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PRIMARY SCHOOL TEACHER CANDIDATES' PERSPECTIVES ON CLASSROOM ENVIRONMENT DESIGN

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Abstract

The purpose of this research is to explore prospective teachers' perspectives on the physical arrangement of an ideal classroom as a learning environment. A phenomenological design was used in this study to reveal the views of prospective teachers about the components and features of an ideal, desired classroom environment. Fifteen teacher candidates in their 4th year in the departments of primary education, science education, and social studies education participated in the research. In the study, two main themes (My classroom, My Advantages) along with ten sub-themes were created regarding the classroom environments envisioned by the prospective teachers. As a result of the analysis, six (6) sub-themes were identified under the theme of "My Classroom": technology-supported classroom, laboratory classroom, well-equipped classroom, interactive classroom, nature-based classroom, and flexible classroom. Under the theme of "My Advantages", four (4) sub-themes were identified: one-to-one teaching, active participation, activity-based learning, and attention-grabbing features. The findings show that teacher candidates believe that the physical environment of classrooms should be different from the traditional classroom layout. They are aware of the importance of providing individualized attention to students and have designed technologically equipped, spacious, and flexible classrooms where they can implement engaging activities that will sustain their students' interests.

Keywords: Ideal classroom environment, design, phenomenology, primary school.

INTRODUCTION

The most important factor that distinguishes formal education from lifelong education processes is the necessity of a planned and programmed education provided within a defined setting. Classrooms created in schools by considering the developmental characteristics of students are the environments where teaching and learning take place. The goal of education is to foster desired behaviours in individuals through effective teaching. In order to achieve this goal, it is essential to have classroom environments suitable for teaching, because a classroom serves as a communal area where educational activities take place for specific educational objectives (Aydın, 2012).

Central to the achievement of the goal of education and the effective execution of teaching activities is the classroom environment. Numerous studies in the literature suggest that the physical arrangement of the classroom positively affects learning (Evans, 2006; Fischer, 2001; Suleman & Hussain, 2014; Verschaffel et al., 1999; Wasnock, 2010). The common conclusion reached in these studies is that the classroom environment positively affects the students' learning process and enhances overall performance. Establishing a high-quality learning environment fosters student interaction, collaborative learning, and the development of intellectual skills, which enhances student outcomes (Evans, 2006; Tanner, 2009).

In the contemporary era, in which technology and digitalization are advancing rapidly, individual interests and needs are also evolving at an unprecedented pace. Schools are recognised as the pivotal agents of this change. In order to respond to changing demands and needs, expectations from schools and classroom environments where teaching takes place are also changing. As posited by Harvey and Kenyon (2013), contemporary pedagogy and learning methods do not support traditional classroom environments. The education programs implemented today have been designed according to the

constructivist approach, which supports this understanding. Constructivism is a learning approach in which students access information autonomously and construct meaning based on their prior experiences by creating an effective learning environment under the guidance of the teacher (Doğanay & Sarı, 2012). Consequently, a constructivist classroom environment should differ from the conventional classroom environment. A variety of studies have been conducted on how the classroom should be organized (Aldridge, Fraser, & Taylor, 2000; Brooks & Brooks, 1993; Doğanay & Sarı, 2007; Fosnot, 1996; Taylor, Fraser, & Fisher, 1997; Yager, 1991). The classroom environment commonly addressed in the studies includes technology-integrated arrangements that facilitate the activation of students' prior knowledge and experiences and promote collaborative work.

The teacher plays the biggest role in creating a classroom environment that aligns with the curriculum philosophy. This is because the teacher is responsible for determining instructional methods considering the personal and developmental characteristics of the students and implementing the curriculum most effectively. Şahin (2019) asserts that the decision made by the teacher, who is responsible for modifying the classroom setting, when necessary, in order to enhance student success and to carry out activities in accordance with the program objectives, is crucial for improving lesson effectiveness and ensuring student participation in the lesson.

In order to carry out teaching activities in the classroom, the teacher' primary responsibility is to cultivate a classroom environment where students can feel a sense of belonging (Scott, Leach, & Bucholz, 2008). As suggested by Bucholz and Sheffler (2009), the classroom environment designed by a teacher either increases or decreases students' learning aptitude and their sense of comfort in the classroom. Hence, teachers need to establish a classroom environment that is open to learning (Cookson, 2006). Furthermore, Verschaffel et al. (1999) identified students' ability to participate in the lesson more actively, construct their own knowledge, and to develop cognitive skills as pivotal features of effective learning environments.

The physical organization and design of educational settings are recognized as crucial factors in ensuring the efficiency of the educational process and improving learning outcomes (Ahmad & Amirul, 2017). Learning environment design is defined by Lefoe (1998) as determining teaching methods and planning the instructional environment for practice. Learning environment design is a complex whole that encompasses different variables. It is teachers who assume control over these variables and guide learners toward achieving desired learning outcomes (Wilson, 1995).

Classrooms are the most important environments where students interact with each other and their teachers. The classroom environment where teacher-student interactions are most intense plays a significant role in the emotional, social, and cognitive development of students. (Evans et al., 2009). Therefore, it is essential to create classroom environments where teachers can apply their teaching skills, which are shaped by their pre-service education. In this sense, the classroom settings preferred by prospective teachers in the light of the knowledge and skills they have acquired are getting highly important for identifying their areas of application. This study seeks to explore prospective teachers' perspectives on how the physical arrangement of an ideal classroom, as a learning environment, should be. It also aims to determine their views on the classrooms they would like to have in the future and offer insights into potential learning environments.

METHOD

Research Design

The study employed a phenomenological design, one of the qualitative research methods. Phenomenological studies delve into how people make sense of a phenomenon and how meaning is constructed at the level of consciousness (Patton, 2014). In this study, phenomenological design was chosen since the research aimed to explore prospective teachers' perspectives on what constitutes the ideal, or desired classroom environment and what characteristics it should have.

Participants

The convenience sampling method, which is one of the purposive sampling methods, was utilized in the study. Neuman (2012) argues that in the purposive sampling method, individuals to be interviewed are selected considering their relevance to the research topic, rather than their ability to represent the universe (Neuman, 2012). In addition, the convenience sampling provides the researcher with an easily accessible group and the research gains speed and practicality (Yıldırım & Şimşek, 2011). In this context, 15 fourth-year teacher candidates from the departments of primary education, science education, and social studies education, where the researcher taught, were selected as the study group. The reason why the study was limited to fourth-year students in these departments was that they had taken the theoretical educational sciences courses required to design the ideal or desired classroom environment.

Participation in the study was on a voluntary basis. The characteristics of the prospective teachers who participated in the study are presented in Table 1.

Table 1. Distribution of the study group by department and gender

Participant	Gender	Departments
S1	F	Primary Education
S2	M	Primary Education
S3	F	Primary Education
S4	F	Primary Education
S5	M	Primary Education
F1	M	Science Education
F2	F	Science Education
F3	F	Science Education
F4	F	Science Education
F5	F	Science Education
Sos1	F	Social Studies Education
Sos2	M	Social Studies Education
Sos3	M	Social Studies Education
Sos4	M	Social Studies Education
Sos5	M	Social Studies Education

A total of eight participants were female and seven were male (codes were assigned based on their departments rather than their names). There were five prospective teacher volunteers from each department (Primary Education, Science Education and Social Studies Education).

Data Collection Tool and Process

In this study, an open-ended opinion form developed by the researcher was used as the data collection tool. In order to ensure content validity, the form was finalized after the relevant literature was reviewed and expert opinion was obtained from two faculty members specializing in education management, and curriculum and instruction. With this data collection tool, prospective teachers were asked to design a classroom environment and justify their drawings. They were asked to explain why they chose such a classroom environment and describe the advantages of the classroom environment they conceptualized. The drawing method was preferred to allow individuals to express themselves and reflect on their emotions and thoughts (Barrantes-Elizondo, 2019; Schratz & Steiner-Löffler 1998). Additionally, the data obtained through this method were believed to contribute to the research objectives (Bland, 2018) since they could be treated and analysed as a form of text (Bland, 2012).

The prospective teachers participated in the face-to-face interviews, and a voice recorder was used to record the sessions obtaining the respondents' consent. A total of 15 prospective teacher volunteers were interviewed, and the interviews lasted approximately 20-25 minutes, 350 minutes in total. The interview recordings were transcribed verbatim and were used as a data source for the study. During data collection in this study, voluntary participation was ensured, the names of the participants were kept confidential, and the ethical principles of scientific research were adhered to throughout the entire process.

