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Exploring the social logic of preschool environments structured with Waldorf, Montessori, and Reggio Emilia

A semantic and syntactic study on preschool environments

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ABSTRACT

Kindergartens are socio-spatial organizations with their social and cultural as well as their spatial structures which prepare children to be responsible members of the society. In the early years of the twentieth century, the issue of how to raise new generations was one of the primary research areas of many educational scientists, especially in Europe, and therefore different progressive pedagogical methods were generated. Among these views, the Waldorf pedagogical approach developed by Rudolf Steiner, Montessori pedagogical approach developed by Maria Montessori, and Reggio Emilia pedagogical approach developed by Loris Malaguzzi became prominent. Although these three pedagogical approaches have a common view that the child should be accepted as an individual with his/her rights, each of them involved different physical environment requirements in the context of their educational philosophies. The projects obtained in an architectural design studio course constitute the focus of this paper and it aims to decipher the semantic and syntactic characteristics based on twelve student projects. The semantic dimension of the study was revealed by coding the related themes through students' project reports while the syntactic dimension of the study demonstrated the prioritized social interaction area through *isovist area* and *variance* values. Considering the semantic results, it was revealed that the students not only comprehended the spatial requirements of a specific educational pedagogy but also grasped the transformative power of the methods, in terms of physical, social, and natural characteristics. Considering the syntactic results, the fact that the mean *isovist area* value was higher in Reggio Emilia schools showed that the *piazza* dominates the physical setting. The fact that the school cluster with the highest variance value emerged in Montessori draws attention to the changeability of isovist perimeter value within the interiors to orientate the individuals to the classroom units.

KEYWORDS

Kindergarten, Preschool education, Montessori, Reggio Emilia, Waldorf

1 INTRODUCTION

Although concepts such as school, educator, and student are such words that have not changed since the fifteenth century, significant progress has been achieved in the concept of education and new paradigms have been introduced about the perspective of how society embraces children's individuality, in the development of new educational approaches and, accordingly, democratization in educational environments throughout the history. In this context, the following statement of Robert Sommer (1969) is remarkable in terms of reminding how traditional schools used to be in the past and understanding how the attitude towards children has changed today: "From a student's eye level, the world is cluttered, disorganized, full of people's shoulders, heads and body movements. His world at ground level is colder than the teacher's world." Thanks to the progressive new approaches mainly developed in the late twentieth century, large, cold, even in some cases, forbidding, crowded, and teacher-centred educational environments have changed into child-centred, free, flexible, democratic, and inclusive educational environments.

In this context, the second half of the twentieth century was a period through which important architectural and design thresholds were experienced, along with aesthetic concepts and new ideas in architecture. In addition, this period was also a threshold period for education in terms of starting to show the necessary respect and attention to the developmental needs of the child and developing various educational approaches centred on the child.

According to Nicholson (2005), based on Froebel's kindergarten approach, successive and progressive Montessori schools pioneered by Maria Montessori and the Waldorf schools pioneered by Rudolf Steiner reflected and shaped new ideas about education. Kindergartens in Emilia Romagna, Italy, were also unique in the current educational environment. The new educational approach, which was developed especially in the Reggio region of Italy, presented a clear model through which the physical environment was binding and indispensable on learning, and summarized the role of the environment with the concept of being a "third teacher".
In the last century, these new approaches to children's pre-school education and psychosocial environment have radically changed the perspective of children and caused significant changes in the understanding of education in primary schools and beyond, and in the design of the physical environment of education. When the pedagogical approaches and accordingly the spatial characteristics of these three progressive education models are compared with each other, it is noticed that the mixed-age model causes the classroom environment to become more special due to the fact that the children aged 3-6 are educated together in the Montessori and Waldorf

method. On the other hand, since the founding philosophy of the Reggio Emilia model deals with the presence of parents, teachers, and children at school together, the *piazza* as a specialized meeting and exhibiting space, and a wide entrance hall with transparent partitions create a social and communicative atmosphere in the school. Also, in Reggio Emilia, which is based on the approach of educating different age groups in separate classrooms, workshop spaces beside the classrooms gain special importance. Therefore, although these three education models have similar attitudes in terms of being child-cantered, they differ from each other in terms of spatial characteristics.

In this scope, answers to the following research questions are sought in this study. What is the relationship between the learning environment and the learning process? How do different learning pedagogies and approaches determine the kindergarten's physical environment socially? How does the physical characteristic of the learning environment contribute to the social development of the child? How do preschool education spaces, which differ in terms of the physical environment due to different pedagogical approaches, differ both semantically and syntactically in terms of spatial requirements and socialization inclinations.

2 TRANSACTIONAL RELATIONSHIPS IN PRESCHOOL LEARNING ENVIRONMENTS

According to Jilk (2005), the development of self and individuality in children can occur in two different attitudes. The first is an attitude in which the child is left alone and not interfered with, and the second is an attitude in which learning opportunities are increased as much as possible and a prolific environment designed within this framework. Jilk (2005) also states that the learning process is mostly experienced in kindergarten environments, where more opportunities are provided for learning, children as learners are more involved, highly motivated, curious, and enthusiastic.

Children's preschool learning environments can also be considered as the settings in which the children are readiest to learn since age offers an advantage over learning. In this context, Nicholson (2005) states that children are well aware of the learning environment they are in and the symbolic messages that this environment offers them, therefore, the visionary contribution made to learning environments in the twentieth century offers important clues for good school design and educational strategies to be developed in the current century. The fact that the education of children has become an issue and the search for a system in this regard is associated with the start of industrialization activities. In England, where the first industrialization movements started at the beginning of the 19th century, children working in factories started to receive two hours of education a day under the name of the Factory Act in 1833 (Dudek, 2007). Today, the necessity of multisensory indoor and outdoor spaces, where children's learning

opportunities are increased as a result of their own experiences, and the importance of this issue in the education of the individual is an issue that is progressively agreed upon (Huppertz, 2007). The expression of "kindergarten", which developed simultaneously with the industrialisation period in England that caused the preschool space to take its name in the sense we still use today, metaphorically expresses the school as an environment where the child is nourished with love like a plant in a garden. Developed by the German educational pioneer Friedrich Froebel, the concept of kindergarten has been used as a symbolic representation of nature, a kind of microcosm of the world containing many positive stimuli and diversity. However, this expression has different meanings in many countries today. Schools, called kindergarten refer to schools with a more craft-based vocational orientation, such as Waldorf schools in Europe and Japan, while in Denmark and Sweden it refers to schools where children aged 3 to 5 years old attend, and to schools where children attend pre-primary school in the United States (Dudek, 2007). Although it is perceived and applied in various ways in different countries today, the idea that pre-school education and the environments specially designed for this education are necessary for the healthy and qualified development and needs of the child is also supported by theoretical studies.

