terms of virtual space.

Elaborated by Marcin Polak based on: Designing Collaborative Spaces for Schools, Peter C. Lippman, THE Journal, http://thejournal.com/Articles/2013/02/13/Designing-Collaborative-Spaces-for-Schools.aspx?p=1, 2013.[u7]

Chapter 3 TECHNOLOGY AND COMMUNICATION SPACE

Technology space and learning

The introduction of information and communications technology (ICT) is changing the way we live, work, teach and learn. It is also challenging the notion of traditional institution-based learning.

- 21st Century Learning Environments, OECD, 2006.

To a large extent, modern technologies shape the behaviour and expectations of the youth, as well as their abilities to access, to master, to use, to create and to communicate information. Mobile technologies, computers, video games, messengers and blogs constitute an important part of daily life of the young, changing also their educational experience and aspirations. Increasing the mobility and availability of technology additionally facilitates the access to

educational content, and communication and co-operation tools in real time. When designing learning environments, we must remember that it will be the space for the spectacular undertakings and efforts of the learners that will happen simultaneously in the virtual space.

The notion of technology (here: the Information and Communication Technology, ICT) is used here in its broad sense and its understanding should not be limited to computers only. The technology, as we see it here, are not only the electronic devices used in the learning process but also online tools that exist solely in the virtual space. Technologies under such definition could be divided into four major groups:

- Personal technologies and social network technologies: school computers and personal computers, mobile devices, online platforms, communication services, podcasts, blogs, wikis, RSS channels.
- Conference technologies (or: Virtual conferencing technologies): tools and devices for making real-time connections with experts, professionals or team members, enabling having and registering audio and video conversations, as well as broadcasting of the conferences held.
- Projection technologies (or: Interactive projection technologies): tools and programmes for displaying presentations, films and screen contents (digital projectors, interactive whiteboards, touch screens).
- Monitoring and management technologies (or: Management and security technologies): technologies enabling the school management and school network administrators to monitor the flow of data, people and objects on school premises (that includes video-monitoring devices, electronic access keys, notification and alarm systems, communication systems, intelligent devices).

Effects of technology on learning

The proper use of Information and Communication Technologies (ICT) during lessons provoke students to think, to create and to solve problems in a new, non-schematic and innovative way, within a general outside-the-box approach.

According to the Learning Spaces Framework publication (2008: 5), in order to ensure deep, powerful and more relevant learning, technological and virtual learning space should provide the opportunity for:

- active and interactive participation,

- team work,
- information retrieval and sharing,
- discussion and presentation,
- production of new knowledge,
- teacher and student-led activities,
- connection with experts,
- access to local and global networks,
- personalised learning.

Once the requirements above are met, we can talk about an ICT-rich environment that supports learning. In other words, school's educational space should maintain a certain level of flexibility so that the students and the teachers would have the possibility to use modern educational technology freely. This makes the educational space designers face another challenge.

The basic element is the correct organisation of school network which:

- should be available to all members of school community, in all school buildings and around them;
- should allow the users to have the Internet connection on any mobile device, computer or other desktop device;
- should be accessible to other people who are not currently on school's premises, i.e. are currently on a sick leave or are working from home, and for students' parents, all within their defined access.

ICT good practices

- Students and teachers are provided with a legal and uninterrupted access to the given school digital resources, databases, online tools for the analysis, processing, modification and creation of knowledge and information resources, tools for search, evaluation and storage of educational content; interactive tools for online peer co-operation.
- Teachers, parents and students share information and resources in real time, continuously, during, after or before school's opening hours.
- School management and administrators understand and manage:

- the access to data relevant to educational processes, the flow of data and the use of data in common formats, without the prejudice to the intellectual property protection rights, right to privacy, and network data security;
- the decision-making process based on facts and evaluation aiming at the on-going improvement of the functioning of the learning environment;
- the continuous flow of information and knowledge between school servers and the outside world.

Source: Learning Spaces Framework: Learning in an online world, MCEETYA - Ministerial Council on Education, Employment, Training and Youth Affairs (Australia and New Zealand), 2008[u8]**.**

Learning with ICT

Currently the whole world is discussing new technologies' potential of transforming the education and teacher's training. Yet only a little part of our assumptions has been verified in scientific research or experimented upon (Lowe and Schnotz 2008; Mayer 2009 and 2010; Spector et al. 2008 / Mayer 2010: 180). The predictions on the use of technologies cover also such opinions that education will benefit from providing students with mobile devices or virtual reality games, abandoning direct classroom teaching and replacing it with online instruction, and from providing all students in developing countries with laptops (Mayer 2010: 180). Some researchers (Mayer 2010; Marzano 2008 / Mayer 2010) stress the fact that equipping students and classrooms in new technologies is important, yet the question of how to work with new technologies is even more important.

