

THE PHYSICAL ENVIRONMENT OF THE SCHOOL AS A SUPPORT FOR STUDENTS' INTERNAL MOTIVATION TO WORK AND LEARN

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ABSTRACT: The article presents ongoing research on the connection between the physical school environment and the intrinsic motivation of pupils. It identifies the support of internal motivation as one of the key principles of modern pedagogy. Based on the psychological Theory of Self-Determination, it poses the following research question: In what way does the physical environment of the school participate in satisfying the need for autonomy, competence and relatedness. It presents methods from the field of ethnography and a comprehensive research methodology, which is applied in the form of a multiple case study. It outlines several theses arising from the ongoing results of ongoing research.

KEYWORDS: architecture; education; theory of self-determination; physical environment of schools

INTRODUCTION

Due to demographic development in the Czech Republic, there are currently being built again primary school buildings. At the same time, innovative pedagogical methods of teaching are becoming more and more popular, and clients require these methods to be taken into account when designing school buildings. If we as architects are to monitor the functionality of our proposed built environment, we need to understand what is going on in the school, what the current pedagogical view of the educational process is and what role the physical environment plays in this process.

A study of the pedagogical literature shows that the importance of the physical environment for the realisation of educational goals is clearly more emphasised in pre-school and primary school education. Interaction with the physical environment has a significant impact on the sensitivity of sensory perception, the development of cognitive functions and elementary skills, and the development of fine and gross motor skills, which are prerequisites for the subsequent acquisition of knowledge; for the successful development of those skills, it is the period of early and middle childhood that is crucial.

During primary and secondary education, as the importance of text, information and visualization and information technology increases, the attention paid to the physical environment decreases in terms of the contribution it can make to the acquisition of the educational curriculum, i.e. the content of teaching.

Looking more closely at current trends in pedagogy, one of the key themes that emerges is the support and development of students' internal motivation to work and study. In this sense, an attractive and supportive physical environment, if it ensures the satisfaction of certain natural needs of pupils, can play some role and be pedagogically helpful. What these needs are and how the physical environment of the school can contribute to their fulfilment is the subject of ongoing research. In this text I would like to present the focus and methodology of this research.

PHYSICAL ENVIRONMENT AND EDUCATION

Since the middle of the last century, there has been systematic research on the effects of the physical school environment on educational attainments of students. Initially, research focused primarily on easily measurable physical environmental characteristics such as light intensity, noise intensity, air quality and temperature. Later, the research dealt also with the structural characteristics of the school environment,

the influence of the presence of natural features, and the typological diversity of educational premises. However, a key difficulty with such research is the limited ability to isolate the importance of the physical environment from other influences that contribute to students' academic achievement, which are usually more significant. At the same time, the very question of the method of testing learning outcomes comes into play.

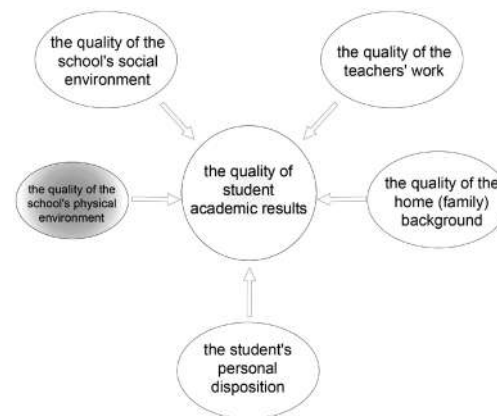


Fig. 1.: Influences on the educational process (Source: author)

For these reasons, a number of studies, often qualitative, have been conducted focusing on the links between the characteristics of the physical environment and specific sub-processes of learning, educational climate, social interactions, etc. Then, in recent decades, meta-studies comparing and verifying the results of many previous studies have been carried out.¹ One of the important conclusions regarding the influence of physical environment parameters on the course of study is the importance of the relationship that students, but also school staff, have towards their physical environment. [1] What then significantly influences this relationship is the possibility of participation, i.e. some form of involvement in the design, creation, modification or maintenance of school spaces. This finding corresponds with the findings of pedagogy, which increasingly requires pupils to do their own thinking and creative work rather than repeating memorised information. There is a departure from a transmissive conception of teaching to a constructivist conception, i.e. from the transmission of ready-made knowledge to the promotion of pupils' own construction of findings. This means that the learner does not passively receive the content of the schoolwork, but seeks, discovers and constructs knowledge and understanding.

