

# Interconnection between physical environment and pedagogical process in elementary schools in Niš, Serbia

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*The connection between the pedagogical process and certain spatial characteristics of elementary schools, as a designed and constructed physical environment is studied. By observing the school premises as a complex dynamic field, the starting hypothesis is that the appropriate physical environment model is derived based on the needs and activities of school children and teachers in the pedagogical process. The physical environment factors that may affect the quality of modern pedagogical process are defined by systematizing specificities of analysed categories, logic factorization and conducted questionnaire and by mapping key attitudes on the existing space of elementary schools. The factors are: the functional organization of elementary school space, its structure, size, extensibility, mobility, flexibility and (dis)continuity. Implementation of these factors in the design of elementary schools aims to create a physical environment that offers a range of transitional forms of the realization of different activities in the pedagogical process.*

**Keywords:** Elementary school, pedagogical process, physical environment, spatial characteristics.

RELEVANT studies on the interdependence of the pedagogical process and the physical environment are related to the critique of existing concepts of school facilities and suggestions for overcoming operationally immanent problems. Some researchers have studied the elements of the physical environment of schools, considering that they have a significant impact on the behaviour and development of school children<sup>1-5</sup>. The research of Moore<sup>1</sup> has confirmed that the quality of the designed space of a preschool facility, as a physical environment, has a significant impact on children's developmental results, especially on their cognitive development and social behaviour.

School physical environments can support positive development. Or, on the opposite side of the spectrum, they can contribute to increased disruptive behaviour, less positive social interaction, and increased stress levels among preschool and elementary school children<sup>6-9</sup>. A significant contribution was made by Evans<sup>10,11</sup> regarding young children's environmental attitudes and behaviours, that is, child development and the physical environment.

A special contribution to the criticism of the existing forms of the spatial organization of the environments in

which children spend their time was made by Itoh<sup>12</sup>, who studied how children's interactions with the physical environment take place and what they mean in the everyday life at school. He viewed the school as a setting for children's socio-cultural development, and studied how space works in this context. Frost and Holden<sup>13</sup> found that school children value adequately resourced spaces at school.

School children and teachers are inevitably involved in the creation of a unified 'social space' through various forms of activities in the pedagogical process. Therefore, it is necessary to consider the optimal configuration of physical environment from the perspective of teachers, and in particular, school children who are the subjects of modern pedagogical process. Thus, possible patterns of children's activities in the school area, conditioned by different levels of needs in the pedagogical process, indicate the basic models of their relationship with the immediate social and physical environment.

Additionally, the quality of the pedagogical process is determined by conditions of the physical environment of the elementary schools. Therefore, the properties of the physical environment that can support the pedagogical process were defined by the analysis of the activities and the possible behaviour of school children, both in their learning process and beyond. This article discusses the treatment of the physical environment (school building space) in the pedagogical process, with special focus on

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the context of elementary schools in the city of Niš, Republic of Serbia.

When pedagogical process and school building space are considered, the central issues are the classroom space, its immediate surroundings and organization. In this context, the main contribution of this article lies in the precise definition of functional and spatial characteristics of the classroom and its immediate surroundings, as a designed and constructed physical environment that suits the different predispositions of school children and teachers in the pedagogical process.

### Research methodology

Several methods which constantly check the scientific basis of the hypotheses have been systematically used in research. In addition, a comparative analysis has been used as a basic research method in the study and formulation of the levels of social processes during pedagogical activities, as well as their relation to the school environment.

According to Kostenius<sup>14</sup> and Bergmark<sup>15</sup> it is common for school children to feel that they are allowed to express their opinions, but that they are frequently not taken into account when decisions are made; an opinion which reflects a problem within the school system based on ethical values. Therefore it is important to turn to the children in school and ask them to share their thoughts and ideas.

In order to gain a better understanding of the shortcomings and to identify objective needs of teachers and school children regarding the organization of the environment in which the pedagogical process takes place, the questionnaire method was used. The method was used in all the 20 elementary schools located in the city of Niš in southern Serbia. They included 529 respondents, 137 teachers and staff and 392 school children.