Learning with technology features also the situations in which the benefits of modern technological development are used to promote learning. The mist frequently used technologies ate computer and information technologies (IT). It is the Internet in particular that has become a truly important space where schools offer online courses, vocational trainings and continuing learning opportunities.

What forms of learning with technology are the most promising ones? As outlined by Mayer (2010: 181), modern researchers (Graesser and King 2008 / Mayer 2010: 181) suggest to divide it into 10 learning environment technologies:

1. *Computer-based training*: lessons, tests and feedback that are presented on a computer screen, usually in a mastery format in which the learner goes on to the next section after passing a test on the current screen.
2. *Multimedia*: instruction that consists of pictures (such as illustrations, photos, animation, or video) and words (such as printed or spoken text).
3. *Interactive simulation*: simulations over which the learner has some control, such as being able to slow down and animation or set input parameters and observe what happens.
4. *Hypertext i hypermedia*: instructional material consisting of clickable links, such as used in web pages.
5. *Intelligent tutoring systems*: instructional systems that tack the knowledge of the learner and adjust what is presented accordingly.
6. *Inquiry-based information retrieval:* such as using Google for web searches.
7. *Animated pedagogical agents*: on-screen characters who help guide the learner through a computer-based lesson.
8. *Virtual environments with agents:* visually realistic environments that simulate interactions with real people, often using natural language.
9. *Serious games*: games that are intended to serve an instructional function.
10. *Computer-supported collaborative learning*: in which groups of learners work together on a common task by communicating via computers.

Chapter 4 PHYSICAL AND ARCHITECTURAL SPACE

Effects of space on student outcomes

The studies and analyses conducted by Australian researchers (for example professor's John Hattie meta-analysis: Blackmore et al. 2011: 4) proved that there is no direct connection between the educational space, its use by the learners and their educational outcomes. ... Yet, it is the space that creates the learning circumstances and relations that could influence the individual educational outcomes depending on the occurrence or non-occurrence of the given factors.

The relations between the learning outcomes, the physical space and the learning space are shaped by a number of tangible (i.e. air quality, light, spaTial density) and intangible factors (school culture, classroom culture, sense of belonging and self-efficacy), as well as by personal relations between the teachers and the students (Blackmore et al. 2011: 5).

Environmental factors that influence learning could be divided as follows (Blackmore 2011: 30): Basic:

- acoustics and noise;
- temperature and humidity;
- air quality: both indoor air quality (IAQ) and outdoor air quality;
- ventilation and air flow;
- lighting.

Arguable (based on varying opinions of authors and researchers):

- colour;
- aesthetics;
- equipment (furniture, display and presentation devices, electronic devices etc.);
- school size;
- number of students per class;
- health and safety regulations.

Source: Research into the connection between built learning spaces and student outcomes, Education Policy and Research Division Department of Education and Early Childhood Development, Australia, 2011.[u9]

Optimal educational spaces for primary school students

A truly practical approach to the question of education has been presented by the authors of the report *Optimal Learning Spaces Design Implications for Primary Schools* prepared by the Salford Centre for Research and Innovation in the built and human environment, or SCRI (Barrett et al. 2009). The report included a few dozens of factors that influence the quality of educational space in primary schools In their quest for optimal solutions of learning spaces organisation and arrangement, the researchers have suggested to distinguish between three groups of factors that influence students' comfort and learning quality up to various extents (Barrett 2009: iv):

- **naturalness,**
- **individualisation,**
- **level of stimulation.**

Naturalness – being human, we have a set of basic expectations towards every type of space; these expectations result from our elementary needs such as access to air, light or safety. The notion of 'naturalness' principally covers the following main factors (Barret et al. 2009: 4):

- Light: the sensation of daylight that supportsvisual comfort and facilitates visual performance.
- Sound: appropriate conditions for listening to wanted sound (i.e. teacher's instructions) and not unwanted sound (noise).
- Temperature: maintaining the balance of heat gain and loss at a comfortable level that provide the optimal learning conditions.
- Air quality: providing fresh air, removing humidity, odours and pollution etc.