Data Analysis

The drawings of the prospective teachers and the explanations about their drawings were analysed using descriptive analysis. This approach aims to organize and interpret the data obtained from interviews and observations. The data are classified, summarized, and interpreted based on predetermined themes (Yıldırım & Şimşek, 2008).

To ensure the reliability of the research, two faculty members were involved in the process to verify consistency in coding. While calculating the coding consistency, necessary adjustments were made after examining the consistency of the coding between the coding performed by the two faculty members and that of the researcher. Miles and Huberman's (1994) 'Percentage of agreement formula = [Agreement / (Agreement + Disagreement)] x 100' was used to calculate consistency between the coders, and the level of agreement between the coders was determined to be 86%. Miles and Huberman (1994) considered an agreement level of 70% and above to be sufficient for a study to be reliable. Given that the agreement level achieved in the present study was 86%, it can be concluded that the research is reliable. Furthermore, a total of ten sub-themes were identified under two predetermined themes.

RESULTS

In this section, the data were analysed using descriptive analysis. The findings were presented by including direct quotations from the interviews. Sub-themes and codes were developed pertaining to the themes identified regarding the classroom environment designs of the prospective teachers. In accordance with the research questions, two themes were identified: "My Classroom" and "My Advantages". As a result of the analyses, six sub-themes were established under the theme of "My Classroom": technology-supported classroom, laboratory classroom, well-equipped classroom, interactive classroom, nature-based classroom, and flexible classroom (Figure 1). Additionally, four sub-themes were formed under the theme of "My Advantages": one-to-one teaching, active participation, activity-based learning, and attention-grabbing features (Figure 1).

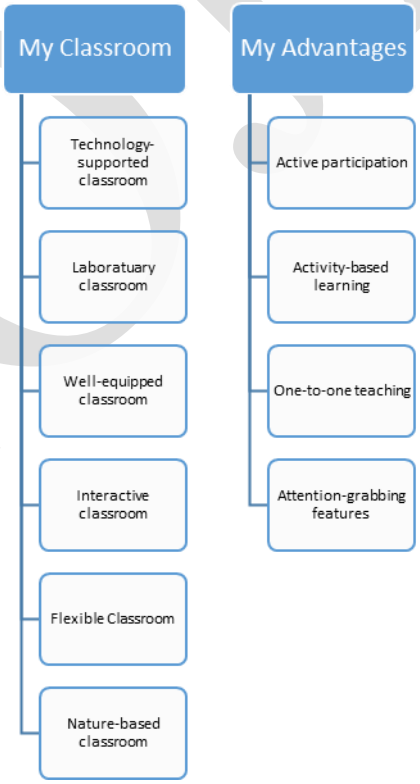

Figure 1. Main themes and Sub-themes

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My Classroom

The prospective teachers were asked to draw the ideal classroom environment they would like to teach in and provide explanations for their drawings. In line with the drawings and explanations of the prospective teachers, the sub-themes of technology-supported classroom, laboratory classroom, well-equipped classroom, interactive classroom, flexible classroom, and nature-based classroom were created under the theme of 'My Classroom'. The study conducted with prospective teachers from three specific departments revealed similarities in the classroom arrangements they desired. Only two students in the science education department designed their classrooms as laboratory settings, while two others created areas in their classrooms that could function as laboratories. Additionally, three students from the primary education department and two students from the science education department underscored the importance of their classrooms being integrated with nature and designed open spaces or classrooms with large windows.

Technology-Supported Class

All the prospective teachers included instructional technologies in their envisioned classrooms. Each teacher candidate emphasized the availability of smart boards and internet in their classrooms. Their views on this issue are as follows:

"...I would like my classroom to be technologically equipped. "I would like to have at least a smart board, and of course, Wi-Fi" (S1).

"...There should definitely be a large touch screen or a smart board, which is the most accessible option right now, in my classroom" (Sos2).

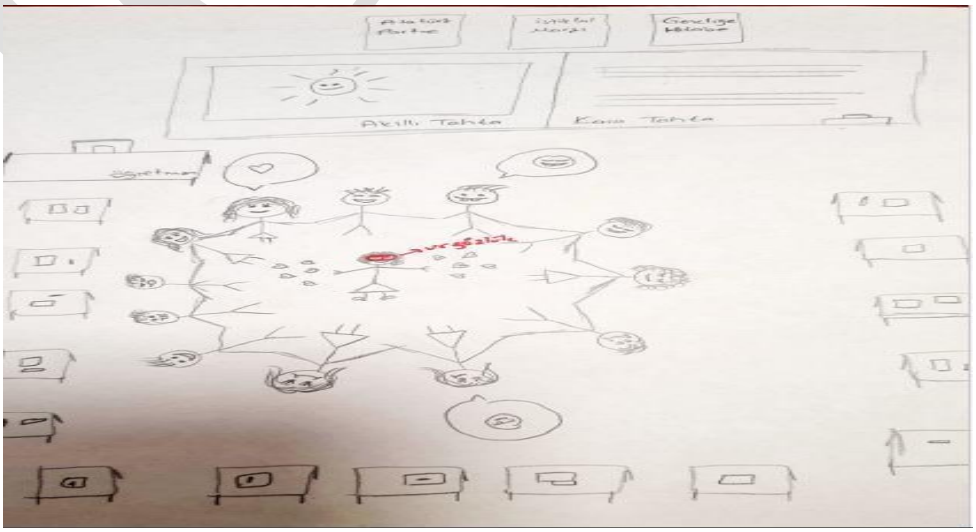
"...Technology should be used to add visuality and to ensure permanent learning, so I added a smart board to my drawing" (F4).

In addition to the smart board, two students from the science education department, one from the social studies department, and three from the primary education department highlighted the importance of having VR glasses in their classrooms. Their views are as follows:

"...It would be effective to use VR glasses, especially on subjects like planets, and plant and animal cells, I would like to have them in my classroom (F2)."

"Since students are still in the concrete operations stage, visuality is important. I think especially three-dimensional studies might be effective and VR glasses could be useful in this regard" (S5).

"For example, in the topic of landforms, VR glasses would be better than pictures. I would like to have them in my class, and they would also be attention-grabbing" (Sos 2)



Picture 1. S5's classroom design

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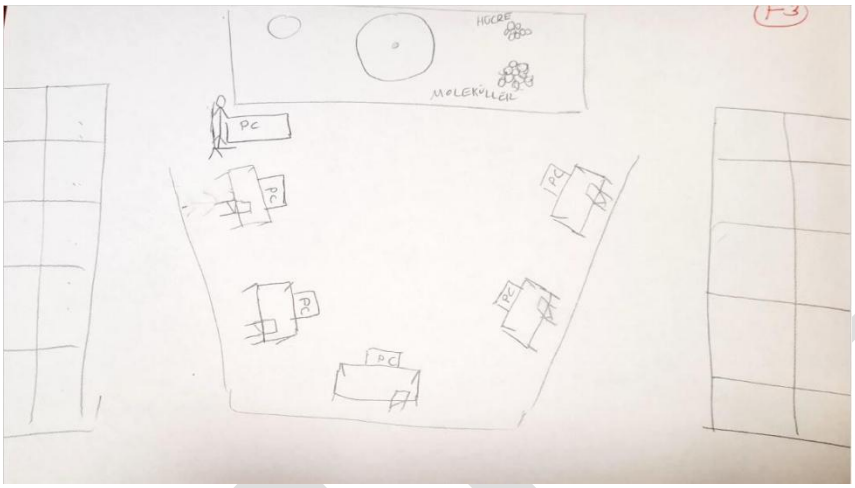
A participant from the science education department designed a classroom that is completely digital and explained how it should be:

"I would like my classroom to be a digital classroom. I often research technological classrooms myself. It would provide students with more current and concrete experiences, and it would appeal more to Generation Z. There would be a large screen, each student would have a computer, there would be interactive computers with the blackboard, and the teacher would be able to project the screen of any student, I would like a digital classroom that is connected to the internet when needed and even connected to schools in different countries..."(F3)