Key positions on the deficiencies and needs of the pedagogical process and related properties of the physical environment were mapped by analysis and projection of the results of the research.

### Organizational aspects of the physical environment

The question of the organizational role in an educational setting and learning also includes the environmental variables within which pedagogical communication takes place, in addition to necessitating the proper selection of pedagogical methods and a combination of the various levels of pedagogical communication between the teacher, school children and other pedagogically shaped sources of knowledge<sup>16</sup>.

Historical examples, contradictory and inconclusive research evidence and contemporary experiences of school

settings show that the relationship between education and physical environment is complex and interactive<sup>17-22</sup>. The conceptualization of suitable environments in the school creates the conditions for the development of varied pedagogical methods, as well as the development of the school children which are supposed to lead to their significant cognitive and psycho-social achievements.

The relationship between the methods and social factors of the environment in the pedagogical process is primarily reflected in establishing diverse social forms of pedagogical work. In terms of the physical factors of the environment, it is of significant importance to determine the patterns on the basis of which the physical environment is related to the pedagogical process and how it supports the same (Figure 1).

By its architectural features, a certain ambient in which a child resides, does not represent only a response to his/her physical needs, but also has qualities which are of essential importance, primarily for the psycho-social development of the child<sup>23</sup>. The immediate physical environment can be considered to be a mediating element in the complex forms of pedagogical communication and social interaction, among the requirements of the programme contents, the teacher, the pedagogical methods and the school children.

At the very basis of each pedagogical process we can find the motivation of school children. The effectiveness of school children's social interaction usually depends on the type of socio-emotional climate that prevails in the class and the kind of group management<sup>24</sup>. Therefore, the quality of the pedagogical work of a teacher must be manifested not only in the sense of the presentation and realization of the programme contents, but also through detailed planning and development of social forms of the work of school children through adequate organization of the physical environment. The goal is to form stimulating physical conditions which would contribute to the interactional development of the pedagogical situation.

Physical settings clearly have an impact on the educational process, even though this may be mediated by the teachers' use of school space<sup>25,26</sup>. This raises questions about how teachers should be trained to perceive the environment as part of the learning process, not just as a

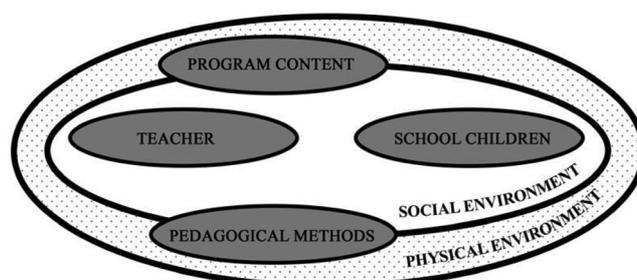


Figure 1. Relationship between various environmental factors in the pedagogical process.

secondary means – furnishing, equipment and walls. Teachers have the ability to affect a wide range of environmental qualities within their classroom such as personalization, ownership and providing space for social interaction<sup>27</sup>. Therefore, the significance of the teacher’s organizational role is emphasized through the design of learning environment, i.e. through the ability to modify the school children’s work space actively, as needed. Moreover, the teacher has a role in transforming the space into a stimulating learning environment, completely suitable for the presented teaching unit and for the teaching materials used by both the teachers and school children.

**Social processes conditioned by contextual changes**

Highly interactive relationships, which are realized among individuals in a pedagogical environment such as an elementary school, are studied from the contextual viewpoint at the level of the physical factors of the environment. The context in which these relationships are realized includes spatial predisposition of the classroom and its immediate environment as the basic architectural module of elementary schools.