Individualisation – every human brain develops in its own way, hence every human being learns in his or her own way. The factors covered by the notion of individualisation can be enumerated as follows (Barrett et al. 2009: 14):

- Choice [of the optimal learning space]: is concerned with the 'fit' between individual personality and the physical environment, which consists of the mental process of judging the size, shape, height of alternative spaces and how appropriate they are for the task.
- Flexibility [of space]: refers to designs that can adapt when changes occur, sustaining or increasing the possibilities for personalising space and [working] in a timely and cost-effective manner.
- Connection: enabling the connection between different educational spaces within one learning community, and in particular arranging connections and passages between school buildings and other elements of infrastructure and neighbourhood in the local community that are available for students; this applies as well to the connections within the virtual space as a factor ensuring the realisation of goals and the opportunity for inclusion.

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Level of stimulation – space should not distract us, yet is can stimulate our behaviour, including the learning. This group of factors can be divided into three sub-groups (Barrett 2009: 25):

- Complexity [or visual complexity of space]: the diversity of noticeable elements in our environment that does not make us perceive a certain space as cluttered or disordered. It is a result of a certain level of organisation of space (its arrangement, order or cohesion) that increases the sensation of clarity and familiarity with a certain space.
- Colour: The perception of colour in the environment always carries visual, associative and symbolic effects with it. Colour in a given space has a great impact on human psychological reaction and physiological well-being.
- Texture: refers to the perceived prominence of materials' characteristics [in a given space]. Along with colour, it is considered as one of the primary abstract elements of design. By combining hard and soft surfaces, texture can animate indoor and landscape experience by complementing built aspects with natural elements.

The features of space as described above should also be combined with practical solutions planned at the stage of design. On one hand, these should be analysed in connection to the main elements of the plan and its placement in space: its location, its position/orientation on the map, layout, appearance and arrangement of windows. On the other hand, the features described should refer to the same space that is going to be organised within a given architectural plan: room layout, circulation/flow of people between rooms, placement and functions of landscape and the outdoor space and their position towards the school building.

Questions to be taken into account by the designers

1. Light:

School location: school placement in relation to the elements of natural landscape, for example a hill or high trees covering the light, and other objects of public infrastructure in school's closest neighbourhood, for example the distance from high buildings or skyscrapers.

Map location / orientation: natural light should provide optimal lighting to the classrooms in which classes take place; this concerns both direct or reflected light.

Windows: should be large (windows for the full height of the wall are also acceptable) in order to provide optimal lighting to the classrooms, as well as to provide heat in colder

climates. It should equally be noted that in the case in which educational technologies are used, the possibility to provide proper shade or blinders should also be present. Designers should additionally be aware of the so-called 'greenhouse effect', i.e. that the combination of intense insolation and insufficient ventilation or air conditioning results in the increase in temperature, which is not favourable for concentration.

2. Acoustics:

School location: it is essential to create a buffer zone shielding the school from the sources of noise in the neighbourhood, for example from a busy street. This can be obtained by planting a line of trees or locating school sports courts properly. Classes should be planned in such a way so that the external noise would not disturb the students.

School's layout: minimising the noise inside the school's walls is also important. Classrooms and other spaces should be designed according to the principle to divide or cover the open educational spaces or common spaces such as the cafeteria with noise-absorbent or sound-insulating structures. Such a noise buffering zone can be arranged with the right location of halls or toilets.

Rooms: providing the right acoustics in the classrooms could be realised by furnishing the floors (or parts of the floor) with sound insulation against such sounds as the sound of heels or dropped heavy objects. Returning to the abandoned practice of floor carpeting is also an option to be considered, as is the installation of movable elements such as screens or partitions that could help to divide the classroom into smaller spaces for individual work.

3. Temperature:

Map location / orientation: sunlight should naturally heat the school buildings, in particular classrooms, for at least two hours a day; the designers should pay special attention to the objects that could cover the light or prevent it from reaching the desired spaces. The main educational spaces should face the South-East or South-West.

Layout: the inadequate planning of educational spaces inside the school building could result in some classrooms being overheated (the so-called 'greenhouse effect') and some being insufficiently heated (related to the suboptimal use of sunlight). Some errors could result from the improperly arranged inner walls or partitions. The school's design should also account for the adequate circulation of hot air masses inside the building.

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Windows: the larger the windows are, the more natural light enter the room, although it also increases the heat loss. This process is related to the structure of the window (single, double or triple glazed window), which is why the windows planned should be well matched with the climate and weather conditions, classroom's temperature and its geographical position of the classroom (its exposition to sunlight).

4. Air quality:

Map location / orientation: all rooms should be arranged in such a relation to the natural air flows that the classrooms would have access to fresh air. Special attention should be paid to the sources and the flow of the unpleasant smells and to contaminated air, al well as to the position of such spaces as the cafeteria in relation to the classrooms; the cafeteria should be placed on the leeward side so that the smells would not linger in other rooms, as they should be naturally transported outside by the wind flow.