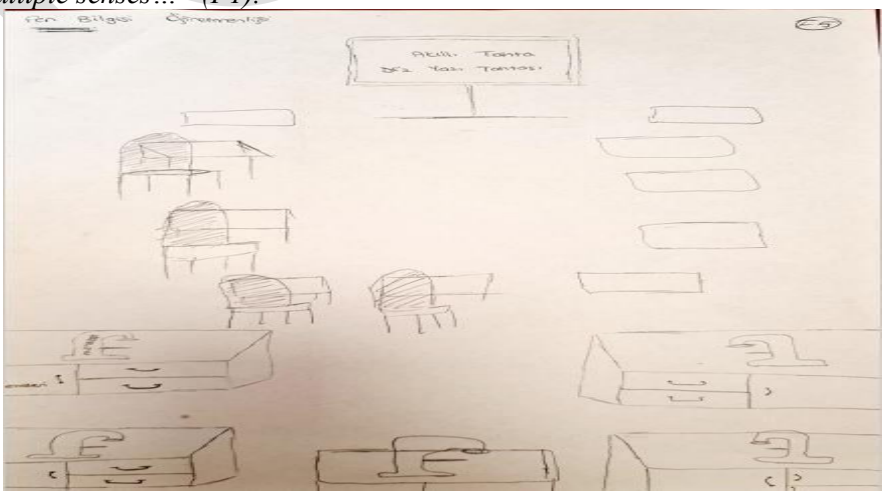
Picture 2. F3's design

Laboratory Class

The prospective teachers in the science education department have stated that their classrooms must be supported by laboratory facilities. Only F3 did not include a laboratory in her classroom design; she made fully digital designs. The prospective teachers emphasized that laboratory studies should be carried out in science classes due to the nature of the content and for learning to take place in the most concrete way. Their explanations and drawings regarding this aspect are given below.

"…there are experiment tables right behind the desks for students to conduct experiments, with two students at each table. In this way, a laboratory environment is created in the classroom…" (F5).

"Since I am studying in the science education department, I would like to teach my course in a laboratory setting, as required by my department… Because our subjects generally include topics that are challenging for children to comprehend, and the laboratory environment facilitates learning by appealing to multiple senses…" (F1).



Picture 3. F5's design

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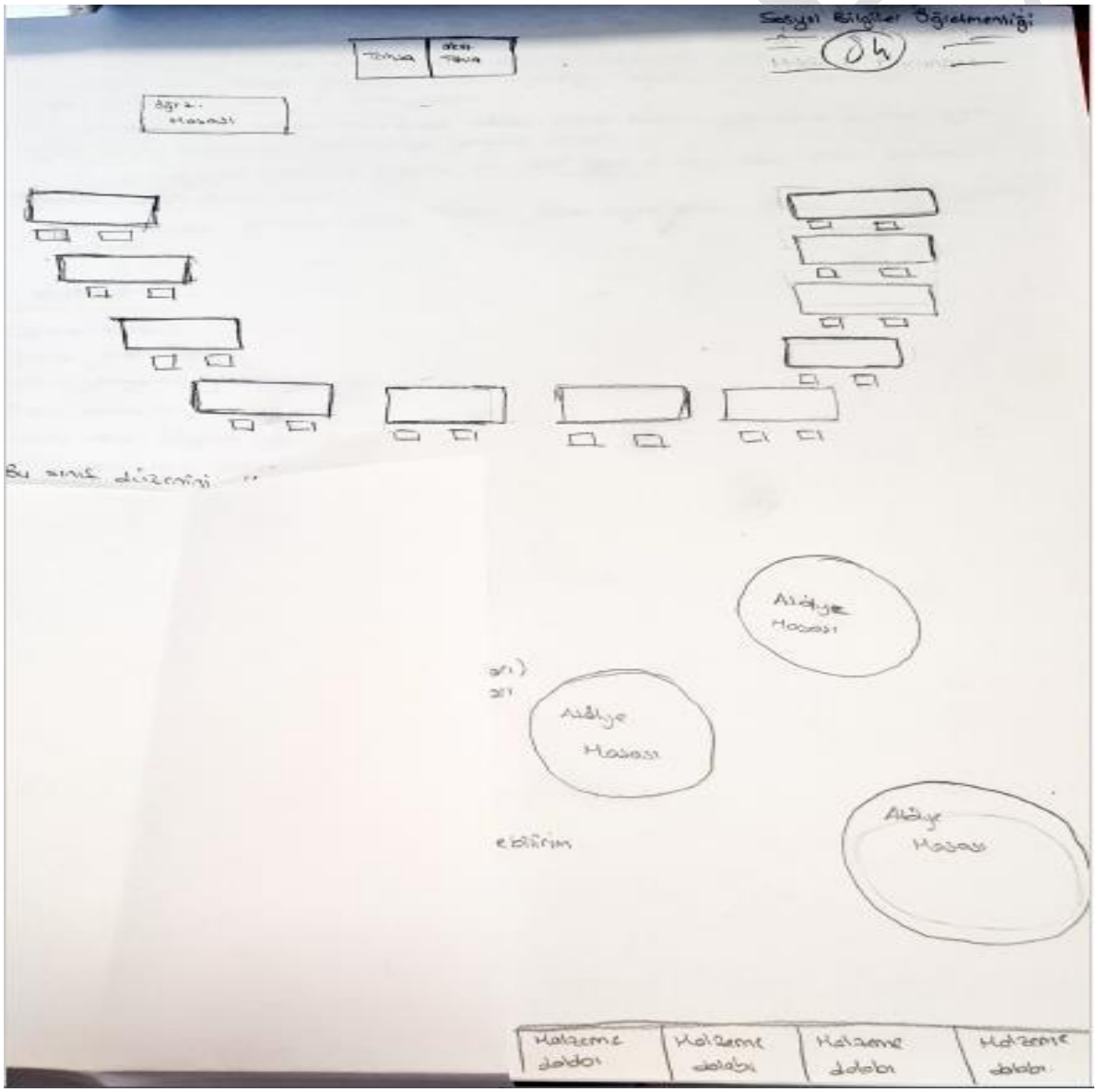
Well-Equipped Classroom

The prospective teachers emphasized the importance of having well-equipped classrooms in terms of instructional materials and included material cabinets or personal storage units in their designs where materials could be stored. They expressed that there was a requirement for maps, models, and a wide range of materials for activities and experiments to be readily available. The statements of Sos3 and S4 on this issue are as follows:

"I added workshop tables to the classroom because I think they are necessary for drawing projects and maps, and I included material cabinets to store our materials. Here at the university, we learned that permanent learning occurs through visualization, so I would like my classroom to be rich in materials (Sos 3)."

"I would like my classroom to be designed in a way that is the least time-consuming as possible. I would like all kinds of materials and models that I need during the day to be readily accessible. Therefore, I placed open material shelves on the wall and designed the back of the classroom as an exhibition area (S4)."



Picture 4. Sos3's design

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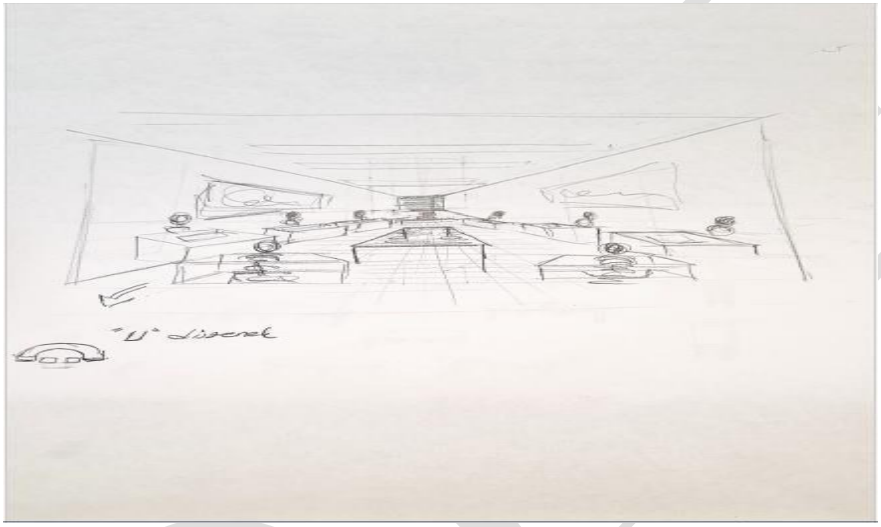
Interactive Classroom