Bearing in mind the variety of achievements to which they should lead, pedagogical methods and activities must themselves be numerous and diverse in terms of their aims, tasks, contents and the ways in which they are organized. In addition to any starting hypotheses, the teacher should take into consideration the age, and the accompanying developmental characteristics of the school children in order to create a compatible plan and successfully realize the pedagogical process. One of the basic responsibilities of a teacher is to unify the work method, teaching programme, developmental possibilities of the school children and the teaching ambient. Thus, in accordance with the need to develop an optimal level of motivation among school children, the teachers, complying with the selected methods, organize not only the pedagogical process, but also the environment in which it is planned and realized in a variety of ways.

Most of the relevant tenets of the modern pedagogical process require the teacher to ‘be familiar with the stimulating and dynamic value of the physical conditions under which he can work with the school children, since thanks to this type of knowledge, he can increase the suitable or mitigate the unfavourable influences which these conditions exert’ on the different models of the activities of school children<sup>28</sup>.

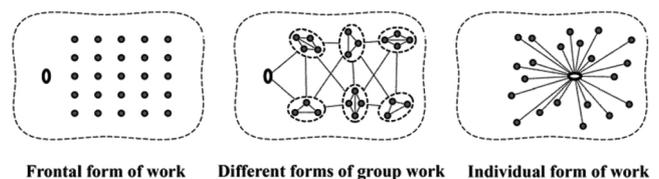
Through a comparative analysis of the pedagogical processes in certain countries, the most frequent deviations in terms of the use of the physical environment can be seen in the individual and group work of school children, which is a consequence of different patterns of the peda-

gogical practice, primarily conditioned by the cultural determinants and the continuity of development of the social-pedagogical concepts of a certain environment. According to the study carried out by Itoh<sup>12</sup>, in elementary schools in Japan, the concept of education is more progressive, nearly half of the school time is spent on individual or group work, while at the same time school children have the possibility to choose where they want to work.

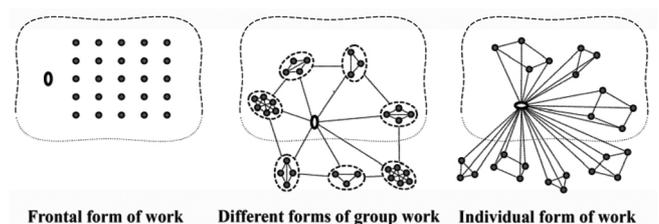
The importance of contextual changes is directly related to the context in which the pedagogical process takes place, that is, with the optimal adjustment of certain elements of the physical ambience of the future pedagogical situation. The structures of the relationship between the pedagogically formed social environment and the physical environment can be diverse, and, first and foremost, contextually operationalized through a functional (Figure 2) or suggestive approach (Figure 3) in the pedagogical process.

The functional approach includes a pedagogical process in which various levels of differentiation in the social environment can be established, where the relationship with the physical environment is based on the practical needs of the teacher and the school children as part of the completion of the assigned activities. Thus, the immediate physical environment is primarily in the function of pedagogical activities. The possible contextual changes take place within the primary physical surrounding – the classroom (Figure 2). However, if the pedagogical situation is such that more space is needed for the execution of a task, the activities of the school children can also take place outside the domain of the classroom (Figure 3).

A suggestive approach requires a higher level of contextual change that emphasizes the significance and the role of the physical environment in the pedagogical



**Figure 2.** Scheme of the classrooms in floor plan – the functional approach in the pedagogical process.



**Figure 3.** Scheme of the classrooms in floor plan – the suggestive approach in the pedagogical process.

process. By means of the physical environment, a message is transferred to the school children in terms of the pedagogical activities and the social form of work.

The international changes in the certain part of the structure of the physical environment should directly indicate a change in the activity. By allowing them to choose a space of their own, the teacher suggests to the school children to complete tasks in various social forms, where group or individual activities allow the child to choose his/her workplace.

The possibility of a differentiation in the pedagogical activities includes both the social and physical environment. Contextual changes, in which certain activities of the school children take place, also include the levels outside of the spatial frame of the primary unit – the classroom. At the same time, during their work, school children can differ from one another based on their position in the physical environment and the acquired experience in relation to the environment, but not necessarily in terms of the tasks themselves.