Windows: the windows chosen should have multiple modules, i.e. they should provide ventilation control for the classroom depending on the climate, outside weather conditions and fresh air needs. For example, it could be considered to plan smaller panes (modules) in the upper part of the window wall in case of strong winds. The building's structure should allow the school staff and students to use windows freely in order to regulate the temperature inside, i.e. they should be able to open the windows easily.

5. Choice:

Rooms: diversifying the classroom space allows the students to familiarize with the space according to their personal preference; for example smaller children would have it difficult to sit down at the table, yet they will be great learners when sitting on a carpet. The space should be interesting and engaging for the students, yet it should also be comfortable. On one hand, this concerns the classroom's arrangements, while on the other it could also be understood as designing special classroom areas that would be adjusted to students' needs. This could cover special corners for individual work, for talking or for observing the outside world.

6. Flexibility:

Rooms: the space should be flexible enough to offer the possibility of various teaching and learning activities. Designers should also take into consideration the size and the surface of the school rooms, as well as their character deciding if a given space should be an open space,

a semi-open space, a closed space (such as traditional classrooms), a covered/opaque space (with screens, partitions or walls around) or a transparent space (with at least one inner window wall). Classroom should be large enough to potentially host various area of activities, for example areas for class work, group work, small group work, for work in pairs and for individual work. The decision on the character of the learning space should be made based on the educational philosophy of a given school. The number of students per class should also be taken into account: it often happens that the classes are composed of around 30 students, which strongly limits the scope of accessible flexibility. It would be perfect if the classroom should be furnished with folding (and safe) tables and chairs, as this would offer more possibilities of adjusting the space to the needs of a given group of students. The geometrical shape of the classroom should also constitute a matter of reflection, as traditionally classrooms are rectangular or based on a square. If one wishes to increase the flexibility of classroom space, the L-shape could be taken into consideration, as this shape offers us an area that could naturally be used in innovative lessons, for example it could be furnished with a carpet and students could sit on pouffes or tuffets. Such a space is relatively easily arranged: large tables for group works could be put here, it could be arranged as a group work space, project work space and innovative work space.

7. Connections:

Location: when choosing the location for a new school, the proximity of cultural and social institutions should be considered; such entities would constitute the prolongation of the educational space in terms of the socio-cultural space. Examples of such institutions could feature: a botanical garden, a cinema, a theatre, a museum, a gallery, or the neighbouring monuments. If the school surroundings have none of the above, then it advised to plan the school terrain in such a way that there would be some space for learning outside of the school building; the design could include a vegetable garden, a flowerbed or a botanical garden, small pond or a fountain designed by the students. Notice: the terrain around the school building should also be arranged to feature such elements that would facilitate the social interaction between students: benches, an arbour or lawns, The next issue is to design the school Wi-Fi network accessible everywhere (including outside of the building) that would allow the students to use the virtual educational space wherever they were.

Circulation/flow of people: what is essential in ensuring the effective functioning of a school as an educational institution is to provide an adequate design of the passages inside the

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building and the passages connecting the buildings and other elements of school infrastructure that are used by the students and the teachers on their way to the classrooms or other spaces. The ill-conceived design could be a source of security issues or simply of students and teachers being late for classes. Moreover, the passage ways should offer areas where students could meet, talk, continue their informal education and to relax. New architectural projects should additionally feature the main or central school point where a larger number of students, teachers and parents should gather. It could be an atrium, a yard or at least a larger hall. Passages in question should also be well marked: colour-coding on the floors for the so-called 'fast passage lanes' proves to be useful here, as is colour-coding on the walls that provides the information on the purpose of the school area (The colour-coding could be adjusted to for example the age of the students). Such solutions reinforce the sense of identity and the sense of spatial orientation.

8. Complexity:

Appearance: school should be a place that the students want to go to. There is no surprise that students are reluctant to come to a school that was resembles a prison with its small classrooms and a narrow corridor with no place to hide. The external appearance of the building should invite them to enter. Unfortunately, most European schools look like Prussian military barracks, which offers a great challenge to the architects to design the building that would be fully operational inside and intriguing and eye-catching from outside. It is sometimes sufficient to introduce an original façade (for example with a mosaic) or to paint for example a mural, yet it is even better if the school could be entered by a nice and eye-pleasing yard that could become the school's landmark and a place for social interactions. The space inside the building falls under similar principles: its users should be happy to be there. Even if the architecture and the functionality of the building prevents the whole space to be nice and friendly, we should try our best to include some areas that will give energy to the students and to the teachers in the building's design.