The prospective teachers excluded traditional desk arrangements from their classroom designs and explanations because they believed that students would be at eye level with their peers, the teacher would be able to maintain better control, and the interaction and communication within the classroom would be improved. They mostly used U-shaped and half-moon-shaped seating arrangements in their designs, as well as folding tables and chairs and round tables to foster group interaction. In addition, they limited the class size to a maximum of 15-20 students to cater for each student according to their abilities and to teach effectively. For example, S2 explained this situation as follows:

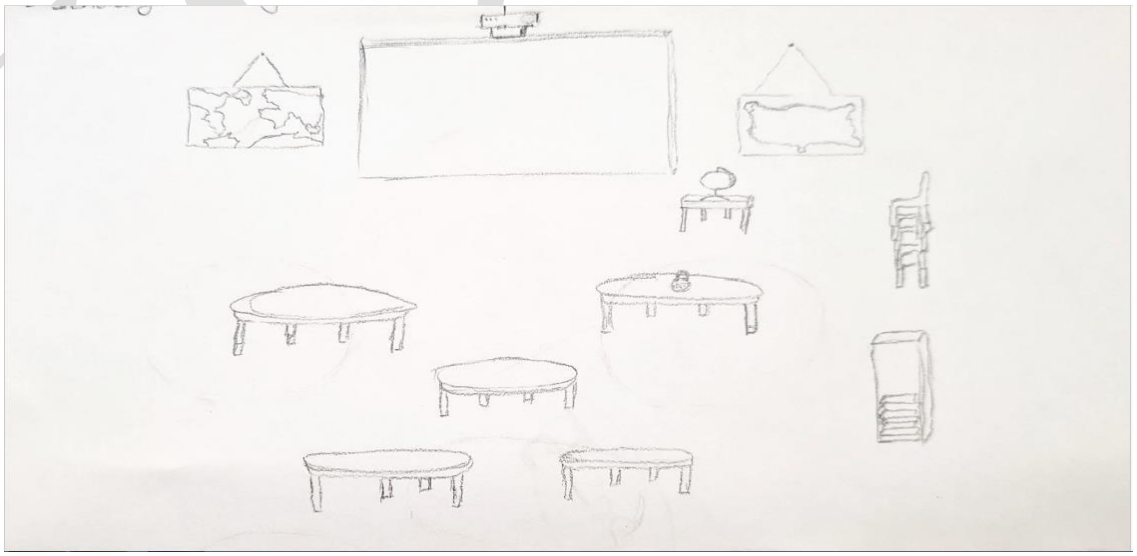
"Classes with U-shaped seating arrangements accommodate 15-20 students, and in this seating plan, where both theory and practice are easily taught, students are at eye level with their peers...class participation becomes more dynamic (S2)."



Picture 5. S2's design

A prospective social studies teacher preferred a round table in his classroom. He justified his choice as follows:

"Having a round table and not having a platform or a teacher's desk would remove the status difference and implicit message between the teacher and the students, making it more interactive...(Sos5)"



Picture 6. Sos5' design

A participant from the social studies education department designed the classroom setting in the shape of a moon and emphasized that students could express themselves more comfortably in this way and that the traditional seating was a hierarchical seating arrangement.

"...the reason why I designed my classroom in the shape of a moon is that the traditional seating follows a hierarchical seating arrangement. Students cannot express themselves, they tend to hide, there is less participation in the lesson, and those sitting in the back rows try to remain unnoticed. The moon shape arrangement, on the other hand, allows students to see each other and prevents their feelings of isolation, and facilitates mutual communication... "Sos(2)

Flexible Classroom

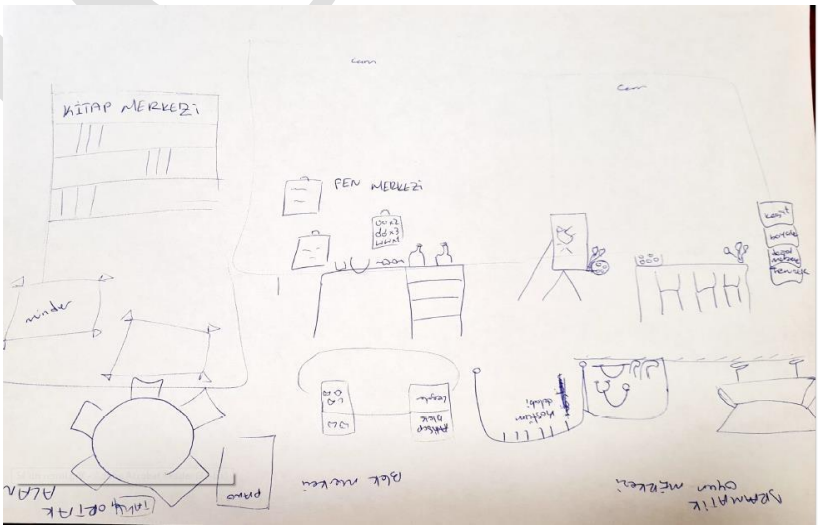
Participants underscored the importance of having a flexible environment in their classrooms. Especially the participants from the primary education and social studies education departments who highlighted that they wanted to provide both loud and quiet atmosphere when needed designed classrooms in which they could switch to a cushioned seating arrangement when necessary, or even play carpets were available in the middle. For example, one prospective primary education teacher wanted to use folding tables and chairs. She emphasized that she aimed to create a comfortable environment by removing the tables and placing cushions in the central area when necessary. Three of the participants from the primary education department designed more comfortable classrooms with larger spaces and included cushioned areas.

"...the reason why I used folding tables in my classroom is that I wanted the tables to take up less space in the classroom, leaving plenty of room for movement and the play area because teaching through play is important at this age and we need a more flexible environment" (S1).

"...sometimes it may be necessary to play loud games in the classroom, but we should avoid disturbing other classes, so I thought at least certain part of the classroom could be soundproofed. We should also be able to sit on the cushions and chat about books when we want. I would like to have an adaptable, flexible classroom" (S4).

"Social studies can be boring for students. In order to create a warmer, friendlier environment, a corner of the classroom can be designed with a comfortable seating arrangement with cushions. Historical documentaries and even debates could be better, and it could be even better if that corner is soundproofed" (Sos2)

"We should use visual elements and models a lot in science education; there should be different centres in the classroom where students can access these materials whenever they want, and there should be comfortable and flexible classrooms..." (F2).



Picture 7. S4's design

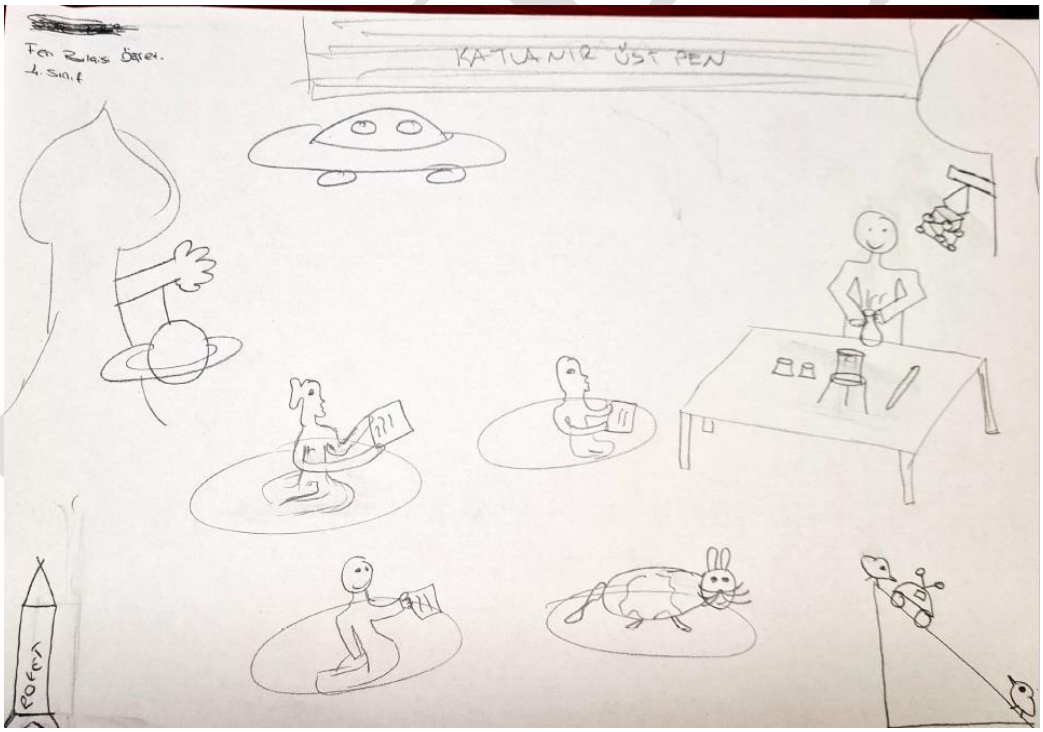
Nature-based classroom

Three of the prospective primary education teachers and two of the science education teachers emphasized that their classrooms should be intertwined with nature and designed open spaces or classrooms with large windows. They added that they designed nature-based classrooms because it was important for children to be in touch with nature for their cognitive, affective, and kinaesthetic development. While explaining their designs, they provided the following explanations:

