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Physical Classroom Environment and Pedagogy

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***Abstract* – The aim of this article is to analyse how physical classroom environment can be related to pedagogy and to examine the causes that prevent such correlation. The article briefly introduces the development of classrooms since the 20th century, it underlines modern learning activities, presents visual organization of classroom spaces in correlation with the latter and analyses students' activity zones in the classrooms. Article presents the model of interaction between pedagogy and physical classroom environment.**

***Keywords* – Classroom, classroom seating arrangements, learning activities, pedagogy, physical learning environment.**

Introduction

The reconsideration of current learning spaces in schools is encouraged by the changing perception of learning process and environmental perception. The diverse effective learning methods, learning organization, and socialized learning expand the school concept and lead to a positive school indication: high learning achievements, suitable learning environment, common values and goals, targeted teaching, cooperation, etc. Modern school is a combination of various functional elements therefore students must be provided with learning areas which are as diverse as possible. According to Nordquist and Watter [16], a classroom was always a dominant space in school. The article by Duarte, et al. [5] highlights that nowadays many teachers still work in tradicional classrooms using traditional educational methods. Merrienboer, et al., [13] notice and highlight that very little attention is paid to the physical learning environment and pedagogical activities carried out at schools which it meats. In this case, pedagogical and physical school environments are two forces that can ensure the best results of the students as well as their pleasant experience at school only by working together. Therefore the aim of the article is to identify the ways in which physical school environment can be related to pedagogy. The objectives are:

1. to briefly introduce the change of physical classroom space since the 20th century until these days;
2. to identify modern learning activities;
3. to analyse physical classroom space organizational methods in accordance with established learning activities.

The article focuses on general education schools with the goal to analyse the basic (Grades 5−8) and secondary (Grades 9−12) education classrooms. The article uses historical method and qualitative analysis of content. The beginning of the 20th century was chosen as the starting point of classroom analysis. This period was particularly important to European countries and USA, because at that time people started paying attention to the limitations of the classical educational paradigm and the need for fundamental change of the concept of education. The new, innovative educational ideas and challenges started to have an influence on school buildings and the most important element of school − classroom.

It is probably obvious, that while creating any physical environment, it is essential to know what activities will be carried out there, how they will be organized. Merrienboer, et al., [13] point out that while physically creating classrooms it is very important to foresee what objectives and tasks will be presented to the students, how they will present their learning results and solve given problems practically, what will be the age and the number of the sudents. In this way, a new or existing school environment is shaped in accordance with pedagogy.

I. Classroom development

Around the year 1910, in the absence of artificial light sources in schools, classrooms were designed in a way that provided maximum natural light flow and enabled as many children as possible to be taught at the same time. In 1910, Hamlin [8] suggested two classroom models and indicated specific ratio of windows, length and width of the classrooms as well as the height of windowsills. It was believed that these measurements ensured optimum natural enlightening in classrooms (Fig. 1). If the classroom was suitable for 48 students, then it should have been 7.5 meters wide and 10 meters long, if for 40 students, then the width had to be reduced to 6.56 meters. The desks in the classrooms were arranged in rows in order for the sun to shine on student's left shoulder when he writes with their right hand, otherwise the natural light would be blocked by the student himself.

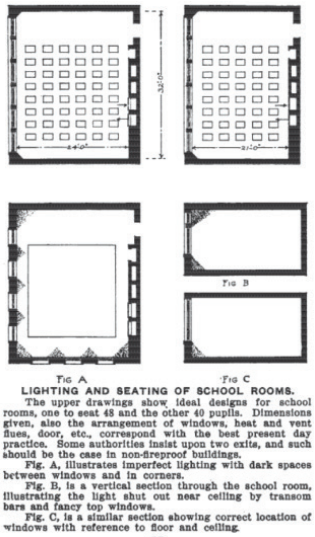

Fig. 1. Drawings show ideal designs for classrooms [12].

In order to have the whole classroom enlightened, according to Baker [2], there was a need to avoid big gaps between the windows and between windows and walls. Teacher's place was in front of the class, blackboard was also hanging there. According to Byers, Imms and Hartnell-Young [4], the teacher standing in front of the class ensures control and monitoring of the students. At the time, this was necessary because a large number of learners often raised discipline problems, which were solved in the elementary and, at the time, routine, corporal punishment [7]. In order for students to focus as much as possible and ensure silence in the classroom, students were not allowed to move around. Another negative aspect of such situation was that students would become merely passive takers of information and knowledge [4]. Students often would learn information by heart from the textbooks and because of that they were not encouraged to think and were not showing any progress [7].

