

The spatial model of the classroom and its immediate surroundings: a variety of learning spaces

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This paper looks into the spatial dispositions of the classroom and its immediate surroundings in elementary schools, with the goal of defining a broad learning space, in accordance with modern intentions in pedagogy. The starting assumption is that the learning space may offer versatility and a variety of options in the educational process. In the development of the spatial model two key contributing factors have been taken into account: the implications of the modern educational process and potential spatial characteristics. Various levels of spatial interrelationship are considered between the classroom and the adjacent classroom, the break-out space, communication area, social activity zones, and the outdoor classroom. Accordingly, by using the modelling method, a conceptual spatial model of the classroom and its immediate surroundings is defined such that it can receive specific applications in the design of elementary schools.

Keywords: Activities, classroom, learning space, students, teaching and learning.

ELEMENTARY school design, and thus the design of the classroom as its principal learning area, can not only be viewed solely as a strictly defined environment, but also as an environment that may be adapted to new needs and changes, to complex and sometimes conflicting requirements of the teaching and learning process. Some authors point to the fact that educational objectives and practices have fundamentally changed from the teacher-centred 20th century factory model and therefore learning spaces must address the educational needs of learners in the 21st century¹⁻³. Today teaching methods have changed, but, often, the design of the classroom has remained static⁴.

Modern pedagogical trends to create forms of organization that would provide the possibility of full development to every student require that one should distance oneself from the rigid school plan and from traditional models of organization. Accordingly, the spatial configuration of classrooms should contribute to the preconditions for continuous improvement of the teaching process and development of the student's versatile and yet coherent personality; along the way, this should ensure a proper environment offering numerous options for various student activities, i.e. options to implement various activities in various ways.

This study supports past findings that the physical environment can significantly contribute to the development and social behaviour of students⁵⁻¹⁴. These findings are particularly important for considering the specific nature not only of learning spaces, but also of the spatial configuration that is appropriate for various social dispositions of students.

An important contribution to the treatment of classroom surroundings has been given by the well-known Dutch architect Hertzberger in his projects. He points out the following: 'In my spatial concepts, therefore, I am particularly concerned with the zones outside the classrooms. Through greater openness spatially, I ensure that corridors are not just circulation routes. In the Apollo School in Amsterdam, for example, many activities take place outside the classrooms just as within them'¹⁵. Having studied the attitudes of teachers on the design of their elementary schools, Barrett and Zhang¹⁶ noted that the size and shape of classrooms are very important to teachers. Bigger classrooms are desired, but just as important is the flexibility of the physical layout, optimally through the availability of alternative spaces immediately outside the core classroom. The importance of classroom surroundings has also been stressed by a study which analysed the relationship between spatial configuration and distribution of children during free time in three Japanese elementary schools. It was found that children in the lower grades tend to stay in small areas near the classrooms and few of them stayed at distant locations. On the other hand, children in the higher grades stayed everywhere in

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the school building, mainly around classrooms and the playground¹⁷. Frost and Holden¹⁸ found that school children value adequately resourced spaces at school.

If one intends to design a modern model, which avoids the institutional feel of many school buildings and which is primarily directed at comprehensive student development, then one needs to start conceptualizing an open, elastic, and ramified curriculum of teaching and learning activities. The spatial rank of the classroom, as the central learning unit, and of its immediate surroundings is defined by the projection of activity so defined. The starting assumption is that the learning spaces that are created can offer versatility and options in the educational process.

In a functional range of classrooms, the relationship between the functions of space and teaching and learning activities is very important. It not only represents the primary defining factor on individual levels (the classroom space), but also needs to be complementary to a different extent on broader spatial planes (classroom surroundings).

The study framework

It is a fact that a large number of studies have explored the topic of classroom space and learning environment. However, results of those studies have not been fully implemented. Most present-day spatial models of the classroom and its surroundings are still based on traditional closed cellular structures.

The aim of this study is to conceptually form a spatial model of the classroom and its immediate surroundings which may receive specific applications in practice. The spatial model is not only based on the synthesis of results of previous studies by the present authors, but also on the not less important or relevant studies of other authors who have established a strong link between theory and practice in this domain. In accordance with this, two key contributing factors have been used in the development of our spatial model: (i) implications of the modern educational process, and (ii) potential spatial characteristics:

(i) Implications of the modern educational process pertain to the multitude of activities involving the teaching and learning process, in relation to various social forms and a range of different groupings, such as whole classes, mixed classes, small groups, and individual study; they also have to do with individual levels of contextual changes during the teaching and learning process, as well as the possible patterns of social behavior and needs of students during their free time and informal activities¹⁹⁻²⁵.