The concept of key personal competences is emerging among the objectives of education and the impor-

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¹ E.g. [1], where the authors present a compilation of the results of more than 200 relevant papers from several disciplines (architecture, pedagogy, psychology, ergonomics) published from 1911 to the present. Most of the papers come from the Anglo-American environment from the last 30 years.

tance of one's own skills and ability to orient oneself in complex problems and to respond creatively to the challenges of a changing world is growing. In education, the importance of internally motivated action and active personal participation of each student in the learning process is thus increasing. [2] A key principle appearing in various forms and to varying degrees in contemporary educational innovations seems to be the support of students' internal motivation to work and learn. This aspect is the focus of our research, which concentrates on the link between the parameters of the physical environment and students' internal motivation. Whether, and how, a correlation can be found between these phenomena is the first question to be answered.

INTERNAL MOTIVATION

Internal motivation is when the motivation for the learning activity stems predominantly from cognitive needs (the learner is interested in what they are learning) - it is therefore internal motivation in terms of the learning activity (the learning activity itself satisfies the need). In other cases, if different needs, originally independent of the learning activity, are satisfied through that learning activity (pupils learn in order to achieve a certain task, a goal that is set and the achievement of which brings a certain reward, e.g. praise from the teacher, joy of their parents, admiration of their classmates, admission to school, a gift, etc.), we speak of external motivation. Internal motivation is not only the most valuable in terms of the quality of learning, but it is also of the highest value for the future of the learner, where it persists as a lifelong ability to expand one's skills and knowledge. [3]

The nature and preconditions of internal motivation are dealt with in the Self-determination theory, which was proposed in the 1970s by psychologists Richard M. Ryan and Edward L. Deci. They formulated the theory on the basis of experiments in which they investigated differences in human behaviour motivated by external reward on the one hand or by one's own personal need on the other. They found that people motivated by their own need, who "enjoyed" the activity or found it interesting, worked with greater commitment and achieved better results than people who worked for financial rewards. In other experiments it even turned out that people who initially worked based on intrinsic motivation reduced their performance in the activity after switching to external financial rewards. [4]

Based on their research, the authors of the theory state that: "Inherent in human nature is the proac-

isfaction of which leads to the development of internal motivation. These needs are experiencing of one's own autonomy, perceiving of personal competence, and feeling of relatedness with other people. The authors further state that these needs are innate and that they are growth needs. It means that their satisfaction does not lead to a state of equilibrium, where the reasons for further activity disappear, but instead leads to further self-developing human activity. These three human needs can be characterized as follows:

Autonomy:

A state in which a person acts for themselves. That is, when they perceive that the cause of their actions is only their own motives. The physical environment may or may not provide the space and opportunity for such behaviour.

Competence:

A state in which a person receives feedback from the environment confirming their actions as successful. Feedback here does not take the form of an external reward but rather information that the action was successful. For example, the learner may perceive satisfaction or even delight from the results of their action in their environment without that implying the receipt of any reward. Such feedback can also be obtained from the physical environment, for example, when one is satisfied with one's creation or knows how to handle an object or orient oneself in an environment.

Relatedness:

The state of feeling part of a larger social group with which one shares important aspects of one's life. For example the language, the values to which they subscribe, the story they live but also, for example, the place where they spend time together. What is significant then are the shared experiences, which are usually situated in a physical, spatial framework.

It should be emphasized, that a quality learning environment must provide for pupils' (and teachers') basic human needs² in the first place and that, in meeting these needs, the social environment of the school is largely involved. [6] However, the needs identified in Self-Determination Theory are precisely those that can be related to pupils' active actions and participation in their own learning, and at the same time it is possible to find support for their saturation in the physical environment. Thus, the presented research project focuses on the physical environment as the support for pupils' self-directed learning, which in some educational conceptions represents a diversifying adjunct but in others constitutes a key principle underpinning the entire educational paradigm.³