During the priod 1918–1939, an establisment of open air schools was initiated in accordance with needs for wellness. In 1935, two architects, Eugène Beaudouin and Marcel Lods, designed one of famous open air schools in France. It consisted of 8 classroom pavilions connected by glass corridor. Each pavilion had three sliding walls made of glass that were opened when needed. In these classes very light tables and chairs were used so that they could be relocated outside whenever necessary. In these clasrooms the furniture was also arranged in rows and the teacher's desk and the blackboard were in front of the class. Despite the fact that in the 20th century the size of the classroom and furniture arrangement in traditional schools was determined by aspiration for abundance of natural light, the number of students and the classical paradigm of education, innovative decisions regarding the classrooms already existed. Around 1910–1920 it was realised that classical education paradigm based training system can no longer meet the needs of society and an individual. The aspiration to change well-established viewpoint to the students, teacher's authority, physical punisments and learning by heart emerged. Free education paradigms started to spread, which encouraged to view an individual as an absolute value, to develop his natural capacities and emphasise spiritual values. As stated by Gislason [7], the increasing interest in the non-tradicional pedagogical practice encouraged architects to create various experimental classroom designs, therefore Austrian architect Richard Neutra (Fig. 2) suggested a classroom design of his own creation.

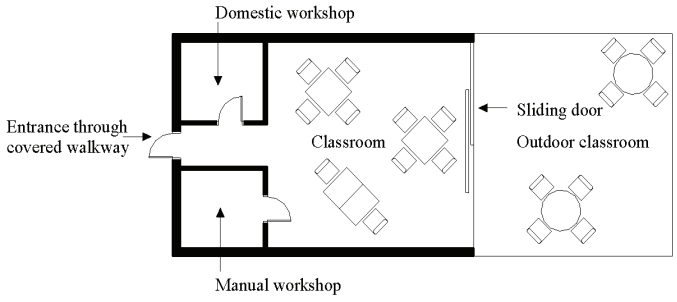

Fig. 2. Activity classroom by R. Neutra, 1935 [Scheme: G.Brukštutė].

Neutra [14] claimed that school should be a place, where education becomes a very specific experience of a student, where children do not learn only by reading and listening. The classroom created by the architect was distinguished by its flexibility and adaptability for practical work.

According to Hille [10], up until that point, prevailing learning method when students were learning things by heart from the textbooks was encouraged to be substituted by active studying. This learning technique encourages group work, improves child's ability to cooperate and apply the received knowledge into practice. Before that, the prevailing figure in the classroom – teacher, in this case acts only as an assistant because independent studying helps a child to develop his/her personal interests.

However, only few schools developed on the basis of innovative educational ideas. The majority of schools used the traditional classroom model, which was suggested by American Horace Mann in 1938 [2] (Fig. 3). The educologist urged to arrange tables and benches in rows, use the front of the class for blackboard and teacher's desk and to design windows on both sides of the room. There were 49 places for students available in such a classroom. Since the number of learners had been increasing significantly in the cities due to the industrial revolution in the USA, it was a very popular design at that time. The modern education paradigm idea that education must be linked with experience and that teaching content must be supplemented with practical subjects expanded the typology of the classes. Laboratories together with music, art, print, and drawing classes have emerged [10].

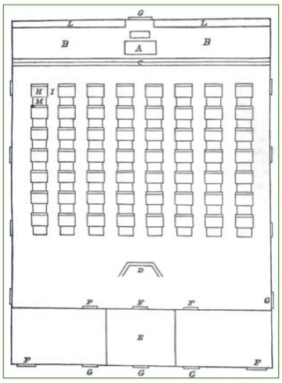

Fig. 3. An early model for a standard classroom by Horace Mann, 1938 [20].

In years 1960 and 1970 the concept of an open classroom flourished. However these ideas can be linked with innovative notion about educational spaces expressed by John Dewey at the beggining of the 20th century. According to Alterator and Deed [1], an open classroom concept emerged as a response to the closed and authoritarian classrooms of the industrial times. The authors link such classrooms with different learning styles, learning space flexibility, student's choice of activities, richness of the learning material, integration of various learning areas, large and small group teaching and individual learning spaces (Fig. 4).