"I prefer open air as a classroom environment. I wouldn't want to confine students to stereotypes and create a classical environment. This open space could be covered in winter so that students would connect with nature both in summer and winter. In addition, the classroom would not just include students, but also living creatures like animals, so a sense of unity would be ensured. Awareness of nature and the environment could be fostered more easily..." (F2).

"I would like my classroom to have large wall-to-wall windows extending from the ceiling to the floor. The classroom should overlook a green area. Children could have the chance to observe the outside, nature. It would be wonderful to explain the formation of water and talk about the colours of a rainbow while watching the rain..." (S1).

"It is difficult to draw children's attention to the lesson and the subject constantly, but I think it would be easier to guide them in nature. Wouldn't it be interesting if we could open the roof and let them watch the sky when they felt bored? Then it would be easier to reengage them in the lesson. Drawing attention using nature rather than artificial materials..." (S4)



Picture 8. F2's design

My Advantages

The prospective teachers were asked to justify and explain their classroom designs. In line with their explanations, four (4) sub-themes were identified under the theme of "My Advantages": one-to-one education, active participation, activity-based learning, and attention-grabbing features. Participants from the science education, primary education, and social studies education departments emphasized that they wished to establish their classrooms as areas in which students could move freely and engage in diverse activities. Furthermore, they expressed a desire to implement one-to-one education model, characterised by reduced class sizes and the creation of an engaging and participatory learning environment.

One-to-one Education

All the participants aimed to provide individualized attention to their students, communicate well with the entire class, and allocate more time for each student. They explained that the physical condition for achieving these goals was to have few students in large classes. They regarded large classes with small class sizes as an advantage for one-to-one education. For example, the statements of Sos1, F4, S5 are given below:

"I would like to have a maximum of 15 students in my class, but I want it to be a large class in size. In this way, I can take care of every student; I don't want to have a student that I haven't connected or communicated with when my lesson is over..." (S1)

"I designed a large classroom with few students so that I could interact more with a higher number of students and allocate more time to them. I think having a large class with a small student population is the biggest advantage for a teacher (F4)."

"First of all, it would be a large class, but student population would be small; for instance, having 15 students is ideal. Because the teacher can pay closer attention to each student. The teacher could provide better individual feedback, in other words, we could support their individual development more effectively. (Sos 1)

Active Participation

The prospective teachers aimed to foster one-to-one education by designing large classrooms with a small number of students, and at the same time designed an environment where students could actively participate. According to the teacher candidates, large spaces and alternative seating arrangements rather than the traditional desk setups mean environments where students can move more freely in the classroom, express themselves more comfortably, and participate in the lesson more actively. The statements of the participants are provided below:

"I designed my classroom with cushions because in such an environment, students could be comfortable, enjoy themselves, and get more motivated. Additionally, since they are comfortable, their interest in and participation in the lesson increase, which is an advantage for the teacher." (F2)

"I think students will be more eager to learn if the classroom arrangement fulfils their need for love and belonging. For this reason, I think my flexible classroom environment will encourage students to take an active part in the lesson. After all, it is students who will be active in the process, not me." (Sos 4)

"I aimed for space comfort in my classroom. They will be playful children, so they will be more eager to participate in the lesson in a spacious environment that facilitates access to materials. And our goal for students is to ensure that they take an active role in the lesson, isn't it?" (S3)

Activity-Based Learning

While designing their classrooms, the prospective teachers underscored the importance of using open shelves to store materials and even personalized cabinets other than the classroom cabinets. They stated that they made such a design to be able to implement activities tailored to each learning outcome in their classrooms and to ensure that students could easily access the materials they need. The prospective teachers added that they should conduct activity-based lessons to engage students actively in the classroom and achieve meaningful learning. They also aimed to design classrooms with ample materials and even technological products.

"I wanted to have shelves in my classroom that children could reach, so that students could easily take and return their materials. Since I will be a classroom teacher, I'll always need to visualize lessons, so I'll implement plenty of activities. I think it's essential to have areas with open shelves where materials and products can be displayed for each unit, which I believe will be greatest advantage..." (S4)

"Social studies classes are already boring for most students. The more activities I conduct and the more diverse visuals I use and even design web-based games and activities, the more eager students will be. Therefore, my classroom should be large enough to conduct these activities, and there should be shelves

to store materials and at least a smart board..." (Ss 2).

"I designed a digital classroom. The program is based on a constructivist approach so that students can carry out research and engage in web-based activities and even experiments regularly. Constructivism includes learning through hands-on experiences as well, and there should be digital activities for digital children, my biggest advantage is the ability to implement activities" (F3)

Attention-Grabbing Features

The prospective teachers stated that incorporating various visuals and even using vivid colours in their classrooms could positively affect the learning process. For this reason, they expressed a desire to have elements in the classroom such as paintings, sculptures, and illuminated panels on the walls in accordance with the theme of the lesson and emphasized that they could provide an advantage to capture students' attention. For example, the perspectives of Sos5, F1, and S5 regarding this issue are as follows:

"If I were to design a separate classroom for the social studies class, I would definitely like to have attention-grabbing elements suitable for the lesson. That's why I drew a huge globe in the centre of the classroom and designed a small interior landscape around it. The greatest advantage of my design is that it will capture attention. A map with an illuminated panel on the wall...I think students would be more interested and would eagerly come to class." (Sos 5).

"Today's classrooms are boring, monotonous...I'd like my students to say wow and become intrigued when they enter the classroom. It would both serve as a laboratory and a comfortable classroom. For example, if there are visuals on the walls related to the subjects, this will attract their attention..." (F1)
"There should be a warm environment to familiarize and endear young children to school and the classroom. There should be vivid, striking colours... there should be boards that I could organize according to each theme. For instance, there could be cartoons on the boards that are interesting and related to topics. The students would enjoy reading and learning them, and these attention-grabbing elements would be my advantage..." (S5)

DISCUSSION, CONCLUSION, and RECOMMENDATIONS

Most of the contemporary educational programs are based on constructivist philosophy, with traditional approaches gradually being abandoned. Contemporary approaches highlight the individuality of the student and underscore the impact of learning environments. More flexible classroom environments that support cooperative learning and consider students' individual differences can be described as environments that are compatible with the philosophy of the program. The present study aimed to provide data on potential learning environments by asking teacher candidates to design classroom environments where they could apply the theoretical knowledge they acquired at the faculty and to explain their drawings. This study was limited to the perspectives of 15 prospective teachers who were designated as the participants in March 2024. In the study, two main themes (My Classroom, My Advantages) and ten sub-themes were identified regarding the classroom environments these prospective teachers envisioned.

According to the findings of the study, the prospective teachers, irrespective of the branches they belonged to, wanted to create attention-grabbing, active, spacious, and comfortable environments in their classrooms by considering student characteristics. In this framework, when the participants' perspectives on the ideal classroom environment were analysed, six sub-themes called technology-supported classroom, laboratory classroom, well-equipped classroom, interactive classroom, flexible classroom, and nature-based classroom were identified under the theme of my classroom. The rationale for including each of the classroom features was discussed under the theme of my advantages.