(ii) Potential spatial characteristics encompass the concepts of function, structure, and size of the learning space; they also include the level of flexibility and layout of particular mobile elements in the space; the potential to extend the classroom space in terms of grouping or dif-

ferentiation of student activities; and in that sense the question of continuity or discontinuity of the spatial flow, depending on the current needs of participants in the educational process¹⁹.

By projecting the contributing factors listed above and by using the modelling method, specific locations in the space have been determined. The full set of these locations in space, defined by varying types of their interrelations, defines the spatial and functional volume of the classroom and its immediate surroundings.

The classroom

Given the function of the set goals – to ensure the potential for versatile development for every student, the classroom represents the main working space and a specific measure for defining and dimensioning other spaces in the school building. In contrast to the traditional classroom with a closed cellular structure, the modern classroom has to be an efficient ‘means’ that will continuously accompany the changes and needs of the educational process, and simultaneously support the implementation of various forms of teaching and learning.

The way in which the classroom is spatially organized and equipped is a key factor that can contribute to the success and quality of interactions in the educational process. The classroom space should be large enough so that it can be configured to accommodate a number of learning activities²⁵. In optimal conditions, the furniture should be mobile, and the equipment easily portable (including its proper storage). This would provide an opportunity to regroup and shape various spaces for individual and group work with students. In that sense, the mobility of the furniture and equipment is of specific importance since it allows more freedom in the use of space, on occasions in which this is necessary^{15,20,26-28}.

Given the implications of modern educational methods, the classroom can be divided into two integrally related zones:

- the flexible work space, and
- the specialized zone – internal specialized space (Figure 1).

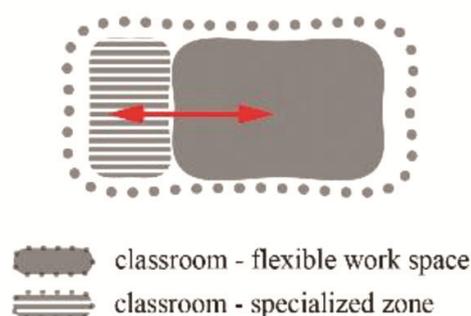


Figure 1. Two zones in the singular classroom space.

The need to work with students in procedures based on pedagogical and didactic doctrines, especially in lower grades of the elementary school, requires a greater flexibility of the working space so that, through quick changes and rearrangements of the furniture and equipment, various types of activities can be implemented.

The flexibility of the classroom entails the organization of space in such a way that this space should be adaptable to various learning activities (Figure 2). The organizational model of the working space must allow various educational activities (teacher-directed instruction, individual study, small groups, large groups, presentations, one-on-one instruction, as well as discussions among students and teachers)²⁵ which can progress in several lines or at several activity locations, and it must also allow combined forms of activities as a result of very specific educational situations^{19,29}. In addition, in terms of its organization, the classroom must adequately respond to the needs of free, informal student activities.

To go beyond the limits of the traditional concept of classroom space, small but inventive organizational interventions are sometimes required. Hence, for instance, Itoh stresses that in a project called ‘Classroom of the Future’, a classroom was created with separate corners each with a small blackboard instead of having all seats face one blackboard in the front. The space symbolically dissolved the traditional teacher-pupil structure and at the same time functioned well for group work³⁰.

In the organizational context of the classroom, we give great priority to modern technical tools and to technology in general, since they replace and advance the use of various earlier teaching aids. With the fact in mind that, given the advancement of technology, various didactic means and technical devices require less and less space, one notices the tendency to richly equip classroom space with such aids. Computer technologies and modern audio-visual equipment are an important, constituent part of the classroom of today as they are objectively needed for daily student activities³¹⁻³⁴. Within each classroom workspace is need for computers, where students can

browse the school databases, access the internet, and use applicable interactive LCD projectors.

From the perspective of the current phase of development, not only that of present-day, but also future technological advancement, it is fully justified to plan the introduction of additional, specialized space in the functional makeup of the classroom. As an integral part of the classroom, the specialized zone represents space in which various student groups can focus on the acquisition of particular skills or familiarization with particular contents. In other words, this zone facilitates specific types of practical activities and some forms of experimental work in natural sciences.

The environmental and functional characteristics of the classroom should be viewed as a specific element of mediation in various types of teaching and learning activities. In addition, implications of possible contextual changes, especially in the spatial plane of the classroom, may also be considered from the viewpoint of formal and informal educational student activities, against the spatial dispositions of the immediate surroundings^{19,22}.

The spatial relationship of the classroom with its immediate surroundings

The highly interactive relationship occurring between the teacher and students in the educational process may be observed from the viewpoint of contextuality caused by various environmental factors. The contextuality in which these relations are reflected, as conditioned by the implementation of various educational methods, includes the spatial dispositions of the classroom and its immediate surroundings¹⁹.