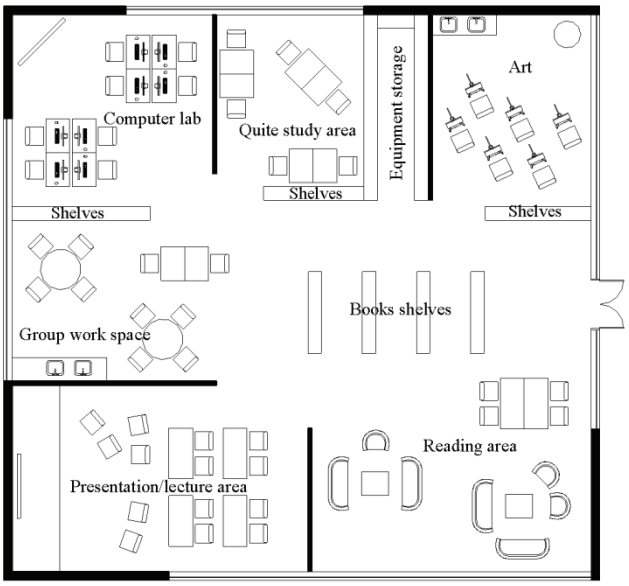

Fig. 4. Principle of open plan classrooms [Scheme: G.Brukštutė].

Alterator and Deed [1] state that students are much better visible in an open learning space, and free configuration of the seats encourages them to communicate and cooperate. However noise is one of the major deficiency of such classrooms. The latter can be one of the main reasons why open classrooms had lost their popularity. Over time it was noticed that academic achievements of the students learning in such areas were low. However we can guess that the emergence of open classrooms provoked a new approach to standard classrooms, it started to be viewed as a flexible space for carrying out various pedagogical activities.

Up until this time, in most of the traditional schools built at the end of the 20th century, the most popular remaining classroom is a standard, rectangular type with furniture arranged in rows and a teacher's desk and a blackboard in the front of the class. However the teaching process itself was not limited to the classrooms. Education was also started to be organized in other school areas: libraries, reading rooms, hallways, lobbies, etc. Modern technologies and wireless internet led to unused school areas, various nooks and crannies, becoming a secondary learning space. Even in newly built schools tradicional classrooms are never declined, however, their space organization has become much more flexible.

In summary, it can be stated that the development of a classroom space and its furniture was influenced by a few factors. That included the reaching to ensure as much natural light in classes as possible, a large number of students in the classrooms, new educational ideas, the emergence of new open air schools, addition of new practical subjects to the curriculumm, and flourishing of the open classroom system. However, during the whole 20th century a standard rectangular classroom model in many schools prevailed, but over time its usage became much more flexible. The reaching for space flexibility and modern technologies led to organizing the learning process not only in classrooms but in other school areas as well.

II. Classroom and modern education

In the beginning of the 20th century a well known educologist John Dewey understood that quality education can be provided by consciously adaptating the educational environment to learning process. Woolner and Thomas [22] assert that education is a complex and dynamic link between the physical learning environment and the activities taking place there. According to the authors, the quality of the learning environment correlates with the results of the students. However, the influence of the environment itself on learning is not direct. With the reference to Barrett et al., [3], it can be stated that physical classroom characteristics lead to higher learning results and a pleasant life experience. According to the authors the physical learning space is a holistic experience involving many factors. If these factors lead to a positive learner's overall well-being, then it is obvious that the student will receive and remember the information provided to him much better and this will result in higher achievements.

It is obvious that the traditional layout of classroom furniture arrangement scheme has not changed since the emergence of a standard classroom model. According to Woolner et al., [21] the teachers express their conservativeness when it comes to trying to change school spaces, while Sanoff (2008) states that if a teacher does not understand why the furniture arrrangement of one of the classrooms is better than that of the other, then all physical changes in the school environment will have little impact on the learning process. The notion that teacher is a very important factor in successful learning is also approved by Tanic et al., [19], according to the researchers one of the main responsibilities of a teacher is to choose the most appropriate teaching methods and to create the best learning environment.

Educational facilities at school can be classified into general education and specialized classes. General education classrooms can be used for many subjects: humanitarian, social studies, and languages. Specialized classrooms are used for sport, arts, technology, IT lessons, and natural science. The distinctive feature of specialized classrooms is that they are normally being used only for one particular subject that usually requires a specific inventory, for instance, stationary tables with sinks, computers, laboratory equipment, and alike. It is clear that many of these classes cannot be flexible, that is to say, they cannot be adapted to other learning activities except the reffered one.