Therefore, the contemporary pedagogical process is based on the interweaving of various social processes and different forms of activities (group, team, partnership, individual and individualized). As pointed out by the psychologist Havelka<sup>29</sup>, ‘these activities are taking place in a few lines, in several workplaces, and the outcomes are integrating into a unique individual or collective group production’ – individual or group reports, concrete results, additional interpretation, additional reports and final discussions. Thereby, an analysis of possible approaches especially emphasizes the possibility of flexibility, extension, continuity/discontinuity of the physical environment in order to develop and connect different levels of pedagogical activities of teachers and school children, independent of the degree of their formalization or spontaneity.

### Perceptions of teachers and school children

In order to capture the objective needs of the teachers and school children with respect to the organization of their physical environment within the current conditions of elementary school education, a survey was carried out in all the 20 elementary schools located in the city of Niš (Figure 4) and (Table 1). The survey included 529 participants, 137 of whom were teachers and their aides, and 392 school children aged 6 to 11 years. According to the 2011 census, the urban area of Niš has a population of 187,544. There are about 17,000 school children aged 6 to 14 years in the urban area of the city of Niš<sup>30</sup>.

In order to ensure the validity of the questionnaire, prior to conducting the final survey, preliminary, pilot questionnaires were distributed out in order to determine the precise meaning and extent of the questions for the teachers and school children separately.

Some of the questions were open-ended, and some were ‘yes’ or ‘no’ questions.

The questionnaire included the organizational aspects of the classroom and its environment as the basic module of a school space. Both groups of participants could, based on the preferred material, answer the following questions: In your opinion, what is your classroom lacking?; Is the size of your classroom appropriate?; In your opinion, what is your classroom environment lacking?; In your opinion, are there any possibilities for the flexible use of the school space?; In your opinion, are the spatial differentiations of the activities of the school children possible?

### Shortcomings of the classrooms

In terms of the size of the classroom, 20.7% of the teachers and 26.1% of the school children stated that, in the existing circumstances, more free space is necessary.

The general opinion that this part of the school space lacks more modern furniture was supported to a great extent in the answers of both the teachers (48.3%) and school children (43.5%). Thus, approximately the same percentage of teachers (17.2) and school children (17.4) thought that each classroom lacked at least one computer with the accompanying equipment.

Even though the answer was not offered, approximately 10.7% of the surveyed school children listed (by adding it themselves) ‘the distribution of the seats’ as one of the shortcomings of their classrooms. Also, 13.8% of the teachers and their aides, and 13% of the school children stated that this part of the school environment did not have any shortcomings (Figure 5).

### Size of the classrooms

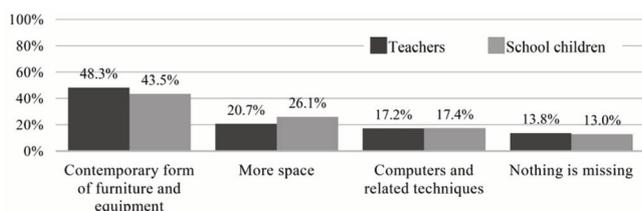
In their responses, both groups of participants (79.5% of the teachers and their teacher’s aides, and 67.6% of the school children) gave a positive evaluation of the existing



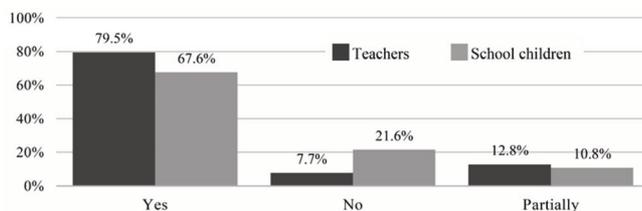
Figure 4. Elementary schools in urban areas in the city of Niš.