Modern pedagogy requires that in addition to frontal instruction, other forms of teaching and learning are also used and have a significant impact on redefining the classic classroom space and its relationship with the immediate surroundings. The possibility to gradually alternate between or introduce a parallel use of individual activities, tandem activities, the activities of small, medium, and big groups of students directly requires that the classroom space should be designed as a variable zone, which can also be integrally connected to its surrounding areas, if need be. Therefore, spatial integration of complementary functions is not just a result of the need to implement one activity. Rather, it is an important precondition for the simultaneous progress of a number of different forms of teaching and learning.

In terms of the possibility to spatially connect classrooms among themselves, and classrooms with its supplementary functions, one finds spatial relationships with:

- adjacent classrooms
- break-out space

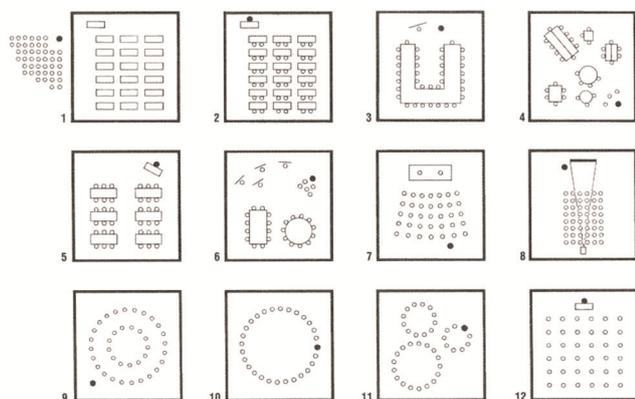


Figure 2. Examples of internal principal classroom organization⁴³.

- communication area
- social activity zone
- outdoor classroom (Figure 3).

In the pedagogically functional and modern classroom spatial model, the contextuality of these relationships and the spatial range in which they operate may to a great extent define the quality of student environment.

Relationship with adjacent classrooms

The relationship with adjacent classrooms is viewed from the aspect of the use of organizational models in the modern educational process, which enable activities of students and teachers in big groups (two or more classes) or combined activities of several groups of students from different classes. In that context, a modification of the structure, form and size of individual teaching and learning spaces should be possible.

Occasional interconnection of classrooms into a unified space is particularly important when one has in mind the preconditions for working with large groups of students, i.e. the development of interclass cooperation and fostering of social behaviour of students from two or more classes (Figure 4). A minimum requirement for this to be implemented implies mounting removable wall panels, or larger doors or mobile furniture so that the space can be put together or divided, in the borderline area between the two classes²⁷. Generally, one needs to carefully define the furniture and equipment in every classroom, by the specific type of activities and in accordance with the variable solutions for the space.

By activating mobile wall panels in the borderline area, a pair of classrooms of optimal dimensions can open up to one another (Figure 5). This creates preconditions for implementing various forms of teaching and learning with a big group of students (two or three classes). In that respect, Dudek specifically emphasizes the following: ‘With the easy variation of the partitioning between the classrooms, spatial transformation can be achieved with ease to host different group sizes²⁸.’ Furniture and equipment in classrooms so conceived should be designed as a

constituent part of classrooms, but also with the full space in mind, in situations when the spaces of the two classrooms are interconnected and make up a unified whole.

The possibility to choose among various forms of inter-linking classroom spaces opens up a philosophical and an operative question. If the classroom model has an adaptable form, and is based on mobile furniture partitioning the classrooms, the probability is higher that the two classrooms will function as a larger spatial whole, i.e. that they will be used for the joint activities of teachers and two or more student classes³⁵. Since there is a need to develop team spirit and cooperation among the students, strict acoustic measures are not necessary. In case of loud activities, interventions would imply the use of materials that can properly absorb sound. In certain pedagogical situations, when we try to develop student ability to work individually or in smaller groups, the setting up of screens preventing visual contact may be even more important than the prevention of auditory contact.

In elementary schools in which traditional teaching and learning methods prevail, and which also include the pedagogical concept of team work of students, numerous teachers, would prefer the model in which classrooms are interlinked by means of a mobile panel³⁵. The model of spatially independent classrooms, in which there is still some possibility for cooperation between the classes, can also contribute to the implementation of various activities in the teaching and learning process.