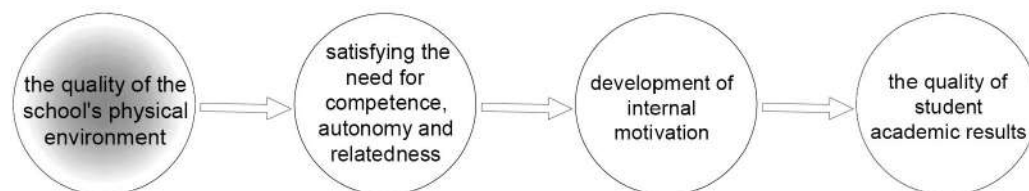


Fig. 2.: One of the possibilities of the physical environment influencing pupils' learning outcomes (Source: author)

tive tendency to engage one's physical and social surroundings and to assimilate ambient values and cultural practices. That is, people are innately curious, interested creatures who possess a natural love of learning and who desire to internalize the knowledge, customs, and values that surround them. " [5]

The emergence and growth of internal motivation is only possible under certain circumstances. According to Self-Determination Theory, the satisfaction of certain personal needs is necessary. The authors of the theory have identified three key human needs, the sat-

RESEARCH METHODOLOGY

The research aims to clarify, through the examples of specific school premises, how the physical environment of these schools contributes to the satisfaction of students' needs for autonomy, competence and relatedness. We thus look for details in the school built environment that provide pupils with support and stimulus for their own personal interest in the world. We thus examined such structural features and phenomena of the school built environment where we identified some connection to pupil autonomous

² Biological and physiological needs, needs for security and safety, social needs, need for respect and recognition.

³ Democratic schools, such as Summerhill in the UK or Sudbury in the USA, in their rejection of learning as a duty, represent such a different view of schooling that we can speak of a separate educational paradigm.

action is identified. Then, it is examined in detail how the physical environment contributes to satisfaction of these three above stated needs.

It is therefore initial research that seeks to understand the situation of users of the school environment through the concept of Self-Determination Theory, to describe this situation in as much detail as possible, and to isolate the significance that the physical environment has for this situation. That is why the research is conducted as a qualitative one, in the form of a multiple case study using a combination of methods from the field of social sciences. The individual cases are concrete campuses chosen to be as diverse as possible in their structural characteristics. For example, buildings with different architectural styles, different periods of construction and different spatial arrangements. The aim was to create the most diverse typology of places and physical objects with which it would be possible to relate the satisfaction of the three identified needs.

The emic perspective, i.e. the point of view from the perspective of the pupils themselves and their actions as they are actually carried out in the school environment, is crucial for the whole research. This approach places the thesis in the context of school ethnography and builds on, for example, research conducted between 1990 and 2005 by the Prague School Ethnography Group. [7] The research is thus focused on the parameters of the physical environment, but examines them through the minds and actions of the users of that environment.

The set of informants

For each school to be evaluated, a pool of informants will be defined in agreement with the school management. Due to the nature of qualitative research and the methods used, it is not necessary for the sample to be too large.

As children's relationship to their environment, both physical and social, changes during the defined period (7-14 years) [8], and the motivational spectrum also changes, it is important to select informants from different age categories. We therefore conduct the investigation within these three age categories:

7-9 years (preschool age reverberation)

10-12 years (peak childhood)

13-14 years (early adolescence)

The questionnaire survey in the first phase of the research is conducted in individual school classes, i.e. among about 20-25 children in each age category. It means 60-75 pupils in each school.

In the second phase of the research, for the survey in the form of a group interview, smaller numbers of informants are more appropriate, in this case groups of no more than 6 pupils. We envisioned one such group in each age category, i.e. 18 pupils from each school.

The initial research is conducted by a questionnaire survey using the free-naming method within a specified cultural domain [9] that consists in listing phenomena related to one specific characteristic. This one characteristic is called a cultural domain in ethnography. In our research, cultural domains are characterized by autonomous behaviours, such as "a place where I can read". Thus, the informant lists all the places in the school where they can read. It is important that they list the places they can think of, i.e. the places where they actually read or at least find suitable for reading. Of course, it may be that they list a place that they know is intended for reading (e.g. the library) but where they have actually never read because it does not suit them. For example, it is noisy, there is nowhere comfortable to sit, etc. Such a fact

should be revealed in the next stage of the research. It is an in-depth interview with a small group of pupils, which takes place by having a group of children guide the researcher around the school building and talk together about why a particular place is significant.