In this context, according to Huppertz (2007, p.46), pre-school education is essential for a child to have a successful start in life, and according to current educational and psychological theories, the child has the following needs for a prosperous start in life: "Children, particularly young children, need human attention usually that of their parents in the first instance. They require social integration in a stable and manageable group and, as they grow older, ideally a group of similar age. From the first moments of life, children need appropriate educational stimulation, learning through objectives and themes. Every child needs guidance - education - so that they can develop a conscience, for example, and become independent. Children need recognition both of themselves and their achievements. Children must be able *to set something in motion*, both in the literal and metaphorical sense: they must have a degree of influence and be able to shape (re-shape) things to their own way of thinking. The child needs adequate space and time to itself. Children need food, drink, warmth, and good air."

Based on the above summary on the development of kindergartens, the school building is embraced as the "third teacher" as being a main actor in the learning process, following the view that the teacher, parent, and the environment go hand in hand (Nicholson, 2005; Lippman, 2010; Robson, 2016; Hall, 2017). Therefore, education buildings and learning environments are the reflectors that determine how children learn, what they learn, how and to what extent they can be taught, and have a leading role in understanding what is important, valuable, and respected so that education buildings have the potential to make a difference in the life and personality of the child as an individual (Nicholson, 2005).

2.1 The impact of the physical environment on the education and socialization of the child in the kindergartens

Children grow up not only under intangible influences of society but also by interacting directly with the physical and built environment. Today, the physical environment where the majority of the children spend an important period of their interaction with the world and experience the tangible attributes of space is the school building (Koralek and Mitchell, 2012). Therefore, environmental characteristics in the educational environments are important for the child's development to progress in a positive direction. It is stated that stimulant environments are effective in children's learning of new information and social memory, while non-stimulating environments dull the perception of children (Nicholson, 2005). In this context, Edwards (2012, p.67) underlines that the classroom, as a learning environment, is a "container" in which a significant part of the child's life passes and the expectations of the child from life are shaped, and therefore, it should "ideally represent a kind of microcosm of the world".

The physical characteristics and quality of the educational environment affect students behaviourally as a common view in the literature. A physical environment equipped with good design and good resources has a positive effect on children's school engagement by giving a message that their needs are taken care of (Barker, 1978; Herbert, 1998; Edwards, 2012) so that they show a more natural disposition towards respectful behavior and a willingness to contribute to the class community (Clegg and Billington, 1994).

Today, the idea that the student should be perceived as an active learner and that the learning environment should be *prepared* in parallel with this idea was formed in line with the constructivist views put forward in the twentieth century (Lippman, 2010). In this context, Reggio Emilia approach considers that the learning environment has a responsibility to guide the child as the *third teacher*, Montessori method deliberates that the *tools* in the learning setting should be prepared in order to create both individual and versatile learning opportunities, and the Waldorf approach considers that the learning of the environment should *holistically* support the child, through each child's own body and all senses. In the next section, these three prominent pedagogical education approaches that shape the pre-school education environments in the twenty-first century within the framework of their intellectual structures and the spatial design features of their unique educational environments will be discussed.

3 EDUCATIONAL PEDAGOGIES AS A TOOL TO SUPPORT LEARNING AND SOCIAL INTERACTION

According to Al et al. (2012), not only the physical characteristics of the educational environment, such as lighting, window sizes, and air quality, affect the success, attendance, well-being, and motivation of the child but also various prepared environments based on different educational

approaches have important effects on the preschool environment and therefore on the behaviours of children.

3.1 Waldorf approach and its reflection on the physical setting

The Waldorf approach, which is an educational approach developed in the twentieth century, is a methodology that tries to reveal the hidden talents, wisdom, and willingness of the child. Within this context, the Waldorf philosophy considers the existence of the child as a bodily whole and a set of values that children produce with their minds, hearts, and hands (Querido, 1987). This philosophy, conceptualized by Rudolf Steiner as “anthroposophy”, tends to evaluate the child's development as a holistic being with physical, psychological, and spiritual potentials. In this context, the design of the school is of great importance in terms of the atmosphere created between the teacher and the child, because children are treated as sensory organs that absorb all the objective and materialistic information around them (Kraftl and Adey, 2008).

The architectural approach of Rudolf Steiner, who is the intellectual pioneer of the Waldorf approach, has an understanding that brings function and organic forms closer together. In his writings, there is a point of view that examines the struggle and spiritual development of humanity with the field of architecture and evaluates art and architecture as a whole. According to Steiner's (1980) expression, the educational approach in schools where there are about 1000 Waldorf of them in the world today is not a "head-learning" but a "limb-learning" education method. The importance of the Waldorf approach to experience and the senses and the acceptance of the child as an individual who experiences the world as a bodily being is in line with the views of John Dewey, one of the pragmatist educational psychologists (Bjornholt 2004, p.117). Within this context, Steiner aims for individuals to be free individuals who can make progress towards their own desires and goals in life (Jolley, 2010).

In the Waldorf approach, the perspective of education is not only academic achievement but rather an individual's ability to survive and it suggests that the child goes through a new developmental stage every seven years and begins to perceive the world differently in every seven-year period. In the Waldorf education approach, where the education curriculum is structured according to this seven-year period system, it is accepted that children learn through their senses and bodies in their first years. For this reason, writing is taught through storytelling and visualization, and mathematics is taught through rhythm and movement (Bjornholt 2004). The spaces in Waldorf schools are environments that are designed to increase the child's concentration and that can change according to the children's participation processes and learning subject. In addition, classroom environments are such settings where direct life objects exist, not artificial ones, and real-life experience is encouraged.

The first established Waldorf School was established under the supervision of Rudolf Steiner in 1919 as part of the Waldorf-Astoria Cigarette Company for the children of the employees of this factory, and over time, it attracted the attention of families who wanted their children to study in this school, where humanitarian values were respected and new education methods were used. Although Steiner never studied architecture, he developed seventeen building projects and wrote articles on the *organic* aspect of architecture that stimulates harmony between human habitat and nature. According to Steiner (1999), the Waldorf school building should be rich in colour, as colour reflects the spirit of the universe and includes movement, and accordingly good architectural design is not a structural and physical content, but an organic, living whole where living forms come together, appealing to human emotions and psychology (Mezentseva, 2019). In Waldorf schools, parents take an active role, and it is not uncommon for them to even take part in the construction of the school (Kraftl and Adey, 2008). In Waldorf schools, it is recommended that the central entrance be defined and inviting and that the interior corridors should be in arc form that supports the movement. In addition, the requirements for the architecture of Waldorf schools can be listed as follows (Mezentseva, 2019):

- Due to the effect of reducing the stress of individuals, natural materials should be used (Kowaltowski, 1980)
- Spaces that include as much natural light as possible should be designed (Jolley, 2010).
- Window heights should be at the level where children can see and observe the nature outside the school.
- Interiors should consist of curved, rounded forms as much as possible (Figure 1). As the grade level increases, it is recommended to use more right-angled formal geometries, but to use more rounded spaces at preschool age (Adams, 2005). Classroom environments should consist of different zones so that the child can develop mentally and physically as well as develop their manual skills. Thus, it is recommended that the classroom be designed in an open plan layout as much as possible so that these three skills can be realized together. (Mezentseva, 2019).