Pedagogical concepts of joint work of larger groups of students in a classroom block should be supported by

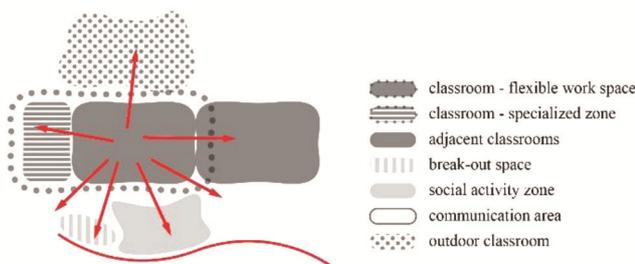


Figure 3. Conceptual spatial model of the classroom and its immediate surroundings.

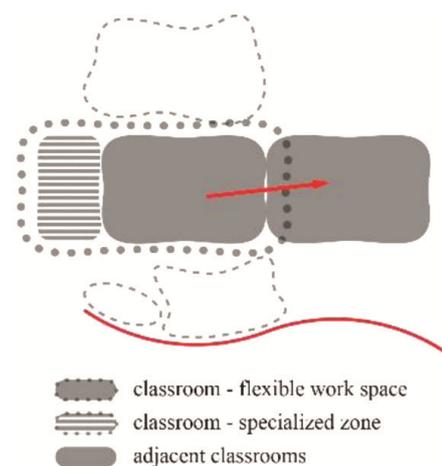


Figure 4. The adjacent classroom immediately surrounding the classroom.



Figure 5. Possible ways to separate and interlink classrooms into a unified space⁴⁴.

enhanced flexible solutions for these spaces. In addition to the mobility of panels, furniture, and equipment, in order to spatially connect various classes, and in line with present-day views of education, solutions are needed that would include certain areas of immediate surroundings into the classroom system.

Relationship with break-out space

Current pedagogical practice is specific in many ways. Among other things, it also provides an opportunity for spatial differentiation in the teaching and learning process.

In terms of its function and position, break-out space complements the functions of the classroom²⁸, thereby providing numerous opportunities for good quality organization of students' free time (Figure 6). Various forms of teaching and learning that can be implemented in this teaching unit are activities for teams, groups, one-on-one work, individual or individualized forms of student involvement²⁰.

In addition to developing various forms of educational activities, it is important to ensure that extracurricular and free activities may also be planned, as they are equally important for versatile student development. Therefore, on the spatial and functional levels of the classroom, one needs to adequately respond to the growing demand for free student activities, especially in terms of various student organizations, groups receiving voluntary extra instruction, the school radio, stay in the building outside of regular teaching hours, etc.

Depending on the way in which particular teaching and learning activities are implemented, especially in situations in which group and individual work with students are in question, this area's spatial relationship with the classroom may vary (Figure 7)³⁶.

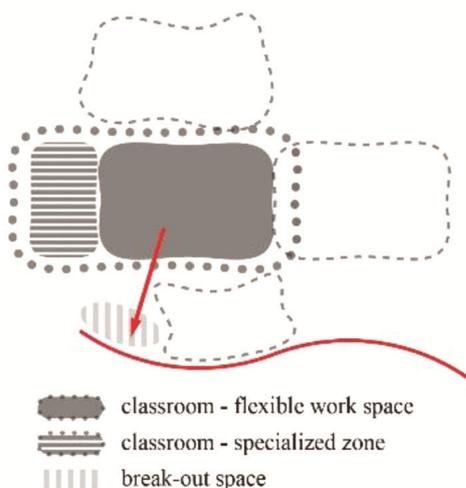


Figure 6. Break-out space as an immediate classroom surrounding.

If this space is separated from the direction in which the classroom extends, better ways are available to inter-link the two spaces. An advantage of this concept lies in the classroom's open orientation toward the communication area or broader space of access, wherein one of its parts, the break-out space, may function as a point for conducting the teaching process with a larger group of students, depending on the way in which the classrooms are grouped with all students. The design variant in which this space is separated in particular justifies the establishment of a specialized learning zone in the classroom, where smaller or bigger student groups alike may focus on more specific elements from the syllabus, and master practical actions and skills.

Relationship with the communication area

As the primary function of classrooms is defined by activities of larger student groups (classes), communication areas, i.e. corridors and other accompanying microspaces may be turned into zones that equally function as learning spaces, in which individual or small-group activities could be implemented, yet in a different environment (Figure 8). Considering the importance of communication areas, Dudek points out that it is a critical dimension

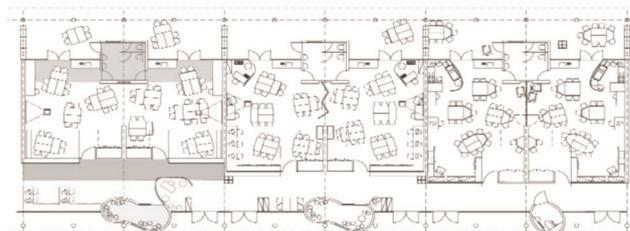


Figure 7. Forming combined spaces for smaller groups and for individual student activities, Temple Primary School, England, 2004, Architects: Cottrell + Vermeulen Architecture⁴⁴.