All the prospective teachers included a technological tool in their classroom designs, and even one participant from the science education department designed a completely digital classroom. Today, as technology has become an integral part of our daily lives; students in schools and classrooms aspire to engage with the technological tools they are accustomed to. The constructivist approach, which forms the core of educational programs, also supports technological transformation. Laney (1990) maintains

that combining technology with the constructivist approach is effective in enhancing students' higher-order thinking skills. At this point, the prospective teachers emphasized the importance of having technological tools like smart boards and internet access in their classrooms. These digital tools have become active components in classrooms in order to facilitate access to information and provide diverse learning experiences. Şensoy and Sağsöz (2015) point out that these technological opportunities extend the boundaries of the learning environment beyond the school, facilitate access to information, and transform the environmental understanding of teaching. In fact, as advocated by one of the prospective teachers in the study, transition to digital classrooms should take place. According to the literature, a digital classroom is defined as a space equipped with computers and communication technologies (ICT). In the classroom, students have access to computers, internet, electronic dictionary, and other technological tools (Liang, Liu, Wang, Chang, Deng, Yang, Chou, Ko, Yang, & Chan, 2005). There are studies in the literature suggesting that digital classroom increases learning motivation and achievement (Brown, 2011; Gulek & Demirtas, 2005; Güven & Sülün, 2012; Judge, 2005; Sinclair, 2009; Su & Klein, 2010; Weathersbee, 2008).

The prospective teachers emphasized that having a technology-supported classroom would provide numerous advantages. These are the advantages related to active participation, one-to- one education, and well-equipped classrooms, under the theme of my advantages. They expressed that integrating technology into their classrooms would allow students to progress at their own pace, provide them with one-to-one education, and ensure more effective participation, ultimately making it a well-equipped classroom. A study conducted by Çağıltay et al. (2007) suggests that technologies that provide easy access to necessary resources and tools foster active participation in the lesson. Likewise, Sarıtaş and Yılmaz (2009) conclude in their study that especially learning environments equipped with computer technologies promote active and effective participation in the classroom.

Four (4) participants from the science department expressed a desire to equip their classrooms with laboratory equipment. The participants have emphasized that the content of science classes is experiment-based, and that students learn best through first-hand experiencing and concretizing events and phenomena. Thus, they have expressed a desire for their classrooms to be especially suited to a laboratory environment. Given that most of the science subjects are based on experimentation and observation, the prospective teachers have regarded laboratory environments essential in their classrooms. In the literature, there are studies indicating that laboratories play a crucial role in helping students learn science lessons more effectively (Ayas, 2006; Cheung, 2007; Domiz, 2007; Freedman, 1997; Kırpık & Engin, 2009; Meb, 1995; Kocakülah & Savaş, 2011). For example, Ayas (2006) maintains that students can engage in activities based on hands-on learning through concrete experiences in a laboratory setting. Oğuzkan (1981) defines the laboratory as a space where students can have direct experiences related to science, underscoring its value in science courses. In addition, in their study, Kırpık and Engin (2009) describe the world as a laboratory and the science course as the area for applying scientific experiments and highlight the critical role of the laboratory in teaching science to students effectively and efficiently.

Emphasizing that their classrooms should be well-equipped with materials, all the prospective teachers incorporated material cabinets or personal cabinets in their designs, where materials could be stored and protected. They reported that they wanted their classrooms to be equipped with complete sets of maps, models, and materials for activities and experiments. Under the theme of my advantages, the pre-service teachers highlighted that a well-equipped classroom would make lessons more engaging and enable teachers to conduct activity-based lessons. As another advantage of having a well-equipped classroom, they stated that students could be active learners rather than passive recipients in activity-based lessons. The prospective teachers regard well-equipped classrooms as a prerequisite for student-centred education. It is imperative for students to participate actively in lessons to facilitate meaningful learning. In this sense, the prospective teachers advocated for their classrooms to be well-equipped with course materials. As a matter of fact, the perspectives of the participants in this study are also supported by the existing literature. In his study, Ergür (2010) attaches importance to learning environments enriched in terms of content and materials for students to be active learners. In addition, in well-equipped

classrooms, lessons can become more interesting for students, which can create willingness to learn. Studies indicating that enriched classroom designs can increase student engagement and motivation confirm these desires of the prospective teachers (Herreid & Schiller, 2013; Kaya &Kılıç-Çakmak, 2015; Olssen, 1996; Reece & Walker, 1998). There are different research findings reporting that equipping classrooms with materials and educational content allows students to develop positive attitudes towards the course and stimulates student interest (Ayaz, 2016; Betoret & Artiga, 2004; Chism & Bickford, 2002; Özer & Tunca, 2014; Yeşiltaş, 2016). Consequently, it is a very important result for the participants to design well-equipped classrooms in order to capture students' attention and promote active participation in the lesson.

In their classroom designs, the prospective teachers incorporated U-shaped and half-moon- shaped seating arrangements, which they thought would improve interaction and communication in the classroom as well as opting for circular desk arrangements to enhance group interaction instead of traditional seating setups. In addition, they limited the class size to a maximum of 15-20 students to provide individualized attention to each student considering their abilities and achieve effective teaching. The prospective teachers designed spacious classrooms in which they could comfortably carry out activities with their students. They thought that the size and width of the classroom would allow them to conduct a variety of activities. As a matter of fact, there are many studies indicating that class size positively contributes to the achievement of learning outcomes and the establishment of an enjoyable and engaging classroom environment (Bucholz & Sheffer, 2009; Cookson, 2006; Gömleksiz & Bulut, 2008; Hill & Epps, 2010; Karaçalı, 2006). Student-centred learning environments not only increase student achievement but also enable students to have positive attitudes and enhanced learning experiences (Gömleksiz & Bulut, 2006; Çetin & Günay, 2006; Ulu, 2012; Yalın & Sezgin, 2006). The prospective teachers also emphasized that having spacious classrooms would have advantages such as promoting active participation, enhancing communication, and facilitating activity-based teaching.

The traditional desk arrangement available in schools makes it difficult for students to focus, brings about a noisy classroom environment, and reduces student-student and student-teacher interaction (Hannah, 2013). In this study, the prospective teachers must have had this awareness because they did not use traditional desk arrangements in their classroom designs. The majority of respondents expressed a preference for seating arrangements comprising U- shaped, V-shaped, and circular seating. Indeed, it can be posited that contemporary trends are increasingly gravitating towards seating arrangements that not only foster enhanced student interaction but also facilitate collaborative endeavours. It is a fact that the classroom seating arrangement enables to establish comfortable communication with students and gives students the opportunity to move freely, thereby increasing the functionality of the classroom. An effective seating arrangement should allow for in-class interaction and easy access to teaching materials. Students should make sure that they are visible to the teacher in the classroom and should be able to see instructional materials clearly. Therefore, seating arrangements are essential for the rational use of the classroom environment and the establishment of classroom interaction (Emer, Evertson & Worsham, 2003). According to the findings of the present study, it can be claimed that the prospective teachers were also aware of the importance of seating arrangements.

The prospective teachers designed flexible classroom environments in which they could separate the loud and quiet areas when necessary and even remove the tables and chairs from time to time and switch to a cushioned seating arrangement, which they believed would enhance interaction and foster active participation. The organization of a classroom determines whether students will have a passive or active role in that classroom (Saban, 2002, p.177). As posited by the prospective teachers in this study, the flexible organisation of a classroom, that is classrooms that can be adapted to different activities rather than keeping the traditional fixed desk arrangement, supports students' active engagement. Existing literature consists of studies conducted on the necessity of creating different, flexible desk arrangements in classrooms (Bucholz & Sheffer, 2009; Cookson, 2006; Bal, Keleş, & Erbil, 2002; Özden, 2002; Şahin, 2019). In addition, constructivist learning can be achieved through flexible classrooms. As stated by Yaşar (1998), constructivist learning environments should include open and comfortable arrangements that require students to take more responsibility and participate actively in the learning

process.

Some participants from the primary education and science education departments emphasized their desire to create flexible, interactive, and nature-integrated classrooms. For this reason, they designed open classroom areas or classrooms with large windows opening to gardens and nature. The prospective teachers reported that these designs aimed to provide their students with opportunities to observe the immediate surroundings and to foster their sense of curiosity and discovery. Additionally, they explained that their designs would offer advantages such as capturing students' attention, fostering active participation, and facilitating permanent learning. Pramling and Samuelson (2011) noted that children were always interested in exploring plants, animals, and all living and non-living things in nature. Many years ago, Comenius advocated that it was necessary for a child to establish a connection with a plant, a stone or an animal while learning a subject (Kanad, as cited in Temiz & Semiz, 2019). In this study, the prospective teachers indicated that learning in nature-integrated environments could facilitate sustaining children's interest. The literature supports this with studies showing that nature-integrated classroom environments support children's development and facilitate long- lasting learning. For instance, Smith and Sobel (2010) argue that the characteristics of the area where students live should be made use of for educational purposes as individuals who are familiar with their immediate environment can come up with sustainable solutions to the problems they encounter, starting from their own surroundings. Similarly, in their studies Beames, Higgins, and Nicol (2012) recommend that teachers make use of natural environments in their immediate surroundings for educational purposes.