Figure 1: Views from physical settings of Waldorf schools
(on the left: Kraftl and Adey, 2008; on the right: Rudolf Steiner School New York, Url-4).

Since the mental, emotional and physical integrity of the child has an important place in the Waldorf approach, the rhythmic movement of children is an important criterion in the daily life of a Waldorf school. Steiner states that with the concept of *eurythmy*, through which children make rhythmic movements accompanied by speech, poetry, and music, they provide bodily concentration, increase their internal balance and reinforce their communication with others (Figure 2). For this reason, a wide and spacious space like an auditorium where performing arts can be achieved is indispensable for Waldorf schools in order to integrate *eurythmy* movements into students' daily schedules (Easton, 1997).

Figure 2: Children practicing *eurythmy* in a Waldorf school (Url-1).

3.2 Montessori approach and its reflection on the physical setting

The Montessori approach is an education method developed by Dr. Maria Montessori, an Italian physician and educator, that supports the concept of learning with curiosity and creativity for practice. Dr. Montessori, who first worked with disabled children, developed a systematic approach so that all children could receive a more qualified pre-school education. With the new method she put forward, Dr. Montessori revealed important developmental results even for children with disabilities (Mendoza et al., 2021). Today, Montessori schools continue to become widespread in various countries by the authorized institution in the context of accreditation, which is the Associate Montessori Internationale (AMI).

The main purpose of the kindergarten, which was founded by Maria Montessori under the name of Children's House (Casa dei Bambini) in Italy, was to take care of the children of parents who had no one to take care of their children while they were at work. In Children's House, where children aged 3 to 7 were accepted, not only their education but also their health, physical and

moral development were given importance depending on the age groups of the children. In the school where Maria Montessori accepted children free of charge, the main condition demanded from the parents was full cooperation with the school's directress regarding the education of their children (Montessori, 1909; 2008). According to the Montessori approach, since children's needs are predominantly based on research, experimentation, observation, and learning by doing, the design of the school should also support such behaviours and action patterns. For example, unlike a standard sequential order, the Montessori classroom (Figure 3) is organized in such a way that children can sometimes work individually and sometimes in groups, observe their peers, learn from each other, and thus become motivated to learn (Al et al., 2012). Additionally, since it is important not only for children of the same age but also for younger and older children to learn from each other, a Montessori classroom has a participation model of a mixed age group together (Figure 3).

Figure 3: A view from a Montessori classroom (Url-2).

In this context, Maria Montessori (1909; 2008, p.75) developed an environment conducive to observation as a condition that must be provided in a classroom with a large garden and stated that the main originality of her own approach was that children have the freedom to choose to be in the classroom or in the garden throughout the day whenever they want. By presenting new kindergarten furniture in design philosophy out of wood materials (Figure 4), Maria Montessori proposed a newly designed environment specific to the Montessori method by determining all the necessary dimensions of the educational materials such as the blackboard areas, cupboards, shelf arrangements, sink area, and hangers. Maria Montessori's meticulous approach to the order in the classroom can be noticed in the following paragraph (2008, p.75-76). “In each of our

schoolrooms, we have provided a series of long low cupboards, specially designed for the reception of the didactic materials. The doors of these cupboards open easily, and the care of the materials is confined to the children. The tops of these cases furnish room for potted plants, small aquariums, or for the various toys with which the children are allowed to play freely. (…) Above the blackboards are hung attractive pictures, chosen carefully, representing simple scenes in which children would naturally be interested. (…) Our little tables and various types of chairs are all light and easily transported, and we permit the child to select the position which he finds most comfortable."

In the Montessori approach, the freedom it gives to children in the arrangement of the classroom and furniture is the essence of the educational approach. As a matter of fact, children who accidentally make mistakes, knock over or drop any object noisily see their mistakes and move on to become an individual who can give feedback on their movements. Another important principle that makes a difference regarding the size of the classes is the age distribution of the children in the class; in the Montessori classroom, where many children of different ages have education at the same time, usually, only in one classroom, children aged 2.5 and up to 5.5 years are all together. The classroom environment in that sense, which is based on a mixed-age in which each child reveals his or her own essential competence, and thus can be managed by even a single teacher, is an environment where children can realize themselves on their own initiatives and in this way, they can reveal their inner nature by getting rid of the oppressive yoke of society (Montessori, 1909; 2008).

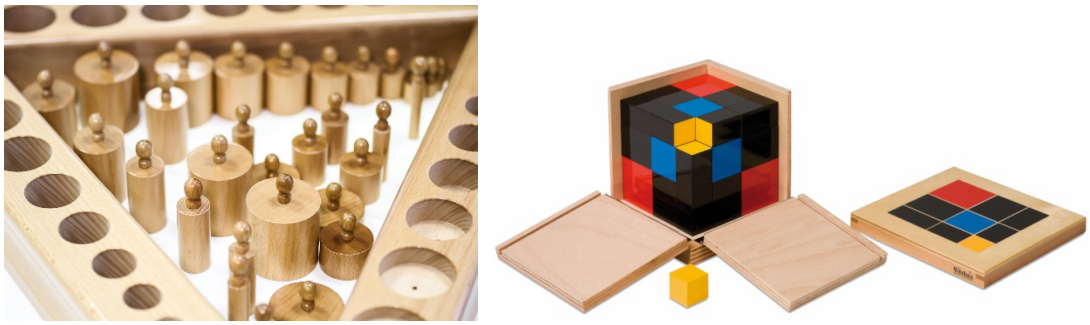


Figure 4: Sensory materials from Montessori learning tools
[On the left: Cylinder blocks (AMI), On the right: Trinomial cube (Nienhus, 2022)]

3.3 Reggio Emilia approach and its reflection on the physical setting

Within the scope of the Reggio Emilia approach, space is an important active component in the education process. It is argued that children are innately active researchers and that they interpret and comprehend concepts by seeing, smelling, hearing, and touching, while space undertakes the task of reflecting the ideas that emerge as well as giving shape to the ideas of children who are in action with all their senses (Nicholson, 2005). The general philosophy in Reggio Emilia schools is not just at the school scale but rather at the city scale which considers the school as a part of the city and its transformative power. According to this view, life and health in the city depend

on the well-being and creativity of young people in the city, in other words, the city is a research universe and laboratory for children. In this direction, the children are *atelieristas* who conduct sensory and interactive studies about the city (Koralek and Mitchell, 2012).