9. Colour:

Appearance: colours attract our attention and have an important impact on our emotions and out psyche. They could also stimulate our brains in various ways both when used inside as well as outside of the building. From outside, colours attract students' attention, influence their attitude and perception of the school. The colours used inside have the effect on the

concentration: they could either distract the students or help them to learn. The colours used at school could be additionally adjusted to the climate and the weather conditions, i.e. in cold climates bright colours will be more visible on cloudy days and when it snows, and they will brighten up the landscape.

Rooms: different colours stimulate the brain in different ways: some can be disturbing or vexing, other can incite different emotions. In short, the colours used i classrooms influence the learning environment. The school space is a great place to play with different colours of walls or ceilings. In general, classrooms should be painted in calm tones, yet it is easily imaginable that a part of a wall or of a ceiling, when placed in a dedicated area of the classroom, could boost students' activity. Colour preferences change with age. A study carried out on 10 000 students at the age between 5 and 9 resulted in creation of a list of colours preferred by students within the same age range (Heinrich 1992 / Barrett 2009: 29–30).

Age	**Preferred colour**	**Not accepted**
5–8	Red, orange, yellow, purple	Black, white, grey, dark brown
9-10	Red, orange, green-blue	Grey, dark brown, black, green, pastel, green-blue
13-14	Blue, ultramarine, orange	White, black, grey, olive, violet, lilac

As noted by Heinrich, the colours preferred by students are not suitable for painting large surfaces and should be rather used as parts of classroom decoration when combined with other, toned down colours. Colour matters, so it is a good idea to try and diversify the colours of the walls, the floor and the ceiling in order to break the monotony and to provide visual stimuli to the students. It should also be noted that various colour combinations in the classroom could have various effects on students and incite various emotions that are not always positive. The choice of colours for the rooms is a matter of key importance and should be preceded by analysis of the available literature and consulted with students within a given age range. There is no argument against using different colours in different areas of the school, i.e. in the library, the cafeteria, the atrium, the halls etc. It is also a good idea to organise a competition in which students would present their artistic projects for the colours

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of the walls (the realisation of which could be delegated to the artists themselves), as this will make the students feel more like the co-hosts of the school or of the given space.

Circulation/flow of people: colours also support the organisation of the circulation of people inside the school; they work in a similar way as the cycling paths: they mark the fast passage lanes to be used to get to the classrooms.

10. Textures:

Landscape / outdoor spaces of the school: the quality of functioning in a school space highly depends on the arrangement of the space around the school building; i.e. are there any benches, arbours, paths, sports courts, lawns, gardens, a little forest of a pond. The presence of these elements allows the students to spend some time in the open air, especially on a warm day, which is essential for the development of younger students in particular. The design should also allow the use of the elements above if the weather turns or when it is for example raining. The arrangement and the aesthetics of the school surroundings are as important as the character of the decorative elements in this space. For example, a racetrack could be covered in Tartan or in gravel, the decorative elements of the environment could be of natural materials such as wood or of plastics. In general, the more the natural elements are used, the better we feel around the school and the happier we return to the building. The use of natural plants and water is recommended: it allows us to show the students the cycle of nature, it has positive influence on the learning and on the development of cognitive abilities.

Elaborated by Marcin Polak based on: Optimal Learning Spaces Design Implications for Primary Schools, Peter Barrett, Yufan Zhang, SCRI Research Report, 2009. [u10]

Classroom arrangements for learning stimulation

There is no single table arrangement that would be universal for every classroom and that would stimulate the learning in every educational situation. The learning process is not linear and is composed of a number of educational situations in which learners take up various typed of activities, or at least this is how it should be defined. The situation in which a teacher is talking during the whole learning unit and the students are only taking notes and listening while sitting at their tables, answering the teacher's questions from time to time is not favourable to learning and demotivates the young.

As shown in both Polish and international research, the place in which the student is seated determines his or her activity during the lesson. For example, the traditional arrangement of tables standing in rows maximises the communication between students in from of the classroom and in its centre, while it excludes those sitting on the sides (Douglas and Gifford 2001: 295–309).

Therefore, the influence of table and chair arrangements on the educational outcomes should not be underestimated, especially as the research seems to confirm it. It should not be forgotten that the table arrangement should be in line with the nature of the given classes: some arrangements are more suited when we want to watch a film together, and some prove better when it comes to group work. The table arrangement and the place occupied by the teacher changes also his or her role and position in the learning space, impacting also their influence on the students.