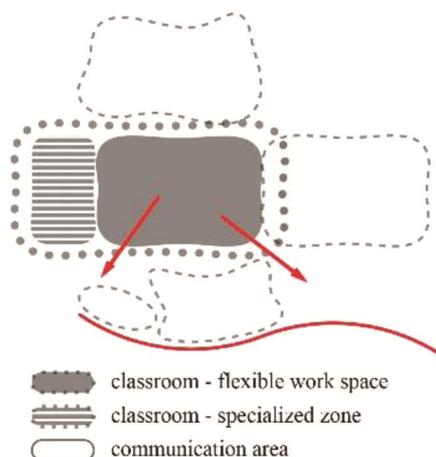


Figure 8. Access communication zone as a direct surrounding of the classroom.



Figure 9. A possibility for student activities in some parts of the corridor, Paschalis school (elementary school and child daycare), The Hague, Netherlands, 2004, Architects: Atelier PRO Architects⁴⁵.

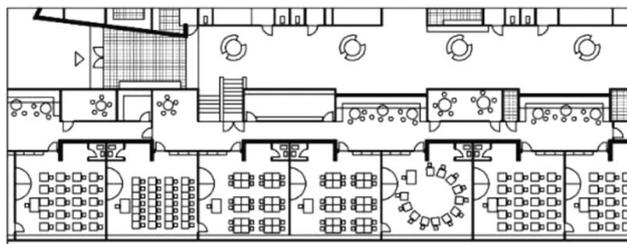
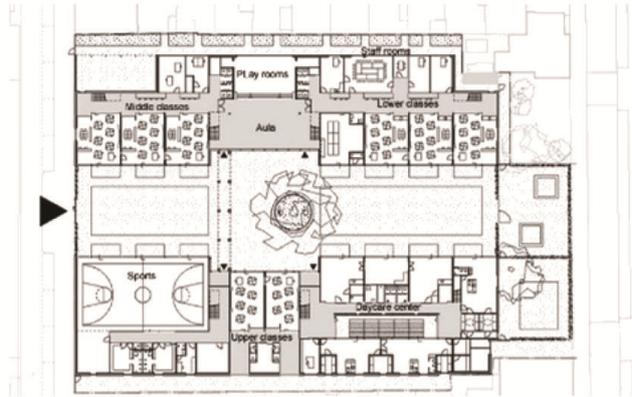


Figure 10. In addition to their basic purpose, communication areas may also be used as the space for various curricular and extracurricular activities, Engjaskoli District Primary School, Reykjavik, Iceland, 1997, Architects: Uti Og Inni, architects⁴⁶.

where good design can make a real difference to spatial quality²⁸.

By incorporating part of the communication area into the system of classrooms, one may introduce additional pedagogically and sociologically relevant materials into student activities. ‘The corridor is the school’s thoroughfare. But shouldn’t it be a pleasant avenue, not a forbidding tunnel? Physically, the corridor is a space for people moving from room to room. Psychologically, it can be a place for refreshment of the mind, for unwinding and relaxation and for pleasant socializing³⁷.

In addition to their basic purpose – to ensure access to particular rooms and interlink with particular parts of the building, and in accordance with the principles of differentiated teaching, communication areas may have other functions, as well: various types of individual and group work (Figure 9), free student activities, rest and recreation for students during breaks, presentation of student papers and other work, food distribution and meals³⁸.

In schools designed in such a way that longer corridors were necessary due to the big capacity of the school, one often does not resort to extension of the area throughout the length of the corridor, but rather organizes work areas in the form of smaller or bigger expansions – corridor

niches³⁹ (Figure 10). In other parts of the corridor, shelves and showcases may be installed, containing various teaching tools and instructive objects, visibly displayed for the students. They can significantly contribute to the supportive and lively educational environment. Organizing communication areas in such a way that they should be used least of all only for the physical movement of students requires that these areas should be integrally connected with the premises they lead to, in this case, classrooms. This can in turn significantly contribute to their more flexible spatial configuration. At the same time, these segments of space may be combined with the classroom by means of various solutions, thus providing the ‘extra space’ for formal and informal educational activities³⁸.

Therefore, communication areas should not be viewed only as linear corridors for accessing the classrooms. Rather, they are an important segment of the school’s spatial structure, which may significantly contribute to the development and implementation of various educational and social student activities. Depending on the pedagogical concept, if there is a need for student activities in the immediate vicinity of the classroom, in the project one should envision an adequate expansion of parts of the communication area so as to ensure that this part of the building would have additional throughput. In any event, if the communication area is significantly expanded, this may help form new areas in which a variety of contextual changes in the educational process will be possible.