By that time, the researcher already has the results of the written questionnaire that were collected in the first phase of the research. He therefore knows what to ask and at which places to stop. These methods can be supplemented by participatory ethnographic observation. Especially there, where group dynamics play a role in children's actions, observation seems to be the best method of finding out what usually happens in a given place and how this relates to the physical parameters of the space. The investigation conducted among the pupils is also complemented by a semi-structured interview with their class teacher, in which the pedagogical context of the identified phenomena is clarified. For each case, i.e. the school premises, a photographic documentation is also made, and the identified locations are marked on the building floor plans.

The formulation of the questions is adapted to the age of the pupils so that they are understandable to them and, at the same time, directly or indirectly reveal the presence of the saturation of needs according to the Self-Determination Theory.

Initial questionnaire questions

1. Do you have any favourite places at school where it is nice to be, to spend time? Which are they?
2. What are some places at school where you can read, study, or work? Which are they?
3. Is there anything beautiful in your school? Are there any beautiful places? Which are they?
4. Are there any places in your school where you can observe, explore, or try something interesting? Which are they?
5. Are there any places where you can create or make something? Which are they?
6. Is there anything in your school building that you created or participated in when it was created, or is there anything in the school that you take care of?
7. What are some places where you can talk or otherwise hang out with your classmates?
8. Do you think your school building is special in any way? In what way?
9. Are there any places where you meet and talk to teachers outside of class? Which are they?
10. Is there any other place in your school that is important to you that we haven't mentioned here? What is it?

The answers obtained from the questionnaires are then entered into a table. The table is arranged in such a way that in the first column all the answers are listed in each row, i.e. the specific locations of the school premises, as well as possible answers such as "all", "nothing", "don't know". There are therefore as many rows as there were specific items in all the responses to all the questions. Other types of responses are also recorded.

In the first row, the questions asked are then assigned to each column. It means there are 10 columns for the 10 questions of the questionnaire. Each column is further divided into two colour-coded sections to distinguish the responses of boys and girls. For each instance in which a given location appears in the answer to the corresponding question, a cross (x) is marked in the table and placed according to the gender of the child. Thus, if one location appears repeatedly as an answer to one question, the appropriate number of crosses is then placed in the appropriate box.

From the table we can then acquire the following data:

- the number of items listed for each question
- total number of items listed
- the order of importance of each site
- variability of responses, or, conversely, the degree of consensus within the group
- possible difference in the responses of boys and girls
- the ratio of the total number of items listed to the number of pupils completing the questionnaires.

For an in-depth interview with students, the following questions are key:

What is interesting or beautiful about this place? What can you do here (with this)? Why can you do this? What usually happens here?

After the second phase of the research, the sites relevant to the satisfaction of needs, as defined in the Self-Determination Theory, are identified. (Not all the sites described are related to the satisfaction of needs as defined by the theory.) For each of these sites,

location:	1. a popular, pleasant place	2. a place to work and learn	3. beautiful place	4. a place to observe and try	5. a place to make and create	6. own creation	7. meeting place with classmates	8. exceptional place of the school	9. meeting with teachers	10. another important place
swimming pool	x			x	x			x	x	
cafe point	x	x	x							
lookout tower (garden view)			x					x		
garden	xxx	xxxx	x	x	xx	xxxx	x	xx	xx	x
classroom	xxx	xxx	x	xxxxx	x	x	xxxxx	x	xxxxx	x
nothing								x		
school canteen			x					xx		x
corridor	x							x	x	xx
gym			xx	x	x					
swing	xxx		x					xx		
library	x	x								
place around the fire pit (in the garden)			x	x						
after-school centre	xx	x	x	x	x	x		x	x	x
school workshop				x	x	xxx				
teachers' lounge									xxxxx	xxx
I dont now				x			xxx		xx	
carpet (in the classroom)	xxx	x	x	x				x	xx	
my school desk	x	x	x			x	x			x
sofa	xx	xx	xxxx	x				xxx		
library			x							
insect observation				x						
English classroom						x	x			
art education classroom							x			
toilets								xx	x	
Leonardo DaVinci?									x	
triangle room									x	x
terrace	xxxx			x				x		
corridor		x								
football field	x		xxx							
flowers, squirrels, trees				x						