Review of table arrangements in a classroom

Traditional arrangement

Tables are standing in rows, one row after another with one or two passages between them. Such arrangement is teacher-centred, the teacher occupies the most important position in the classroom and has a good overview of the whole classroom. The teacher is undisturbed when he or she is giving a lecture or a presentation, the role of the students that this arrangement imposes is the role of a passive listener who takes notes based on the teacher's lecture. Students see only the backs of their colleagues, which makes the communication between them and their co-operation more difficult. Such arrangement practically leaves only one space for student's presentations: it is next to the teacher, by the whiteboard or the screen.

V-shape arrangement

In the case of classes with a larger number of students, we can abandon the traditional table arrangement and put together 3 or 4 rows of tables, connecting them at a 90 degrees angle in order to obtain the V-shape of tables. Space for the passages is left along the classroom walls. This arrangement is far from ideal, as the teacher is still on a privileged position and he or she dominates the classroom, yet it brings the students closer, there is less distance between them, they can keep eye contact and can communicate with more ease when having a discussion or presenting their work to each other. Everyone has a good overview of the classroom, and can see the presentations and films that are shown on a whiteboard or on the screen. In front of the

classroom, more space for students' presentations is created, and while presenting, the presenter can keep eye contact with the whole class.

The U-shape / the horseshoe / the hyperbole arrangement

Classroom tables are brought together and attached at their shorter side one next to another, which gives a more or less continuous line in w shape of a hyperbole or the letter 'U'. The centre of the classroom is dedicated for the teacher who has good access to every student; the teacher can easily approach anyone, control student's progress or talk to him or her. Such arrangement also offers the possibility to demonstrate learning aids closer to the students and to look at students' work together. Teaching materials and learning aids can be easily passed from one student to another, every student has a good overview of the classroom, students see each other and the teacher, they can watch presentation or films shown at the interactive whiteboard or on the screen and to have a discussion engaging all classmates. The whiteboard and the information written there is also more visible. U-shape arrangement facilitates working in pairs or three-person teams. The teacher is still able to control the classroom; teachers can stand next to the blackboard and keep their superior and privileged position, they can sit down next to their students at the same table or they can attach their desk to the circle of tables. The teacher can also bring his or her chair to the middle of the space and give classes from there. The students can enter the space in front of the tables as well and to present their work of a given issue. Designers should keep in mind to take care of the unobstructed passages so that the students would have free access to the whiteboard or the interactive whiteboard.

Tables in the shape of a cross

Cross-shape arrangement is practical and interesting both for group work and class work. The arms of the cross are situated in the middle of the classroom (two tables for each arm first, then the next tables are attached at the ends if needed); the spaces between the arms are left unfurnished in order to keep the due distance between workstations. We should not forget about the need to provide proper access to whiteboards and flipcharts used by the students during classes. It would be perfect to have more than one whiteboard in the classroom, and to complete the equipment with a couple of flipcharts. The cross-shape arrangement is not the best one if we want to watch a film or a presentation, as some students are sitting with their back to the screen and have to turn around to see what is going on behind them. The teacher

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can sit down at one of the tables or circle the classroom giving the teams the information and the advice they need. Tables in the middle do not have to be attached, there could be some space left for presentations of group representatives in group work, or the students can just talk from where they sit, as good eye contact with the rest of the class is provided here.

Conference table arrangement

We can also bring together all the tables, form one large table and allow the students to sit around it. The teacher keeps control over the classroom, he or she can sit at the table among the students (it is a more democratic solution) or take the seat at one or the other end of the table if he or she wants to have the privileged position of a leader. The teacher can also circle around the student and observe their work, although the contact is more difficult when compared to the U-shape arrangement. The conference table arrangement offers a good overview of the whole class, students can exchange materials and learning aids. The screen or the whiteboard are slightly less visible, conference table arrangement is rather not recommended for watching films or presentations. It was designed to facilitate the training of co-operation skills in a large group, it also proved useful in communication skills exercises such as floor-taking during the debate or exchange of arguments during a discussion.

Club table arrangement

Students are seated in groups of 3 to 5 persons at little separate tables dispersed in the classroom, which provides the adequate passages around them. Club tables arrangement allows the student to work comfortably in a group sitting at one table. Team members can easily communicate with each other and with the neighbouring teams. The teacher can pass from one table to another, offering additional information and observing the progress of work. The teacher's role here is to assist the learning process. Club tables arrangement also allows the students to work individually on the tasks attributed to team members. When the teacher stays by the whiteboard, some students may experience communication problems and will have to turn their chairs or their heads in order to hear the instructions. This is not an issue if the teacher keeps on walking around the tables when giving classes. It is also possible to modify this arrangement and to place the tables along the walls; this creates a middle space that can be used by the teacher, by team members to give a presentation or for different purposes. Club tables arrangement makes it possible to have more space for students' presentations: all classroom walls can be used.