The name of the Reggio Emilia approach comes originally from a socioeconomically highly developed town in Italy, and the method was developed by Loris Malaguzzi who has a degree in pedagogy. The aspect of this approach that Malaguzzi cares about is that children will have *a hundred different languages* in order to realize themselves and to reveal the potential that exists within them, and he supports this statement with his poem called *Hundred Languages of Children* (Arseven, 2013): Starting with the expressions as “The child has / a hundred languages / a hundred hands / a hundred thoughts / a hundred ways of thinking / of playing, of speaking. (…)”, and continuing with the expressions of “A hundred always a hundred/ ways of listening/ of marveling of loving/ a hundred joys/ for singing and understanding/ a hundred worlds/ to discover/ a hundred worlds/ to invent/ a hundred worlds/ to dream. (…)”, Malaguzzi expresses not only that 100 or even more skills exist in the child with this poem, but also he criticizes the system that existed at that time by stating that the education structure did not allow the children to discover their own potentials through these statements: “They tell the child:/ to discover the world already there/ and of the hundred/ they steal ninety-nine./ They tell the child:/ that work and play/ reality and fantasy/ science and imagination/ sky and earth/ reason and dream/ are things/ that do not belong together.” (Loris Malaguzzi International Center). Malaguzzi states that in order for the children to discover their own potentials, the environment they are in should be prepared accordingly, and therefore Malaguzzi considers the environment as a *third teacher* (Robson, 2016).

Hence, the environment in Reggio Emilia schools should have rich stimuli, support active *learning by doing*, and have a wide range of materials and equipment that stimulate the child's senses in the environment in order to trigger the child's research and problem-solving skills. According to Fraser (2012), there are eight keywords and principles that summarize the Reggio Emilia learning environment which can be stated as: "aesthetics, active learning, collaboration, transparency, bringing the outdoors in, flexibility, relationship, and reciprocity." (Robson, 2016, p.15). Following these keywords and principles regarding the physical environment of a Reggio Emilia school, this approach can be summarized as a multi-sensory learning environment in which all interpersonal communication is invited.

Within this context, the concept of communication, which is the basic message of the Reggio Emilia approach, is conveyed to the user in a very clear and transparent way, both intellectually and spatially. The three subjects of the preschool setting -the child, the teacher, and the parent- are included in the child's educational process equivalently. In this context, the Reggio Emilia approach differs from other pedagogical methods, especially in terms of the parent's acceptance into the process and educational space.

Figure 5: Entrance hall of a Reggio Emilia school (Url-2).

However, in many other methods, parents are generally forced to leave their children at the door, while in schools designed with the Reggio Emilia approach, the entrance area is designed in a very inviting way (Figure 5) where parents can spend some time, see the exhibited works of children and even participate in their children's activities (Nicholson, 2005).

Thus, within the scope of the Reggio Emilia approach, which aims to make students intentionally have leading roles in their own learning processes, the educational space is as participatory and supportive of socialization as the student. In this context, the designed environment is an active actor that reinforces the communication between students, peers, and teachers (Hall, 2017). The concept of communication, prioritized within the pedagogical approach, overlaps with the design of the space and spreads to the entire pre-school education building. For example, the walls of the school are designed as transparent to support child-teacher-parent communication, as well as being used as large exhibition surfaces (Nicholson, 2005).

So, the issue of being a *third teacher* of the space in Reggio Emilia schools is supported by the transparency feature between spaces. In this context, the term *piazza* is an indispensable spatial component for a Reggio Emilia school. Since the *piazza*, which is an important feature of Italian cities and means square, is the place that brings people together, it is also preferred to have a *piazza* in Reggio Emilia schools because of its potential to bring people together. Hence, the *piazza* area is not only a place where children meet and communicate with each other but also a place that brings teachers and parents together. In addition to the meeting, a *piazza* is a place that invites many possibilities such as investigation of indoor plants, seeing each other, the exhibition of what is produced at school, conversation, chatting, and collaboration for all individuals in the school (Tarr, 2001).

4 METHODOLOGY

The methodology of the study is based on revealing how the spatial characteristics of the three different educational approaches –Waldorf, Montessori, and Reggio Emilia- differ, especially in the contexts of spatial and social interaction. In this way, a methodology in which qualitative and quantitative methods are used together was followed; (1) a semantic analysis was conducted regarding the projects by referring to the project reports and statements of the students in which they explained the pedagogical features and spatial aspects of their projects, and (2) a syntactic analysis was conducted considering the floor plans where classroom units are dominant as learning environments. The qualitative analysis was carried out with the help of NVivo software while the quantitative analysis was carried out with the help of Syntax 2D.

It is anticipated to start by briefly mentioning the process of the architectural project studio course, through which the preschool designs analysed in the paper are developed. Within the scope of the conduction of the course, the three different pedagogical approaches and their spatial requirements were explained by the instructor to the students at the beginning of the semester. By also examining a sample building that exists in the world and designed with the philosophy of one of these three pedagogies, the students reinforced the knowledge they learned through a concrete example. Students working on various plots on the Anatolian side of Istanbul chose one of these three pedagogical methods and designed a pre-school education building. During a fourteen-week semester, the students, who received feedback on their projects two days a week, presented their projects to the juries through two in-semester juries and a final jury.
Within the context of this paper and the analysis of this study, a total of twelve buildings (Figure 6), four from each pedagogy designed by the students, were selected. Although thirty-eight project proposals were developed during the semester, only a total of twelve projects had to be chosen because the number of buildings designed with the Waldorf method was only four. Since a comparative analysis was desired in the study, four buildings were selected from each of the other two pedagogical methods, and thus twelve buildings were included in the analysis.
In this section, where the methodology of the study is mentioned, it is also preferred to mention the limitations encountered especially in the analysis phase of the study. The limitation of this study is due to the small number of projects examined. In fact, it was anticipated to include all thirty-eight projects obtained in two different semesters in the research. However, due to the small number of students who preferred to work with the Waldorf method, the number of projects designed with the Waldorf approach was only four. In order to make an equal comparison between the pedagogical approaches, four from each of the other school groups were selected and included in the study. Examination of more plan samples in a future extended study will contribute to the reliability of the data obtained.

4.1 The qualitative method followed in the study to reveal the semantic content of the student projects

One-to-one interviews were held in each lesson with the students who were observed for five hours, two days a week, for fourteen weeks throughout the semester. In addition to receiving the necessary architectural documents regarding the student projects at the end of fourteen weeks, written statements not only about the students' pedagogical approaches but also about the spatial approaches in their projects were also received within their submissions. Therefore, in the qualitative analysis stage of this study (Creswell, 2015), these expressions with a maximum length of 250 words that the students wrote about their projects were discussed.

Through this method, it has been aimed to understand which aspects of the pedagogy were emphasized by the students who designed using the pedagogical methods they have chosen while stating about their projects. Thus, students' written project statements were analysed with NVivo software using the *inductive content analysis* method. With this method, first, some specific *codes* were determined and then these codes were combined under common *themes*. These five themes identified are as follows, respectively:

(a) architectural characteristics of the school design,
(b) pedagogical characteristics of the pedagogy,
(c) spatial characteristics of the pedagogy,
(d) natural characteristics of the pedagogy, and
(e) communicative characteristics of the pedagogy.