Based on de Souza and Kowaltowski [18] as well as Merrienboer et al. [13], three main groups of learning activities can be distinguished: collective, group, and individual learning. Nair [15], who examines school architecture and education, introduced 18 learning activities that are recommended by the author to be applied in every modern school: independent study, peer tutoring, team collaborative work in small and mid-sized groups (2−6 students), one-on-one learning with the teacher, lecture format with the teacher at center stage, project-based learning, technology based learning with mobile computers, distance learning, research via the Internet with wireless networking, presentation, performance-based learning, seminar-style instruction, hands on project-based learning, naturalist learning, social/emotional

learning, art-based learning, storytelling (floor seating), and team teaching.

Three main groups of learning activities, distinguished by de Souza and Kowaltowski [18] and Merrienboer et al., [13] can be accordingly added to educational activities recommended by Nair [15]. The visuals of physical learning space organization models of these activities can be provided (Fig. 5). One of the main variables in the learning space is the placement of tables and chairs, therefore the various configurations of this furniture allow to organize space according to the nature of learning activity.

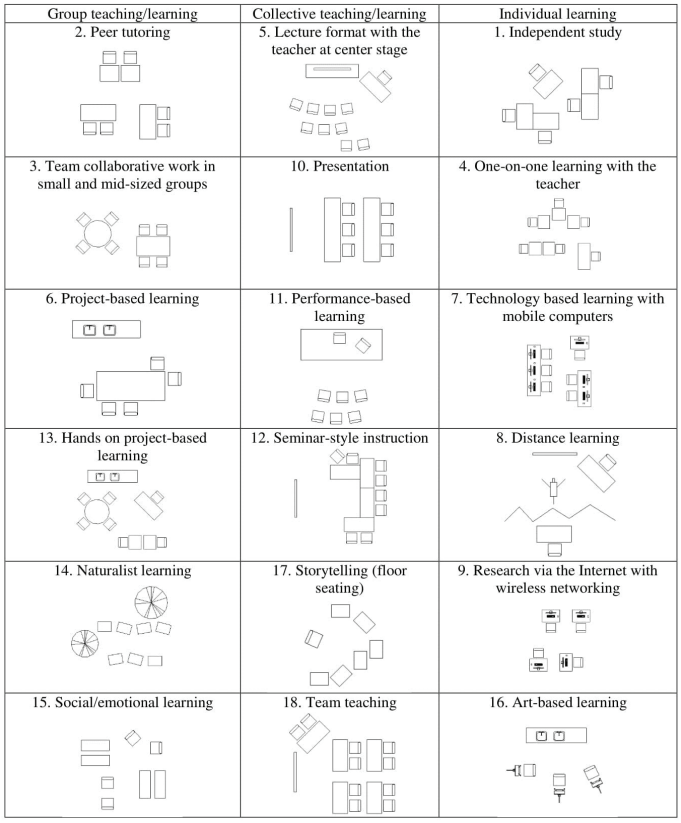

Fig. 5. Classroom furniture arrangement by modalities of learning [Scheme: G.Brukštutė].

Traditional classroom layout with tables and chairs arranged in rows, according to Higgins et al. [9], is suitable for individual and fixed-time work. However, if the goal is to pass on certain information to the children, it should be noted that this arrangement of furniture constitutes a very low activity zone. The impact of classroom furniture arrangement has been analysed by McCorskey and McVetta [11]. Authors noticed that the different layout of the classroom furniture determines the same activity zone problem if the teacher is standing in front of the class. In the example shown below (Fig. 6) there are distinguished three different classroom layouts: modular, traditional and horseshoe shape. All three layouts have similar students' activity zones, which concentrate in the central part of the classroom or closest to the teacher.

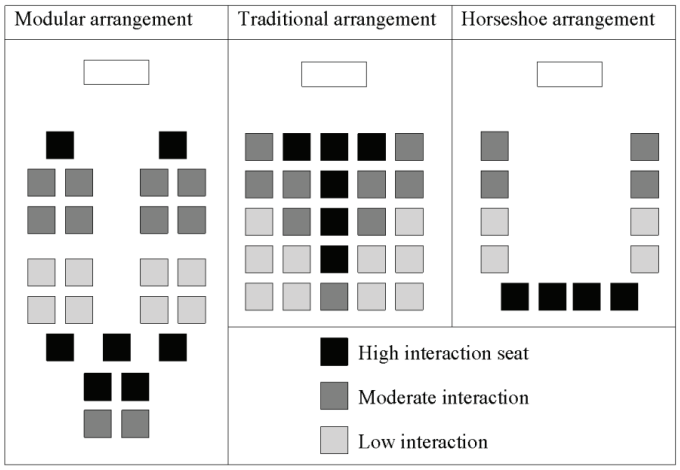

Fig. 6. Classroom seating arrangements by McCorskey ir McVetta [11] [Scheme: G.Brukštutė].