School and classroom environments in which education and teaching take place mean much more than bricks and mortar; they symbolize society's responsibility toward education and reflect the culture, values, and worldviews of that society (Şensoy & Sağsöz, 2015). The prospective teachers involved in this study were also aware of this responsibility and believed that the physical environment of their classrooms should be different from the traditional classroom arrangements. They were aware of the importance of providing individualized attention to students and designed spacious, flexible, and technologically equipped classrooms where they could implement engaging activities to sustain their students' interest.

Recommendations

Considering the results of the study, the following recommendations can be proposed for the desired classroom environments from the perspectives of the prospective teachers: Traditional classroom arrangements should be abandoned, and classrooms that make use of educational technologies should be designed. Flexible classroom environments, where teacher-student and student-student interactions can be established more easily, should replace fixed desk arrangements. The notion that classrooms are made up of four walls should be abandoned, and classrooms should be transformed into places where students can learn through hands-on experiences.

As aligned with the constructivist approach, student-centred classroom environment designs may be more compatible with the philosophy of the educational programs. Various areas can be created in the classroom to suit the learning styles of students, such as individual and group study areas, quiet reading corners, and separate areas for creative activities.

In a constructivist classroom environment, modular furniture, including tables and chairs that can be easily moved, could utilized to allow students to work collaboratively. Visual materials, posters, and graphics that align with the learning outcomes can be placed on the classroom walls, providing students with valuable cues.

Interactive boards and tablets can enable students to learn on their own in line with the demands of the digital age. Classroom areas can be created where students easily access online resources.

This research is a qualitative study based on the perspectives of a certain number of prospective teachers from three particular departments. In future research, quantitative studies involving prospective teachers from a wider range of departments can be conducted to further explore the desired classroom arrangements. In addition, experimental or action research studies could be conducted to evaluate

student satisfaction or academic achievement resulting from different classroom designs. Moreover, teachers' perspectives could provide valuable insights into desired classroom environment designs.

Ethics and Conflict of Interest

This research has an ethics committee permit issued by the Pamukkale University Ethics Committee on 11.03.2024 with the decision numbered E-93803232-622.02-506666. The author declares that they have no conflict of interest.

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REFERENCES

Ahmad, C. N. C., & Amirul, N. J. (2017). The effect of the physical learning environment on students' health, enjoyment and learning. *Jurnal Pendidikan Sains & Mathematic Malaysia. 7*(1), 47-55.

Ahmad, C. N. C., Osman, K., & Halim, L. (2010). Physical and psychosocial aspect of science laboratory learning environment. *Procedia Social and Behavioral Sciences, 9*, 87-91.

Aldridge, J. M., Fraser, B. J., & Taylor, P. C. (2000). Constructivist learning environments in a cross-national study in Taiwan and Australia. *International Journal of Science Education, 22(1)*, 37-55.

Ayas, A. (2006). *Use of laboratory in science teaching.* Anadolu University, http://www.aof.edu.tr / book/IOLTP/2283 / unite07.pdf . 30 March 2024 retrieved from

Ayaz, M. F. (2016). The effect of using teaching materials on students' attitudes towards courses: a meta-analysis study. *OMÜ Journal of the Faculty of Education, 35(1)*, 141-158. doi: 10.7822/omuefd.35.1.11.

Bal, H., Keleş, M., & Erbil, O. (2002*). Faculty of Education Journal Educational technology guide*. Revised 2nd Edition. Ankara: Ministry of National Education Education Research and Development Department Publications.

Barrantes-Elizondo, L. (2019). Creating space for visual ethnography in educational research. *Revista Electrónica Educare, 23(2)*, 1-15.

Beames, S., Higgins, P., & Nicol, R. (2012). Learning outside the classroom. Theory and guidelines for practice. Newyork and London: Routledge

Berberoğlu, H., & Uygun, S. (2013). Examining the development of outdoor education in the world and in Turkey. *Mersin Journal of the Faculty of Education, 9(2)*, 33-42.

Betoret, F. D., & Artiga, A. G. (2004). Trainee teachers' conceptions of teaching and learning, classroom layout and exam design, *Educational Studies, 30*(4), 355-372.

Chism, N. V. N., & Bickford, D. J. (2002). Improving the environment for learning: An expanded agenda, in *The Importance of physical space in creating supportive learning environments: New directions in teaching and learning*, No. 92, Nancy Van Note Chism and Deborah J. Bickford, eds., San Francisco: Jossey-Bass.

Bland, D. (2012). Analysing children's drawings: applied imagination. *International Journal of Research & Method in Education, 35(3)*, 235-242.

Bland, D. (2018). Using drawing in research with children: lessons from practice. *International Journal of Research & Method in Education, 41(3)*, 342-352.

Brooks, J. G. & Brooks, M. G. (1993*). In search of understanding: The case for constructivist classrooms*. Upper Saddle River, NJ: Merrill Prentice Hall.Brown, J. M. (2011). *Does the Use of Technology in the Classroom Increase Students" Overall Academıc Performance* (Unpublished doctoral dissertation). University of Gonzaga, USA.

Bucholz, J. L. & Sheffer, J. L. (2009). Creating a warm and ınclusive classroom environmet: Planning for all children to feel welcome. *Electronic Journal of Inclusive Education, 2(4)*, 1-13. http://corescholar.libraries.wright.edu/ejie/vol2/iss4/4 30 March 2023 retrieved from

Budge, D. (2000). *Secret is in the seating*. Times Educational Supplement, 4396, 26-27. https://www.tes.com/news/tes-archive/tes-publication/secret-seating 30 April 2024 retrieved from

Cheung, D. (2007). Facilitating chemistry teachers to implement inquiry-based laboratory work. *International Journal of Science and Mathematics Education, 6(1)*, 107-130.

Chism, N. V. N., & Bickford, D. J. (2002). *"Improving the environment for learning: An expanded agenda,"* in *The Importance of physical space in creating supportive learning environments: New directions in teaching and learning*, No. 92, Nancy Van Note Chism and Deborah J. Bickford, eds., San Francisco: Jossey-Bass.

Cookson, P. (2006). *Your ideal classroom. TeachingK-9.com.* https://www.essentiallearningproducts.com/your ideal-classroom-peter-w-cookson-jr 28 March 2024 retrieved from

Creswell, J. W. (2013). *Research design: qualitative, quantitative, and mixed methods approaches.* New York: Sage. Çağıltay, K., Çakıroğlu, J., Çağıltay, N. ve Çakıroğlu, E. (2001). Teachers' opinions on the use of computers in teaching. *Hacettepe University Faculty of Education Journal, 21: 19-28.*

Diem-Wille, G. (2001). *A therapeutic perspective: the use of drawings in child psychoanalysis and social science*. In T. V. Leeuwen & C. Jewitt (Eds.), Handbook of visual analysis (pp. 119–133). London: Sage

Doğanay, A., & Sarı M. (2007, September). *How much constructivism has been established in primary schools? A comparative study in social studies, science and technology and mathematics courses.* E. Erginer (Ed.), 16th National Educational Sciences Congress (s.149-163). Gaziosmanpaşa University, Faculty of Education, Tokat, Türkiye.

Doğanay, A., & Sarı, M. (2012). The Prediction Level of Constructivist Learning Environment Features on Thinking-Friendly Classroom Features. *Çanakkale University Social Sciences Institute Journal, 21(1).*

Domin, D. S. (2007). Students' perceptions of when conceptual development occurs during laboratory instruction. *Chemistry Educational Research and Practice, 8(2),* 140-152.