Relationship with the social activity zone

In finding the optimal levels of productivity of individuals in the educational process, one needs to have in mind that dynamic interaction of students with their social and physical environment is one of the most important conditions for high achievements in education and development.

Each activity in the school area is conducted with an aim to satisfy a formal or informal need. From the organization of educational process, a series of teacher and student needs emerges, related, among others, to the definition of various teaching and learning forms in particular parts of the school area. Simultaneously, during free student activities, much more flexible patterns of student behavior may be formed²².

The range of possible educational student activities is not defined only by the curriculum and syllabus, but also, to a large extent, by the undefined or lesser defined needs of student social life outside of the teaching process, i.e. during their free time.

The option to concentrate a number of activities in particular spaces surrounding the classroom (Figure 11) may encourage the students to find their own identity, to identify with certain elements of their social and physical environment, and ultimately to feel that they belong to the school.

The social activity zone, belonging to one particular classroom, primarily represents the central spot for gathering and social involvement of students from one or more classes. Along the way, this does not exclude the option to conduct full educational activities here, if the need for a contextual change arises¹⁹. In fact, as an expansion of the classroom area, the social activity zone may provide for various forms of teaching and learning (whole classes, mixed classes, small groups, and individual study) in a different context. By opening up the classroom and by interlinking it with the social activity zone, one creates a single continuous learning landscape²⁷.

The incorporation of the social activity zone into the spatial concept of classrooms not only contributes to the total flexibility of the learning space, but also provides organic integration for the microspaces, as expected in a modern educational environment with pronounced social functions.

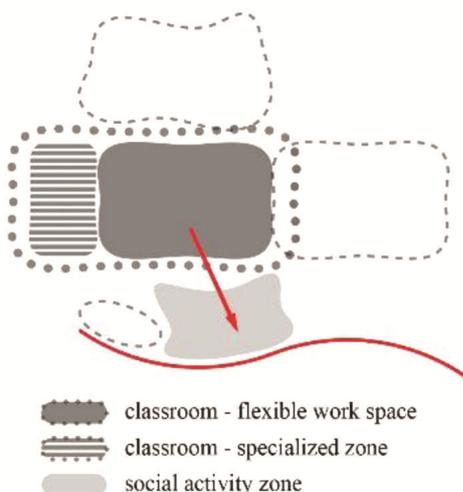


Figure 11. The social activity zone immediately surrounding the classroom.

Relationship with the outdoor classroom

Full spatial transparency of the classroom volume is achieved, among other means, by its opening up to the outdoor area, mostly in the ground floor of the school building, i.e. by its interlinking with the natural surroundings^{40,41} (Figure 12). Some authors emphasize the need for the conceptualization of the outdoor classroom and school ground as sites of ecological, pedagogical, and social transformation, in terms of pedagogical and learning theory⁴².

Outdoor classroom is formed in the open space of the school grounds, and is directly spatially connected to the applicable classroom in the school building (Figure 13).

In addition to various forms of teaching and learning in the open space, these facilities are used to organize versatile activities for students' free time, while simultaneously providing close visual connection with green areas.

Application forms of the spatial model of the classroom and its immediate surroundings

In accordance with points presented above, one recognizes that there is a need to form an entire complex of variable social zones, intended for various teaching and learning activities, in both internal and external spatial classroom planes.

The application forms of the spatial model of the classroom and its immediate surroundings have been conceptualized in such a way as to enable a whole array of transitional forms for the implementation of various teaching and learning activities (Figure 14).

To present the options for forming various spatial configurations, and the broad versatility of the learning space, the spatial model of one classroom and its immediate surroundings has been multiplied (Figure 15).

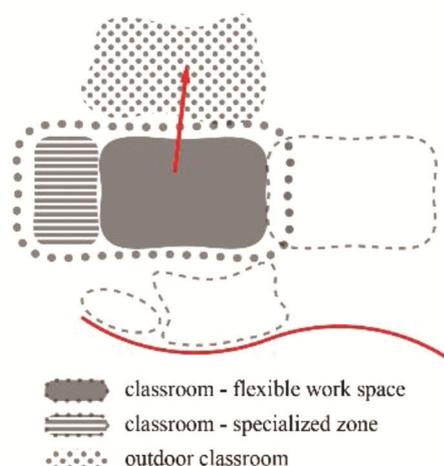


Figure 12. Open-area activity space as a direct classroom surrounding.