In this way, a semantic study was carried out by coding each sentence in the report of the twelve projects included in the analysis within the scope of each pedagogy, under one of the appropriate five themes. The findings related to the qualitative research of the study are discussed in section 5.1.

4.2 The quantitative method followed in the study to reveal the syntactic data of the student projects

Since the transparency criterion of the division elements between the spaces was taken into consideration, the dividing elements with visual transparency and therefore supporting visual communication were not included as obstructive elements when the layouts were transferred to Syntax 2D. Through the isovist graphs of each of the twelve plan layouts, the values of (a) mean isovist area and (b) mean isovist variance were revealed. The data within the result report produced by Syntax 2D software has been taken into account. Considering the information in the report produced by Syntax 2D software for each project, the isovist area and variance data of

each building were revealed, and then the mean value of each of the four schools in their own group was also revealed.

The reason for choosing the isovist area and variance values in the analyses is because these values are the parameters that support the visual perception and social interaction within the buildings. In this way, it was intended to understand whether there were any differences between the spatial characteristics of these three pedagogical approaches in terms of their average isovist area and variance values that reveal the potential of people to come together.

Meanwhile, the term isovist, which is an important research area and context of space syntax and isovist literature, is briefly mentioned. The concept of isovist is the data that provides an understanding of the space, how the individual perceives the space, what kind of visual interaction he or she has with the space, and how the visual perception of the individual changes at each step. Because isovist data provides the researcher the visual field that the individual can see at any point in the space, as the individual rotates 360 degrees around himself (Turner et al., 2001). In this context, Benedikt (1979) put forward six different quantitative definitions regarding the isovist characteristics of spaces. The first two of these definitions are the isovist area and the isovist perimeter values of the space.

The parameter of variance, one of the values put forward by Benedikt (1979), is considered as the second moment of radial lines of isovist that determines the visibility in space and reveals the dispersion value of these lines based on the isovist perimeter. In this context, the more variable the isovist perimeter of a place, the higher the variance value, while the more continuous the isovist perimeter of the space, the lower the variance value.

The reason why the variance parameter was also preferred in this study is the assumption that the isovist perimeter and accordingly the variance will change in the interiors of kindergartens shaped by Waldorf, Montessori, and Reggio Emilia pedagogies. It is predicted that the eurythmy room in Waldorf schools and the piazza space in Reggio Emilia schools will decrease the variance value, especially since large spaces with high visibility will reduce the variance value. On the other hand, the physical environment in a Montessori school is expected to have a higher variance value, as there is no requirement that a multi-purpose hall or similar visibility value be high in Montessori schools. The findings related to the quantitative research of the study are discussed in section 5.2.

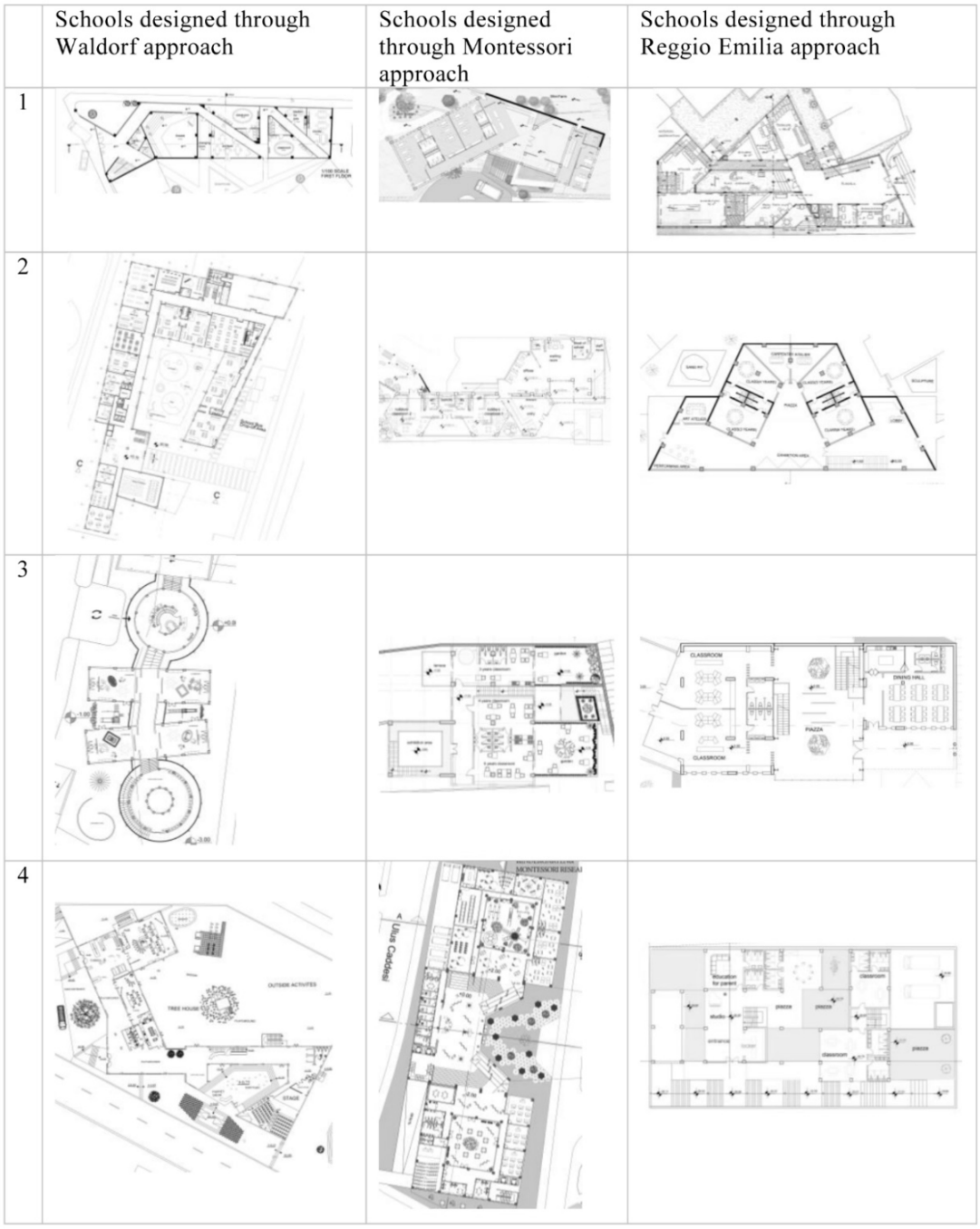


Figure 6. Twelve kindergartens designed by students based on three different pedagogies.

5 RESULTS

The qualitative and quantitative findings of the study are explained in two different sections below. The resulting semantic and syntactic results are discussed depending on the morphological structure of the educational environments as well as the learning outcomes of the students.