It can be assumed that in any furniture arrangement an activity zone would expand if the teacher was not just standing in front of the class and could move freely in the learning space. However, the limited use of classroom space and the lack of movement in it is often a result of the high number of learners or simply too small classrooms and heavy school furniture that prevents the creation of a desired learning space.

The article defines the physical classroom environment and education studies as two forces that must act together. The analysis of the interaction of these two forces can be based on philosophy. The physical environment of the classroom is defined as substance while education studies is perceived as an idea. According to the Greek Philosopher Plato, an idea is the reason for a thing and a force that is unchangeable, it is the thing's essence and ideal and the beginning of all. Substance is contrary to the idea and it is a force most importantly denoted by its ability to change. Substance manifests in different forms and shapes, one of which is material. When idea and matter (material) interact, the entire process results in a certain form, i.e. a physical manifestation. A conclusion can be drawn that during the interaction of the idea about learning activities with the material substance, a form, i.e. physical manifestation of classroom environment, is shaped. The model of the interaction between the idea (pedagogy) and the substance (physical classroom environment) is displayed in Fig. 7.

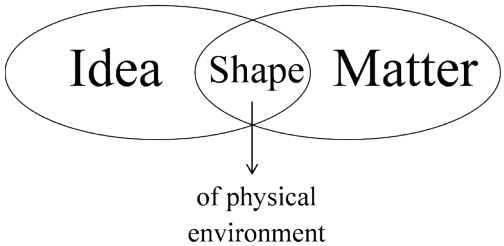

Fig. 7. The model of interaction between idea (pedagogy) and matter (physical classroom environment) [Scheme: G.Brukštutė].

In summary, four reasons that prevent the transformation of current physical classroom spaces into learning spaces meeting modern educational recquirements can be distinguished. These are a dominant standard classroom model, traditional teaching methods, heavy school furniture, teachers' conservatism and lack of information. In order to create a physical learning environment based on new educational ideas, it is essential to analyse learning activities and corresponding learning spaces. The planning of classroom environment manifests the transformation of an educational idea into a physical shape. The targeted educational goals are best revealed through observation of the physical classroom environment.

Conclusions

The interaction between education studies and physical classroom environment analysed in the article allows drawing the conclusion that the most favourable learning and teaching environment can be created by these two forces working together. These two forces cannot be separated because the idea of education studies can only take root through physical manifestation and the latter, in turn, needs the former to create the optimum learning and teaching environment. A conclusion is drawn that the interaction of education studies and physical classroom environment is an indisputable and indispensable process in each school.

The relationship between the physical school environment and pedagogy is revealed through the organization of the classroom. The latter depends on what kind of learning activity is carried out in a specific classroom. Teachers often lack the basic information or ideas how to organize their classroom space differently and how to use modern technologies, therefore often they not only return to the traditional classroom model but also traditional teaching methods. This, of course, hinders systematic changes in learning activities as well as classroom space management, and encourages the continuity of the practice of the past.

Modern physical learning spaces must be able to change their sizes, shapes and furniture layout. For this reason, lightweight sliding or folding partitions are needed when designing or rebuilding existing schools to transform, enlarge or reduce the learning space when needed. It also requires the use of lightweight school furniture that can be arranged in terms of learning activities for collective, group or individual work. The learning spaces should not be overloaded with unnecessary school furniture that would reduce the learning space, so these spaces should either be spacious or elements such as storage areas for students and teachers should be moved outside or separated from the learning space. Specialized learning spaces such as chemistry, physics, and biology classrooms are often not easily transformable due to specific space conditions: sinks, equipment used, and so on. Therefore, it is recommended to place school benches along the perimeter of the classroom in such learning spaces, leaving the center of the learning space free. In this way, specialized learning spaces become more flexible and can be used for a variety of learning activities.

Rapidly evolving modern technologies provide an opportunity to facilitate the learning process and make it more interesting. More flexible classrooms would allow an easier integration of computers, tablets, smart boards, and alike into the environment. Modern technologies allow the learning process to develop beyond the classroom and use other school areas, which perhaps have not been used yet.

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