**Table 1.** Existing funds of elementary schools in the urban area of the city of Niš

Elementary school	Year of construction	Year of upgrading	Total number of school children	Classroom area (sq. m)
Vozd Karadjordje	1889	1937	775	45–58
Radoje Domanovic	1932	1960, 1978	988	45–49
Kralj Petar I	1933	–	931	60
Ucitelj Tasa	1935	–	929	60
Njegos	1955	1973	610	54
Ratko Vukicevic	1958	1968	890	54
Cegar	1959	1971	825	54–56
Vuk Karadzic	1960	–	446	54
Car Konstantin	1962	1976	782	65
Dositej Obradovic	1962	In phases	631	53–54
Branko Miljkovic	1965	1972	1224	52–56
Cele Kula	1966	1975, 1976	707	57–59
Bubanjski heroji	1972	–	889	54
Stefan Nemanja	1973	–	1092	54
Ivo Andric	1974	–	1026	53–54
Kole Rasic	1977	In phases	762	54
Sveti Sava	1980	In phases	1024	53–54
Sreten Mladenovic	1982	1989, 1998	406	55
Dusan Radovic	1987	2004	1305	54–58
Miroslav Antic	1983	2006	1217	47–48



**Figure 5.** Shortcomings of the classrooms.



**Figure 6.** Opinion of teachers and school children regarding the size of the classroom.

size of their classrooms to a great extent. A similar number of teachers and their aides (12.8%), and school children (10.8%) selected the ‘partially’ response.

Relative deviations could be found in the ‘no’, response, where in comparison to the responses of the teachers (7.7%), a greater number of school children (21.6%) stated that the classrooms they spend their time in were not big enough (Figure 6).

It is important to point out the experience regarding the internal organization of the classroom space. The responses of the greatest number of the participants represent a projection of the space which is suited to the frontal form of work. Thus, what remains is the question of the kind of data that could have been obtained, had the

experience, primarily of the school children, been expanded to include other forms of organization of the classroom space (space organized for the needs of various social forms of work, such as group, team or combined forms of work).

*The classroom environment*

The questions regarding classroom environment allowed for multiple responses. The teachers and their aides in their responses (76.1%) paid special attention to the lack of preparatory rooms, since they objectively represent a shortcoming of many elementary schools.

Unlike the teacher’s aides (34.8%), the school children (68.9%) emphasized the lack of space in the hallways. This representation of the school children can be viewed both as the kind of need for space which is primarily meant for socializing/leisure activities and which can suit various forms of the social predispositions of the children.

It is a fact that elementary schools included in the analysis do not contain open/summer classrooms. The need for this was noted among 47.7% of the teachers and their aides and 53.3% of the school children (Figure 7). The responses of the teachers can be explained to a somewhat lesser extent by their representation that it is meant for younger school children and that there is no need for it at all in the educational environment.

*Flexibility of a school environment*

Only a small number of the teachers included in the survey (15.8%) stated that there were possibilities for a more

flexible use of the school's environment. The figure of 78.9% of those who did not indicate the possibility of flexibility additionally confirms the fact that the dominant part of the existing elementary school funds has been adjusted exclusively to the traditional forms of curricular activities.

Similar to the teacher's aides, most of the school children (58.9%) stated that there was no possibility for any changes and adjustments in the space to fit the various requirements of the pedagogical process. Only 18.4% of the school children were convinced that school space can be used flexibly (Figure 8). These opinions of the school children confirm the need for the organization of a changing environment that would accommodate both studying and spending, time and the structure of which must be suited to the level of development of the school children. The attitudes of the school children regarding any possible changes in the structure of the physical environment are certainly partly dependent on the perception of their potential role in the complex of the social environment.

*Possibility of the spatial differentiation of the activities of school children*

The claim that there is a possibility of the spatial differentiation of the activities of school children was supported by 17.3% of the teachers and 6.9% of the school children. Usually these answers included activities at the level of the space of the classroom. About 37.9% of the surveyed teachers and 17.2% of the school children stated that it is very small due to the lack of space in schools. Both school children (75.9%) as well as teachers (44.8%) mostly gave a negative answer to this question (Figure 9).