5.1 The qualitative results of the study related to the semantic data of the student projects

When the project reports of the students on their projects are examined, it is noticed that regardless of the pedagogical method, the students mainly emphasized the architectural features that make their projects unique which is related to *theme-a*. A student (WS1), who designed with the Waldorf method and explained the facade of her project, expressed the use of natural materials with the design approach of her project as follows: "*This float is also readable on kindergarten façade, too. The façade is covered with wooden stripes. These wooden stripes are closer on classrooms façade and more separate on corridors. Kindergarten also emphasizes the usage change with change of the material, too*." Of course, this result and effort of the students were expected since each of the students aimed to develop a distinct way of design and tried to create an architecturally original design, although they tried to adhere to the spatial conditions required by the pedagogy.

When student expressions related to Waldorf, Montessori, and Reggio Emilia methods are taken into consideration within each cluster, it is observed that mostly communication-oriented (theme-e) expressions emerged in the Waldorf method. However, most of the statements that emerged on this subject are related to the school's creating social interaction with its urban and social environment in which it is located, rather than the social interaction within the school. The following statement of a student (WS4) can be given as an example for this situation: "*This building in Sancaktepe offering a new opportunity to serve as a connection between two societies in the neighbourhood. Educational approach, Waldorf education system, in this area is important to acknowledge what will create a new equal and free space for kids and community*." This result shows that students realize that the equalizing force aimed by an education model is a driving force that increases a cohesive effect in society.

When the themes related to the Montessori method are considered, it is understood that pedagogical (theme-b) and spatial (theme-c) characteristics of the pedagogy were predominantly emphasized concerning the Montessori pedagogy. A student (MS3) who emphasizes Montessori pedagogy explains why he chose this method as follows: *"I chose the Montessori way of teaching for my kindergarten because I got attracted seeing little kids doing adult work which is basically what Montessori is teaching the kids to do their daily work by themselves also teaching them number, games, etc."* This result may be due to the approach of the Montessori method that

focuses on the classroom environment. As a matter of fact, the main focus in the Montessori method is the large classroom environments where the 3 to 6-year-olds are coeducated, where Montessori tools are the focus of education.

When the themes related to the Reggio Emilia method are considered, it was observed that natural characteristics come to the fore the most. Besides a student who uses the phrase of "*green harmony*" (RES1), it is noticed as in the statement of the student (RES2), in which the wide transparent dividing elements in this method are also evaluated in terms of making the school a part of nature: *"There is a mini orchard that children can grow vegetables and a sand pit for children to play."* It is also realised that some specific pedagogical concepts (theme-b) and spatial features (theme-c) such as *piazza*, exhibition hall and *hundred languages of children*, which are related to workshops, are emphasized in the Reggio Emilia approach. A student (RES1) emphasizes the spatial characteristics of *workshops* that enable children to reveal their potentials as follows: "*According to Malaguzzi and parents, people form their own personality during early years of development and that children are endowed with a hundred languages through which they can express their ideas*." Another student (RES2) emphasizes the *visibility* of the *piazza*, the largest space in a Reggio Emilia school, as follows: "*In Reggio Emilia pedagogy, there is a large central area called piazza. In this building, piazza is located in the middle and it can be seen from each floor."*

The qualitative analysis of the study aimed to show that students comprehended the spatial requirements required by educational pedagogy not only with their architectural characteristics, but also in relation to social aspects, communication, and nature, and they can proceed with their designs with this comprehension. The qualitative results show that students not only tried to fulfil the requirements of a spatial program within the scope of the project studio but also put effort into thinking about how these educational methods, which emerged for the transformation of societies in the 20th century, can create a spatial and socially transformative effect in today's urban spaces.

5.2 The quantitative results of the study regarding the syntactic data of the student projects

As stated in the methodological section, (1) isovist graphs and (2) variance graphs of twelve schools were prepared (Figure 7 and Figure 10), and mean isovist area and mean-variance values generated by Syntax 2D were revealed for each school. The mean isovist area and mean-variance values of Waldorf, Montessori, and Reggio Emilia school clusters were calculated by taking the average of the results for each group (Table 1).

The overall isovist area and variance values of each of the twelve Waldorf, Montessori, and Reggio Emilia schools were discovered, and then the average of the isovist area and variance of

each cluster consisting of four schools for each pedagogical method was revealed (Table 1). As can be noticed in Table 1, it is understood that the isovist area value is the highest in Reggio Emilia, Montessori, and Waldorf schools, respectively. The high value of the isovist area in Reggio Emilia schools is due to the contribution of the *piazza*, which is the entrance and meeting place of these schools, as expected. As a matter of fact, the piazza is the meeting, socializing, and sharing place of children, parents, and teachers so, it is intentionally designed to be large and transparent enough to increase interaction at the same time to meet the gathering function of individuals.

However, it was realized that the *eurythmy* areas in Waldorf schools could not demonstrate the potential to increase the value of the isovist area. When the isovist area graphs (Figure 7) of all the schools analysed in the study are also examined, the intense red colour in the piazza space in Reggio Emilia schools can be noticed. When Montessori schools are examined, a relative redness can be observed in the hall before the corridor leading to the classrooms. When Waldorf schools are examined, an intense redness cannot be seen in general, while the *eurythmy* area is mostly orange and green.

Table 1. The mean-isovist area and mean-variance values of the schools.

	Isovist Area	**Isovist Area Variance**	**Pedagogical Method**	**Mean Isovist Area of each cluster**	**Mean Isovist Variance of each cluster**
Waldorf School 01	970924.9	213116722374.0	Waldorf School Cluster	1514953.2	688642488633.1
Waldorf School 02	1620251.0	879007198985.2			
Waldorf School 03	1027763.4	255205345345.3			
Waldorf School 04	2440873.4	1407240687827.9			
Montessori School 01	868126.9	254395163806.1	Montessori School Cluster	1603241.3	1814220531683.6
Montessori School 02	1259089.3	302035833603.0			
Montessori School 03	656283.7	64413751822.9			
Montessori School 04	3629465.0	6636037377502.2			
Reggio Emilia School 01	1072947.6	424517985687.1	Reggio Emilia School Cluster	1712263.1	798418219211.9
Reggio Emilia School 02	3302789.9	1745528126899.7			
Reggio Emilia School 03	1245940.9	472841612308.8			
Reggio Emilia School 04	1227374.0	550785151952.1			

These results, which are reflected in Table 1 and Figure 7, and the differences in mean isovist area values between schools can be perceived more easily through the bar graph in Figure 7. Indeed,

among the spatial requirements of Montessori schools, there is no great requirement for a large gathering environment.