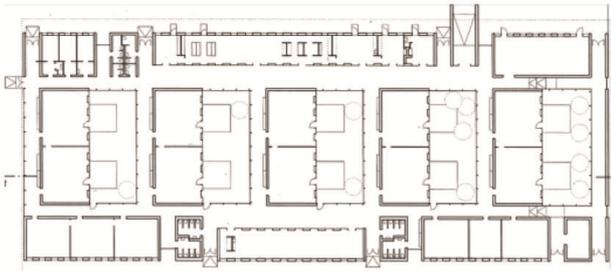


Figure 13. Outdoor classroom located directly adjacent to the classroom in the school building, Grundschule, Vienna, Austria, 2001, Architect: Helmut Wimmer⁴⁷.

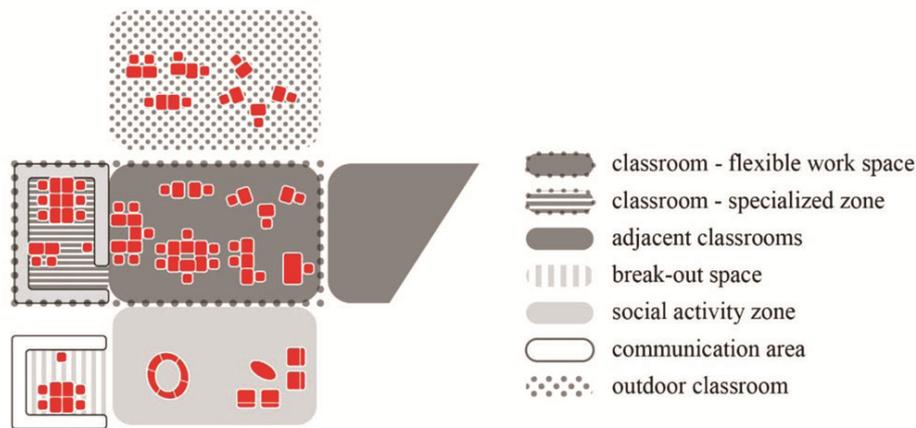


Figure 14. The spatial model of the classroom and its immediate surroundings.

Various spatial configurations of the model have been defined based on the position of the flexible work spaces and the specialized zones within the classroom and between classrooms.

Based on the implications of the modern educational process, individual functions of the learning space have been defined such that they can be used to implement a broad spectrum of teacher and student activities, including various forms of grouping and differentiation of activities.

Starting from the classroom as the main learning space, the structure and size of surrounding spaces have been adapted to specific activity types, required due to possible contextual changes and objective needs of the educational process.

Given the various ways in which they may be interlinked, the entire spatial flow of the classroom and its immediate surroundings may be designed in different ways. In this process, particularly relevant to the development of the spatial model is the option to expand the classroom area toward its immediate vicinity, as an important element for contextual change, and the adequate levels of continuity and discontinuity of the spatial flow.

The introduction of these two important factors aims at better flexibility and mobility of the learning space.

Conclusion

Designing an extroverted spatial classroom configuration, which functionally unifies zones intended for various student and teacher activities, and offers various contents so as to spatially fulfill the modern educational process, represents an important segment in conceptualizing modern learning environment.

There were two key factors influencing the development of the spatial model of the classroom and its immediate surroundings: implications of the modern educational process and potential spatial characteristics. The findings provide important guidance for designing the classroom and its immediate surroundings.

Various models of interlinking the classroom and the adjacent classroom, the break-out space, communication area, social activity zones and the outdoor classroom confirm that there is a possibility to form a broad spectrum of learning spaces.