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Teamwork segments

Teachers should not hesitate and should arrange the tables according to the current needs of the class; it cannot be the cleaning service that decides. The teamwork segments are the sets of four tables put together so that they offer a large surface for teamwork, providing space for large sheets of paper for tasks. Segments can also be arranged in a shape of the letter 'L' or in any other shape, for example if the teacher needs to introduce the tasks with a lecture or presentation. Segment arrangement is rather flexible, as the passage between the tables can be obtained by moving one table and one chair only. One segment offers up to 6 places if needed. Communication within the team is easy here, it is easy to observe each other's work, and the teacher can easily pass from one team to another and to maintain proper communication with the students.

A circle

Circle arrangement does not require tables, we need only the chairs that we arrange in a relatively even circle around the classroom so that the activity's participants will face each other directly. This enhances the interactions between the students and the possibility to establish direct relations between them. When there are no tables, no one can hide behind one, everyone is visible and seen by others. The teacher can sit down with the students which makes him an equal group member. Chairs arranged in a circle invite the students to discuss or to play games that would allow them to get to know each other better. It is difficult to take notes so this arrangement is better for talking, exchanging opinions, having discussions or brainstorms, especially if we add some flipcharts to the mix. The circle works best with up to 20 students.

There is also another version of this arrangement according to which the tables are put around the chair circle, forming the next, external circle. This offers great opportunities when it comes to the individual work: students can just turn their chairs around and perform individual tasks at the tables, and they are able to finish any time, turn the chairs around again, face other students and engage in a discussion.

Working groups

In the case when there are not many students present or when a class is relatively small, it could be interesting to put two tables together, form 4 or 5 of such groups, and to put the rest of the tables together in the middle of the classroom for example in the shape of the letter 'U'

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in order to create the space for shared learning. This allows the students to work in teams of 4 or 5 persons when needed and to go back to the main table for this part of the lesson that should be done together, i.e. the introduction, explaining the tasks, discussing the works, watching the content displayed on a blackboard or the interactive table. Tables for group work should be put at a certain distance from each other so that the teams would not disturb one another and to have the suitable work space. The teacher should maintain eye contact with all the teams and have access to all of them.

The laboratory

Laboratory arrangement offers space for individual work. Individual tables could be put at a certain distance, passage between the tables provided, each table hosting a pair of students sitting across from each other on the opposite sides of the table in order not to disturb each other at work. If the students are to use the same device, they can be seated on the same side of the table. The teacher should have access to all the tables in order to be able to give advice and to monitor the work's progress.

Source: elaboration by Marcin Polak based on: *Organizacja przestrzeni szkolnej* (How to organise a school space)**, e-learning platform Jaszczur, Jagiellonian University, http://jaszczur.czn.uj.edu.pl/mod/book/tool/print/index.php?id=8994, accessed: 03.01.2015; and *Active learning spaces. Insights, applications & solutions*, Steelcase Education.**[u11]

Mixed arrangement (classes brought together)

It is an interesting and a rather innovative solution to put two classes together in a shared space used by two groups. In order to have that, the wall between the classrooms should be brought down (or simply not erected if this is the case of a new building), and the sliding doors or partitions should be installed as a symbolic division between two areas: the area of group and individual work, and the area for meetings and class work. The first area could have its tables arranged in the shape of the letter 'U' or 'V', the school should provide the adequate tools for audio-visual presentations and a couple (3 or 4) work stations equipped with computers to be used during the lesson, and the lockers for learning materials. Behind the partition, the tables should be arranged in such a way that the small groups could work together, the space should be equipped with flipcharts and sliding whiteboards for noting down and presenting the outcome of work. This part of the room will also need additional

chairs and tables (folding chairs and tables for example), as this makes the space more flexible and adjustable to the current needs. This part of the room should also provide a couple of computer stations for current use. The spaces are connected, so the teachers can give classes to a larger group of students and to mix them according to the teacher's plan. The mixed classroom arrangement offers the advantage of being able to make use of the already existing, ready-made space, there is no need to re-arrange the tables during the lesson, ans it allows the teachers to work as a team on a particular part of the curriculum. This invites interdisciplinary approach and allows the classes in different subjects to be organised together. The teachers are now free to circulate between the two parts of the space and to be exactly where they are needed.