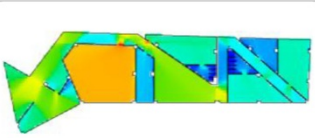
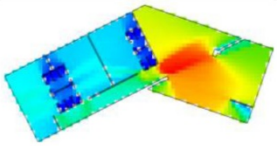
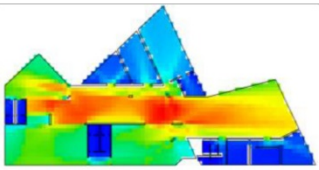
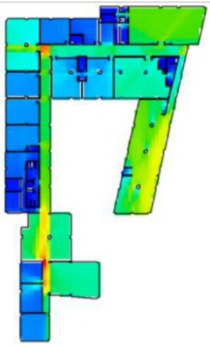
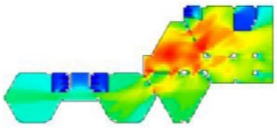
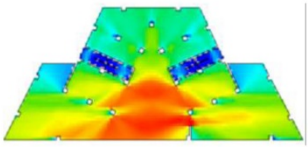
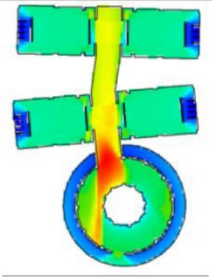
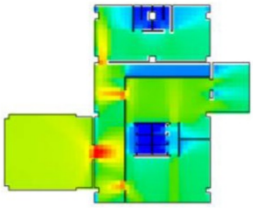
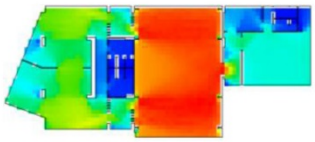
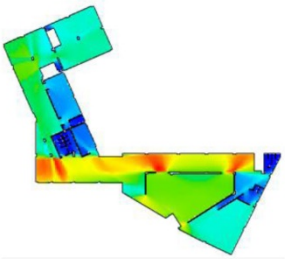
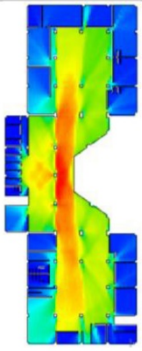
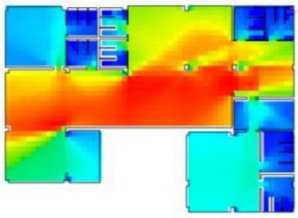
	Isovist Graphs of Waldorf Schools	Isovist Graphs of Montessori Schools	Isovist Graphs of Reggio Emilia Schools
1			
2			
3			
4			

Figure 7: Isovist graphs of twelve kindergartens based on three different pedagogies.

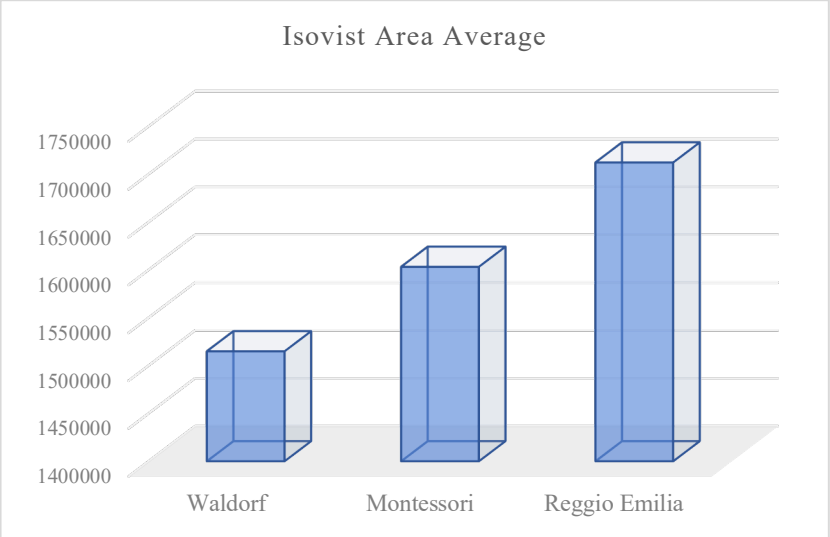


Figure 8: Comparison of isovist area averages of kindergarten buildings designed through Waldorf, Montessori, and Reggio Emilia approaches.

When the mean isovist area variance values of the kindergarten buildings are considered, Montessori schools have the highest variance values, as an expected outcome. When variance values are analysed, Montessori schools have the highest variance values as expected (Figure 9). When Table 1 and variance graphs (Figure 10) prepared with Syntax 2D for all twelve schools are also examined, it is understood that the variance value in Montessori schools is by far, the highest. Indeed, among the spatial requirements of Montessori schools, there is not a necessity for a large gathering environment. The next highest value was found in Reggio Emilia schools and the lowest in Waldorf schools. The reason for the low variance values in Reggio Emilia and Waldorf schools is due to the large and spacious spaces in these schools, as predicted. The large and spacious *piazza* area in Reggio Emilia schools and the *eurythmy* space, where dance and movement are performed in Waldorf schools, are the spatial components that lower the variance values in these two educational settings.

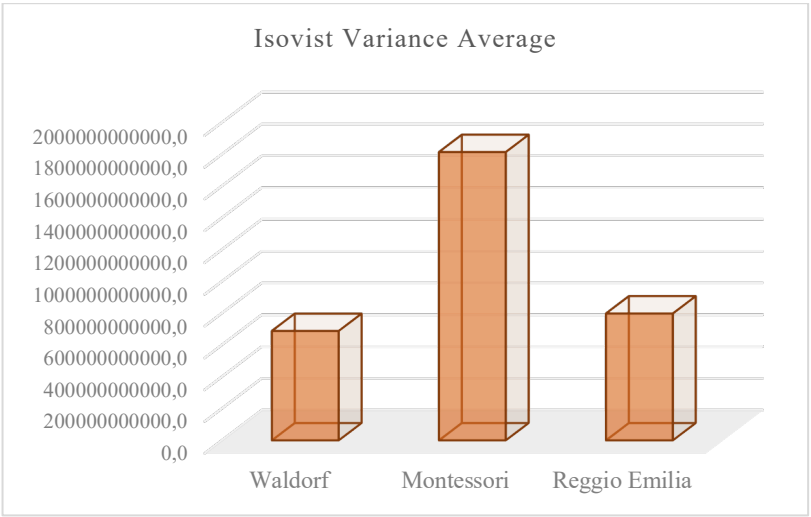


Figure 9: Comparison of isovist area variance averages of kindergarten buildings designed through Waldorf, Montessori, and Reggio Emilia approaches.