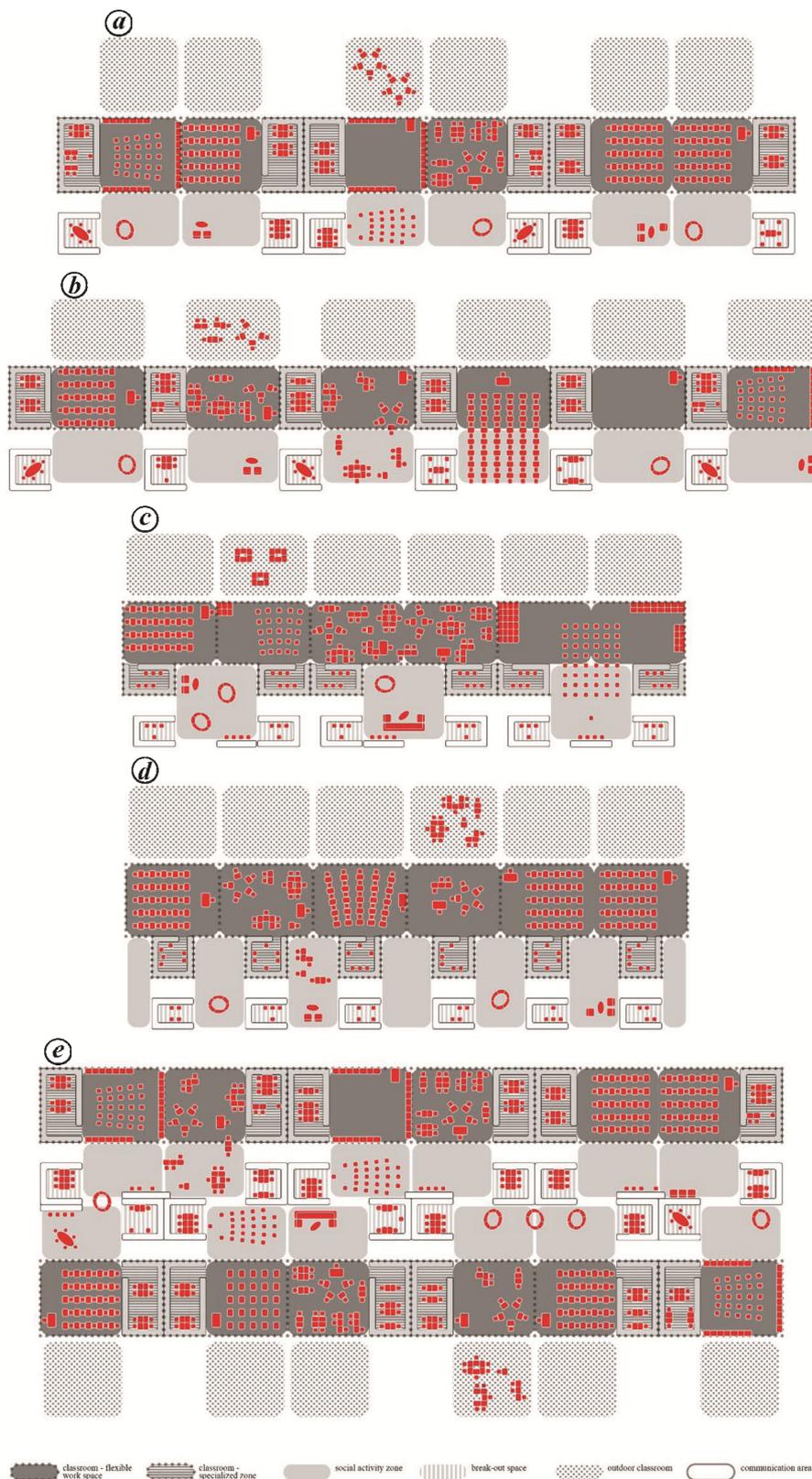


Figure 15. Variable spatial configurations of the model of the classroom and its immediate surroundings. *a*, flexible work spaces paired and specialized zones paired, all in the same strip; *b*, individual flexible work spaces and individual specialized zones, all in the same strip; *c*, flexible work spaces in the same strip, specialized zones in pairs; *d*, flexible work spaces in the same strip, specialized zones separated from one another; *e*, a double series of classrooms – flexible work spaces paired and specialized zones paired, all in the same strip.

By using the modelling method we have shown that application forms of the spatial model may be variable, and that they ensure a whole range of transitional forms for the implementation of various teaching and learning activities. As one can notice, they can contribute to a transparent, polyvalent spatial classroom configuration, and also to high usability and interconnection of the school space.

The spatial model defined above may be differently interpreted in elementary school design. For instance, if it is possible to expand the classroom space toward the social activity zone, the interlinking of two classrooms into a unified space is not necessary.

Likewise, there are various ways in which the spatial model can be adapted to the needs of different school cultures, teachers' preferences and pedagogical practices.

Therefore, the classroom space is no longer the only base in which students spend most of their time in the educational process. By offering various contents and spaces, and contrary to the traditional paradigms of school design, the defined spatial model of the classroom and its immediate surroundings offers numerous possibilities for creating versatile learning spaces which, in terms of both form and function, accompany the various needs of students and teachers in the dynamic educational process.

Additionally, such a conceptualization of the broader classroom space, which strongly focuses on common, microsocial functions in the area adjacent to the classroom, introduces a not only pedagogically but also socially new dimension to daily student activities.

Further studies should define the framework for the spatial model in more detail, both programmatically and dimensionally, which would include types of furniture that would be suitable for ensuring high flexibility of the learning areas.

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ACKNOWLEDGEMENTS. This paper has been written as part of a national project implemented at the University of Niš, financed by the Ministry of Science and Technological Development of the Republic of Serbia 2011–2019: 'Revitalization of preschool facilities in Serbia – The program and methods of environmental, functional, and energy efficiency improvement', No. 036045.

Received 15 May 2019; revised accepted 28 January 2020

doi: 10.18520/cs/v118/i9/1354-1364