Edwards, N. C. (2006). *School facilities and student achievement: student perspectives on the connection between the urban learning environment and student motivation and performance*. Doctorate Thesis, Philosophy Department of the Ohio State University, Ohio, America

Emmer, E. T., Evertson, C. M., & Worsham, M. E. (2013). *Classroom Management for Elementary School Teachers* (9th Edition). (Ahmet Aypay, Trans. Ed). Ankara: Nobel Publications

Evans, G. (2006). Learning, violance and the social structure of value. *Social Anthropology, 14*(2), 247-259.

Fisher, K. (2001). Building better outcomes: The impact of school infrastructure on student outcomes and behavior. *Schooling issues digest*. https://files.eric.ed.gov/fulltext/ED455672.pdf 15 March 2024 retrieved from

Fosnot, C. T. (1996). *Constructivism: A psychological theory of learning.* In C.T. Fosnot (Ed.). Constructivism: Theory, perspectives and practice (pp. 8-33). New York: Teacher College Press.

Freedman, P. M. (1997). Relationship among laboratory instruction, attitude toward science, and achievement in science knowledge. *Journal of Research in Science Teaching, 34*, 343-357.

Gulek, J. C. & Demirtaş, H. (2005). Learning With Technology: The Impact of Laptop Use on Student Achievement. *The Journal of Technology, Learning, and Assessment, 3 (2),* doi: http://www.jtla.org

Güven, G., & Sülün, Y. (2012). The effect of computer-assisted teaching on academic success and students' attitudes towards the course in 8th grade science and technology course. *Turkish Journal of Science Education, 9(1), 68-79.*

Hannah, R. (2013). *The effect of classroom environment on student learning.* Honors Theses. Paper 2375.

Harvey E. J., & Kenyon MC. (2013). Classroom seating considerations for 21st century students and faculty. *Journal of Learning Spaces, 2(1)*

Herreid, C. F., & Schiller, N. A. (2013). Case studies and the flipped classroom. *Journal of College Science Teaching, 42(5),* 62-66.

Hill, M. C, & Epps, K. K. (2010). The impact of physical classroom environment on studentsatisfaction and student evaluation of teaching in the university environment. *Academic Education Leadership Journal, 14,* 65-79. https://pdfs.semanticscholar.org/b1c7/9d8585d8cc3d7236dd798350f01af5e4399f.pdf 28 March 2024 retrieved from

Judge, S. (2005). The Impact of Computer Technology on Academic Achievement of Young African American Children. *Journal of Research in Childhood Education, 20 (2),* 91-101.

Kaya, S., & Kılıç Çakmak, E. (2015). Opinions of prospective teachers regarding the cognitive and metacognitive strategy activities applied in the instructional design course. *Education and Science, 40(181), 329-347.*

Kırpık, M. A., & Engin, A. O. (2009). The Importance of the Laboratory in Teaching Science and Basic Problems Related to Teaching Biology. *Kafkas University Institute of Science and Technology Journal 2(2).*

Kocakülah, A., & Savaş, E. (2011). Opinions of science teacher candidates regarding the experiment design and implementation process. *Ondokuz Mayız University Faculty of Education Journal, 30(1), 1-28.*

Kuschnir, K. (2016). Ethnographic drawing: Eleven benefits of using a sketchbook for fieldwork. *Visual Ethnography Journal, 5(1).* 103-134.

Lackney, J. A. (1999). *Why optimal learning environment matter*. Mississippi: Mississippi State University, Mississippi State Educational Design Institute.

Laney, D. (1990). Micro computers and social studies. *OCSS Review, 26*, 30-37.

Lefoe, G. (1998) Creating Constructivist learning environment on the web: The Challenge in higher education. ASCILITE'98 Annual Conference, 14-16 December, *Wollongong Proceedings Book*, 453-464.

Leung, M. Y., & Fung, I. (2005). Enhancement of classroom facilities of primary schools and its impact on learning behaviors of students, *Facilities, 23*(13/14), 585-594.

Liang, J. K., Liu, T. C., Wang, H. Y., Chang, B., Deng, Y. C., Yang, J. C., Chou, C. Y., Ko, H. W., Yang, S. & Chan, T. W. (2005). A few design perspectives on one-on-one digital classroom environment. *Journal of Computer Assisted Learning, 21*, 181- 189.

Lyons, J. B. (2001). Do school facilities really impact a child's education? http://www.cefpi.on org:80/issuetraks.html 3 March 2024 retrieved from

MEB (1995). Science laboratories for educational research-demonstration. TC. MEB Education Research and Development Department: Ankara.

Neuman, W. L. (2012). *Social Research Methods: Quantitative and Qualitative Approaches* I-II. Skin(5th Edition). Istanbul: Publishing Room.

Oğuzkan, A. F. (1981). *Dictionary of educational terms* (2nd Edition). Ankara: Turkish Language Association Publication.

Özden, Y. (2002). *Organizing the learning and teaching environment in the classroom. Classroom management*. 1st Edition. Ed. E. Karip. Ankara: PegemA Pub. 38-73.

Özer, Ö., & Tunca, N. (2014). Opinions of teacher candidates regarding material preparation and use. *Route Educational and Social Science Journal, 1*(3), 214-229.

Pramling Samuelsson, I. (2011). Why we should begin early with ESD: The role of Early Childhood Education. *International Journal of Early Childhood, 43(2),*103-118

Sarıtaş, T., & Yılmaz, G. (2009). Effects of Information and Communication Technologies (ICT) Based Learning Environments on Students' Critical Thinking Skills. IETC (6-7 May.2009). Hacettepe University, Ankara.

Schratz, M., & Loffler, U. (1998). Pupils using photographs in school self-evaluation. In: Prosser J (ed.) *Image-Based Research: A Sourcebook for Qualitative Researchers.*(pp. 209–224). London: Falmer Press.

Scott-Webber, L. (2004). *In sync: environment behavior research and the design of learning spaces,* Ann Arbor, MI: Society for College and University Planning.

Sinclair, G. B. (2009). Is Larry Cuban Right About the Impact of Computer Technology on Student Learning?. Nawa *Journal of Language and Communication, 3(1),* 46- 54.

Smith, G. A., & Sobel, D. (2010). *Place and community based education in schools.* Newyork: Routledge.

Su, Y., & Klein, J. (2010). Using Scaffolds in Problem-based Hypermedia. *Jl. of Educational Multimedia and Hypermedia, 19(3)* 221-241.

Şahin, M. (2019). The Importance of Classroom Seating Arrangement in Education, *Ihlara Journal of Educational Research,4(1),* 73-101.

Şensoy, S., & Sağsöz, A. (2015). The Relationship between Student Achievement and Class Achievement. Ahi Evran University Kırşehir Faculty of Education Journal, *16(3).*

Temiz, Z., & Karaarslan Semiz, G. (2019). My Best Teacher is Nature: Teacher Activities Prepared within the Scope of Pre-School Nature-Based Education Practices Project. *Journal of Humanities and Social Sciences Research, 8(1), 314- 331.*

Yeşiltaş, E. (2006). *The effect of using tools and equipment on students' success levels in teaching social studies and physical geography subjects (Kars province example). (*Master's thesis), Kafkas University, Institute of Social Sciences, Kars, Türkiye.

Taylor, P. C., Fraser, B. J., & Fisher, D. L. (1997). Monitoring constructivist learning environment. *International Journal of Educational Research, 27(2),* 293-302

Tanner, C. K. (2009). Effects of school design on student outcomes. *Journal of Educational Administration, 47*(3), 381-399.
Vandier, B. (2011). *The impact of school facilities on the learning environment.* (Doctorate Thesis), Capella University, America.

Verschaffel, L., De Corte, E., Lasure, S., Vaerenbergh, G. V., Bogaerts, H., & Ratinckx, E. (1999). Learning to solve mathematical application problems: A design experiment with fifth graders.*Mathematical Thinking and Learning,. 1(3),* 195-229.

Wasnock, D. P. (2010). *Classroom environment: Emphasis on seating arrangement.* Mathematical and computing sciences

masters, Paper 17. MS in Mathematics, Science, and Technology.

Wilson, B. G. (1995). Maintaining the ties between learning theory and instructional design. http://carbon.cudenver.edu/~bwilson/mainties.html 25.02.2024 retrieved from

Weathersbee, J. C. (2008). *Impact of technology ıntegration in public schools on academic performance of Texas school children.* (Unpublished master's thesis), Texas State University, Texas, ABD.

Yager, R. E. (1991). The constructivist learning model: Towards real reform in science education. *The Science Teacher, 58(6),* 52–57.

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