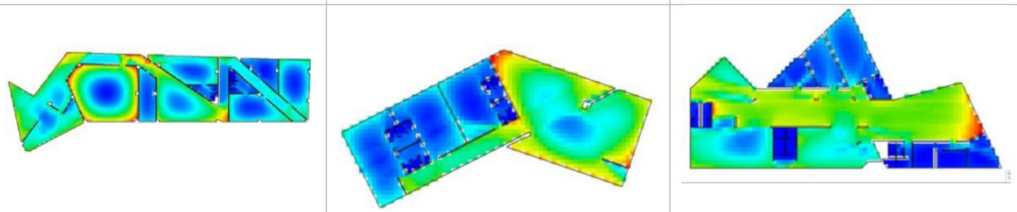
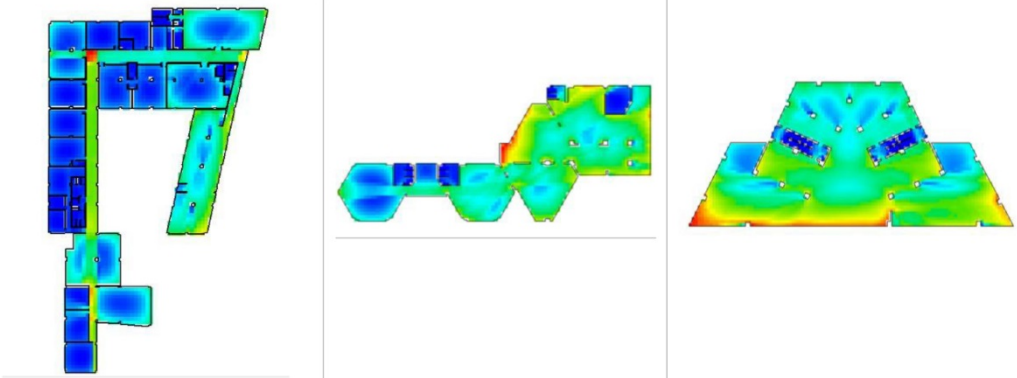
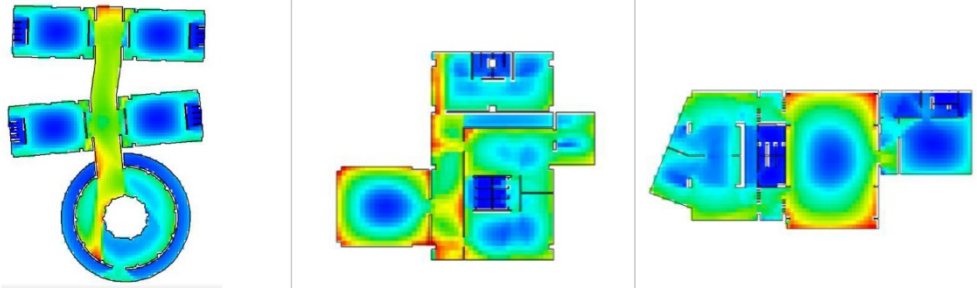
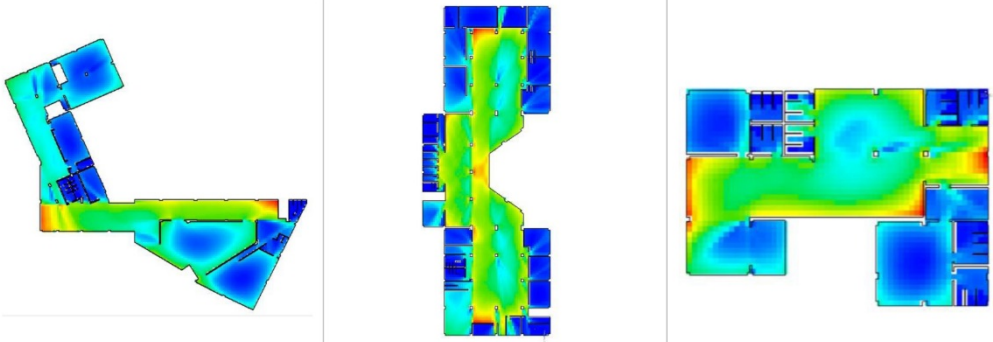
	Variance Graphs of Waldorf Schools	Variance Graphs of Montessori Schools	Variance Graphs of Reggio Emilia Schools
1			
2			
3			
4			

Figure 10: Variance graphs of twelve kindergartens based on three different pedagogies.

6 CONCLUSIONS

The Waldorf, Montessori, and Reggio Emilia preschool educational approaches, which started to be especially effective in the twentieth century, created radical changes in the education of children, deeply influenced the pedagogic attitudes towards children, and found wide reflections in the education of preschool children and today's educational environments. In this study, it was examined whether there are any differences in terms of spatial, social, and communicative

interaction through the projects designed following the spatial design requirements required by these three pedagogical philosophies. Although these three different approaches show many common features that value the individuality of the child, there are slight differences between them in terms of educational curriculum and equipment resulting in changes and alterations in the school environments of each pedagogical method.

Within this context, in this study, it was aimed to reveal whether there is any difference in the context of social interaction between pre-school education environments designed through Montessori, Waldorf, and Reggio Emilia methods, by using a two-partite methodology. Thus, in the study, qualitative and quantitative research methods were used together. With the qualitative research conducted through NVivo, it was aimed to semantically comprehend the extent to which second-year undergraduate architecture students who learned the spatial requirements of these three pedagogies comprehended the pedagogical aspects of the education methods, as well as the aspects related to nature, spatial setting, society and social communication. With the quantitative research, the *isovist area* and *variance* values of twelve schools in three clusters dependent on the pedagogical approach were investigated through Syntax 2D and the results were interpreted to generate a discussion on the social logic of preschool education environments.

Qualitative research, analysed by examining the expressions in the students' project reports, demonstrated that students, in addition to focusing on the spatial requirements specific to educational pedagogy, have realized that the preschool methods that created the educational thresholds of the 20th century have a socially transformative effect on societies even in today's cities. Additionally, considering the syntactic results about isovist area values, the mean isovist area value was higher in Reggio Emilia schools and lowest in Waldorf schools. This result regarding the Reggio Emilia schools can be due to the dominating characteristic of the *piazza* area, which is required for visual and social interaction, which is a requirement of the method and the architecture of the school. Considering the results about variance values, the school cluster with the highest variance value has emerged in Montessori schools, and this draws attention to the fluctuating isovist perimeter value to direct the individuals to the classroom since the most important part of the Montessori school architecture is the classroom unit.

Besides, considering how such studies can contribute to the literature, studies on kindergartens can have positive effects in increasing the dialogue between various individuals in preschool buildings and thus facilitating the adaptation of children to school. This study is an examination that contributes to the literature on the subject of kindergartens' physical setting through space syntax since there has not been encountered with any study on the space syntax among kindergartens arranged according to different pedagogical approaches. Thus, these results show that different pedagogical approaches have the potential to cause different physical environments, and accordingly diverse physical environments are effective on social interaction and internal circulation within the school environments. Additionally, it is thought that the use of variance

value in this study, which is one of the parameters that is rarely used in deciphering the social logic of space in architectural research, contributes to the potential of using the variance value in research where space syntax is used as a methodological approach.

In addition to its quantitative data, this study makes a contribution to the architectural studio culture with its qualitative perspective. With this study, it is underlined that when the students in architecture departments try to deal with a new design problem, they also realise the importance of the historical background of the building typology, the influence of the significant scholars who are influential in the structuring of the architectural spaces, and the transformative power of the spatial settings which creates an impact on architecture and society.

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