Tab. 1.: Record of the results of the questionnaires completed by seventeen 5th grade students (Source: author)

locality	What is happening in the locality? What activity satisfies needs according to SDT.	How does the environment contribute to this?	Boundary conditions. Under what circumstances would this not be possible?
tea room ("niche" in the dining room)	Autonomy The very presence in the space is a matter of choice. They sit here in different ways (on the floor, on cushions, in the window) and informal conversations take place here. Older students come to work here and sometimes have lunch here. It is one of the possibilities where you can go to work in a smaller group as part of organized teaching. Thus, it expands the possibility of choice within this teaching as well.	school institution The school sets rules for the use of the space. Smaller children are not allowed to eat here, otherwise the space is free to use without conditions.	If the school allowed, for example, only teachers to use the space.
		interior equipment The space is separated from the dining room by a wooden structure woven with fabric. So it is not separated acoustically and visually only to a certain extent.	If the space was not separated in any way, it would lose its intimacy.
		school building It is a structurally designated space (niche) in the larger space of the dining room	If this space had not been separated from the dining room, it probably would not have been created at all.
	Competence Sometimes it is necessary to negotiate the use of the space with other pupils. If you eat here, care must be taken to maintain order. However, competence as a need is only satisfied in the sense that pupils experience (as a matter of course) that they can use the space without supervision according to their own needs.	school institution It allows all students free access. Holds students accountable.	If the time and method of use were organized and limited by the school.
		interior equipment Seat cushions can get dirty or damaged.	Pupils appreciate the design of the interior. If it were a bare space, the possibility of using it would have less weight (for some pupils).
		school building ----- *	
	Relatedness Children like to be together in a small group. They value "peace", i.e. a certain intimacy of the space.	school institution It allows all students free access.	If the time and method of use were organized and limited.
		interior equipment The partition separates the space from the dining room and thus promotes a feeling of intimacy. A separate space promotes a feeling of closeness	If the time and method of use were organized and limited.
		school building It is a structurally designated space (niche).	The dining room as one large space would not evoke such a feeling of closeness.

Tab. 2.: Site analysis (Source: author)

a table is drawn up which clearly names which of the mentioned needs is being satisfied, how this happens and how the conditions in the social environment of the school, the parameters of the interior furnishings and the parameters of the building contribute to this.

DISCUSSION

The proposed research seeks to gain as detailed an insight as possible into pupils' lives in the physical school environment and pursues a shift in education towards greater pupil autonomy. It is clear from previous research that where teachers allow children to be autonomous, i.e. where pupils are given the opportunity to work independently, work in small groups or work on optional projects, younger children in particular then seek out any place in the school space that is at least somehow separated. They work everywhere, including corridors, changing rooms and toilets. If the children have the opportunity, for example during afternoon playgroup time, they use the school premises in a similar way during their free play. This places on the school building demands for a high degree of complexity, multiple scales of space and variable usability of all spaces. Herman Hertzberger already worked with this principle in his designs in the 1960s. In the Czech Republic, however, it does not appear very often in the designs of school buildings.

There is also a clear difference in the approach to space between younger and older pupils. While pupils aged up to about 12 years use all the possibilities of space, preferring the natural environment of school gardens and playgrounds, older pupils turn their interest away from physical space towards the social environment of school. In a simplification, we can say that they are attracted only to places where they can be together and pay minimal attention to the physical context of the environment. This finding corresponds with results of research on childhood and children's relationship to the environment [8]. The exception are spaces that allow for some real activity (real in the sense, that it goes beyond mere school exercises). A professionally furnished workshop, studio, theatre hall or music rehearsal room tend to be real inspiration for their own activity and creativity in the upper grades. One important theme that emerges here is the competence of pupils in school. Although there is much talk in pedagogy about cultivating personal competences, school is usually a place where, for various, often understandable reasons, children's competences are largely taken away from them. Here, there is room for collaboration between educators and designers (and architects) to design environments with minimum risk so that pupils can use them independently as much as possible.

CONCLUSION

A plastic picture of what is really important or decisive for the satisfaction of needs according to the Self-Determination Theory and therefore for the promotion of students' internal motivation in the physical school environment can only be obtained by comparing similar situations in different school settings. Even completely identical elements may have different meanings in the lives of pupils depending on the social conditions in a particular school community.

Five school premises with different typological structures of the built environment were identified as a minimum number of cases.

The purpose of this research is to look at the primary school environment through the lens of Self-Determination Theory with emphasis on the importance of the physical aspect of this environment. Based on the findings, it is then possible to describe the general ways in which the physical environment could be involved in promoting students' internal motivation and suggest

possibilities for further research using experiments and quantitative methods.

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