Elaborated by Marcin Polak based on: Designing Spaces for Effective Learning A guide to 21st century learning space design, Higher Education Funding Council for England (HEFCE) on behalf of JISC, 2006. [u12]

Micro-space and learning support

The physical space where the learning process happens should not be the same for all learners and is not universal for all types of educational events. Some rooms do not provide the optimal conditions and simply make the effective teaching and learning impossible due to a number of factors such as the wrong acoustics, inadequate lighting, uncomfortable furniture, devastated walls etc. Reflection on how to organise the micro-space and how to increase the effectiveness of the learning process could be greatly enriched by the observation of the corporate world and the organisation of the office space that is designed in order to stimulate creativity and co-operation between employees working on common projects. The corporate terminology related to office organisation, especially at the companies with open-spaces, features a number of terms that are recently gaining more popularity and feature for example such terms as 'hot desking', 'break-out space' and 'energy points'. These terms could provide inspiration for the organisation of space at schools, as it is also at schools that we aim at obtaining the optimal activity of students and at giving them the right motivation for learning and progress.

'Hot desking' refers to a desk management system that could be explained in a simplified way as the system in which the employee coming to work sits wherever there is a free spot. This

helps the company to use its office space in the most optimal way, additionally helping the teams to get to know each other better.

'Break-out points' refer to the spots in the office space that are dedicated for the exchange of ideas, for stress release, for casual conversations or calming down. These spots are available for all employees that are in the need of using them, as leaving one's desk for a moment helps to boost the employee's productivity.

'Energy points' refer to such spaces as the library or a kitchen; the point may not even be to eat or to drink anything but rather to calm down or to focus on some task.

"It is worth to mention that some open-space offices account for the fact that not everyone wants to work behind a desk. As a result, we get the office which resembles rather a club divided into diverse areas than a monotonous ant hill." – Beata Oseicka, Kinnarps Polska (Waszkiewicz 2013).

A classroom can also be seen as a specific type of an open-space surface: people are sharing the same space and have to work following the teacher's instructions. Compared to the corporate world, students are given a less enjoyable space, as all of them are assumed to have the same job to perform. Is it possible to change that and is it worth it?

The school space should inspire creativity and should support students' daily activity. Its design should fulfil students' need for development and social and emotional progress, which is why Peter C. Lippman suggests providing some space to accommodate at least a couple of various types of break-out points at schools (Lippman 2013):

- Break-out niches: are relatively open areas, such as recesses in walls, in hallways, or at intersections. This type of space might be a waiting area with soft seating, small tables, and chairs; these points can also be used as a scene, namely the spots for multimedia presentations, for example with the use of digital projectors. These are also settings where students may use their laptops, tablets, or handheld devices; the school should thus take care of providing the proper number of operational electric sockets.
- Break-out hollows are the semi-enclosed settings that might be 'holes' in walls of corridors, within the instructional spaces, or in more public areas like libraries or waiting areas. Breakout hollows function as extensions of the instructional spaces and

support one to three people. These areas might have movable chairs or stools around fixed tables where students may work on their laptops, tablets, or handheld devices.

- Break-out rooms are private and enclosed settings for one to six people. They might be used for staff, parent, or student meetings or for other purposes. These spaces should be insulated against noise and allow students to work quietly and in peace. Within these spaces might be movable chairs around a movable table (or tables), soft seating, or fixed countertops, as well as interactive projects for presentations and electric multi-device sockets.
- Break-out nodes could be located in small rooms or in larger open-space areas. They promote independent, small-group, and large-group interactions. These are instructional spaces, and as such should be outfitted with the appropriate technology and furniture.

Apart from the break-out points, the corners of the rooms play a separate role in the school space: they allow the students to detach themselves from the group, to spend their time in little teams with the possibility of close physical, voice and eye contact.

Planning and designing such areas within a classroom is yet another challenge.

Elaborated by Marcin Polak based on: Designing Collaborative Spaces for Schools, Peter C. Lippman, JCJ Architecture, New York* [in:] *THE Journal, http://thejournal.com/Articles/2013/02/13/Designing-Collaborative-Spaces-for-Schools.aspx?p=1, 2013.

There seems to be a possibility to design classrooms that would be bigger than they usually are; in Poland, the legal regulations on that mater are not conclusive, but in general, a typical classroom is planned for the surface of 50-60 m^2. Larger classrooms could be used as learning hubs and could be divided into various areas dedicated for various types of educational activities. This makes it possible to try different table arrangements in one classroom, adjusting and changing it according to the needs of the currently performed task, and to divide the students into teams that would be able to work together and not to disturb each other during project or task-based work. A larger classroom has the additional advantage of facilitating interactions between different classes, as a larger surface could be used by two or three teachers. This additionally encourages interdisciplinarity and the integration of the school community. [Case Stonefields School, Auckland, New Zealand]

Elaborated by Marcin Polak based on: Modern learning environments, Mark Osborne, CORE Education's White Papers, New Zealand, 2013. [u13]

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