It follows that most of the surveyed teachers consider the current elementary schools to partially meet the

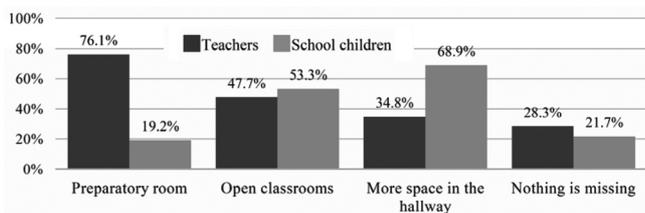


Figure 7. Shortcomings of the classroom environment.

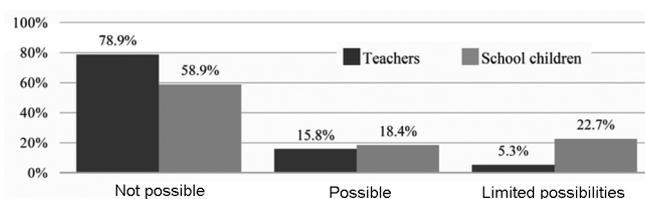


Figure 8. Opinion of teachers and school children regarding the possibilities of the flexible use of the school environment.

requirements of the conditions both in terms of function and the use of space for realization of certain programme contents. The spatial differentiation of the curricular activities is possible somewhat in the very classroom space, but not in its immediate environment. It is difficult to recognize the spaces or parts of the spaces which are meant for individual or group activities of school children or which could contribute, in their organizational form, to the level of social interaction in the pedagogical process.

**Concluding remarks**

Contemporary pedagogical process assumes that teachers and school children in elementary schools function within an environment which provides the implementation of various pedagogical methods and related with that the formation of branched structure of pedagogical activities of school children. Thus, the different levels of pedagogical communication between the teachers and school children, as well as their position in different social levels of activity, equally include the physical environment in which the pedagogical process is realized.

The properties of the physical environment were systemized through the analysis of social processes in terms of possible contextual changes during pedagogical activities. The questionnaire method used in elementary schools in the city of Niš, Serbia, contributed to a more complete registering of the objective needs of teachers and school children related to the organization of the physical environment. The questionnaire results demonstrate that the considered spatial characteristics of existing elementary schools do not correspond to the requirements of the contemporary pedagogical process. By projection of the results of the conducted research it is possible to map key positions on the needs of school children and teachers when it comes to the organization of the physical environment in the pedagogical process.

The results of the present study further reveal additional questions regarding the modes of organization of the physical environment, primarily the classroom and its immediate environment. Furthermore, the following elements should be emphasized: the concept of function, structure and size of the space; the level of flexibility and layout of mobile elements in space; the possibilities for

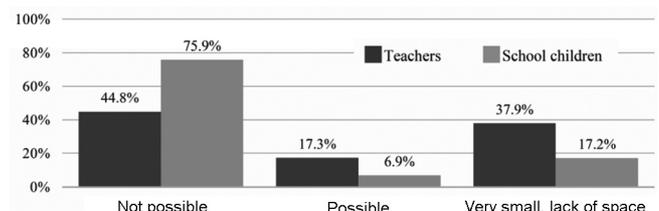


Figure 9. Possibility of the spatial differentiation of the activities of school children.

extensions of classroom space in order to differentiate activities of school children; and, last but not least, the question of continuity/discontinuity of physical flow depending on the current needs of the participants of the pedagogical process.

In the design process of elementary schools, proper implementation of the following characteristics would be directed towards the creation of a 'multidisciplinary' physical environment, where it could be possible to accomplish conceived development and connection of different levels of pedagogical activities.

Therefore, the specific influential factors affecting the model of organization of the physical environment in elementary schools can provide a range of transitional forms in the implementation of various activities in the pedagogical process.

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ACKNOWLEDGEMENTS. This paper is realized within the national scientific projects at the University of Niš, financed by the Ministry of Science and Technological Development of the Republic of Serbia 2011–2014: 'Revitalization of preschool facilities in Serbia – The program and methods of environmental, functional, and energy efficiency improvement' No. 036045.

Received 7 April 2014; accepted 20 January 2015