

Mathematics Teachers' Opinions on the Use of School Gardens in Lessons

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Abstract

This study was conducted to determine the use of school gardens, one of the out-of-school learning environments, by elementary school mathematics teachers in their lessons. The case study method is a qualitative research method that allows a topic to be addressed in detail. It was preferred in this study in accordance with the purpose. 27 mathematics teachers working in MoNE secondary schools participated in the study conducted in the fall semester of the 2023-2024 academic year. In the study, a semi-structured interview form consisting of open-ended questions prepared with the aim of obtaining data on the use of school gardens in mathematics lessons was used as a data collection tool. Content analysis method was used to analyze the data obtained. The data obtained were given by creating categories and codes in the sections belonging to the sub-problems. At the end of the study, it was concluded that teachers mostly preferred and supported the use of the school garden in mathematics lessons, but they faced problems such as maintaining discipline, attracting student attention to the lesson, and having other lessons at the same time while using the school garden in their lessons. When teachers compared school gardens with other out-of-school learning environments, they reported more positive aspects of school gardens.

Keywords: Mathematics Education, Out-Of School Learning, School Garden, Teachers' Opinion

Introduction

It is known that education is a process that creates changes in the behavior of individuals and is one of the most important factors for a society (Sünbül, 2011). The role of schools in this process that provides behavioral change is very critical and important (Varış, 1984). Many factors are effective in education and training activities in schools. Teachers, curricula, school environment and physical conditions are some of the many factors that affect education and training activities in schools.

In our age, only classrooms should not be considered as learning spaces (Sarioğlu & Küçükozer, 2017). It has been shown in previous studies that learning environments outside the classroom have a very positive effect on the permanence of learning. In this context, out-of-school environments are necessary to transfer the information learned in the classroom.

Out-of-school teaching is teaching that takes place in the school garden or outside the school, eliminates the teacher-student hierarchy, develops individual learning experiences and is in line with the achievements of the curriculum (Ciftçi & Dikmenli, 2016).

Out-of-school learning environments, which have gained importance today, are included in the curricula of the Ministry of National Education and it is emphasized that different activities should be carried out in these learning environments within the possibilities (MoNE, 2018).

Out-of-school learning environments include a wide range of venues such as excursion-observation studies during the education process, trips and visits to social, cultural and scientific venues (museums, science and technology museums, etc.), virtual reality applications, sportive activities, exhibitions, congresses and conferences (Saraç, 2017).

One of the out-of-school learning environments is school gardens. School gardens are recognized as social spaces that contribute positively to children's developmental areas and have an important effect on ensuring the continuity of education by increasing the quality of education (Küçük Kurt & Tuğrul, 2021). The use of school gardens as open learning environments and outdoor classrooms attracts children's attention and encourages learning (Aksu, 2023). School gardens are one of the out-of-school learning spaces frequently preferred by teachers due to their ease of transportation and low cost, and the fact that they are more advantageous than other out-of-school learning environments in terms of administrative and parental permission (Yıldız, 2022).

Many studies examining the effects of school gardens in the educational process show that they provide many benefits to students (Başar, 2020). However, when the relevant literature is examined, it is noticed that the topics of mathematics learning and teaching and school gardens are relatively less discussed in studies on educational activities carried out in out-of-school learning environments (Özkaya, 2023). This study aims to examine mathematics teachers' use of school gardens, one of the out-of-school learning environments, and to examine the opinions of teachers working in different schools on the use of school gardens and the obstacles faced by teachers in the use of school gardens. Based on the results of the research, it is aimed that teachers will have information about the lesson processes carried out in the school garden and the solutions to the problems encountered in these processes.

Purpose

It is known from previous studies that school garden practices have a positive effect on students' attitudes towards the course (Ürey et al., 2013). Although there are various studies on the effective

use of school gardens in the literature, there are not enough studies on the use of school gardens in our country (Gülen & Bozdoğan, 2021). From this point of view, it was thought that the information on teachers' preference for school gardens in mathematics lessons was insufficient. In this context, the aim of the study was determined as examining the preference of mathematics teachers to use school gardens in their lessons by considering different factors. Within the scope of the study, the following questions were tried to be answered:

- What is the status of mathematics teachers' use of the school garden, which is one of the out-of-school learning environments, in mathematics lessons? What are their opinions about its use?
- At which stage of the lesson do mathematics teachers use the school garden in mathematics lessons?
- What problems do mathematics teachers face while teaching in school gardens?
- How do mathematics teachers compare the use of school gardens with other out-of-school learning environments?

Method

Research Design

This study aimed to examine mathematics teachers' preference for using school gardens in their lessons by considering different factors. In this study, qualitative research method, which is an inductive research method that aims to examine the experiences of a certain community in a problem situation in their own environment and to generalize from small groups, was adopted. Qualitative research examines the problematic in its own context with an interpretive approach; while interpreting events and phenomena, it focuses on the meanings people attribute to them (Baltacı, 2019). The research was designed in accordance with the case study, which is one of the qualitative research approaches and offers the opportunity to examine a situation in depth with a limited number of participants. Case study is a research method that aims to find answers to questions such as 'How?', 'Why?', 'What?' and offers the opportunity to examine the subject in detail (Yıldırım & Şimşek, 2011).

Participant Group

The participant group of the study consisted of 27 mathematics teachers, 21 of whom were female and 6 of whom were male, working in different schools with different lengths of experience in the profession. Attention was paid to the fact that the schools where the teachers working in public education institutions were working had different social environments and different physical conditions. Teachers' ages ranged between 25-46 years. Teachers' years of experience in the profession ranged between 1-23 years and the majority (20 people) had between 2-10 years of experience.

Data Collection Tool

Semi-structured interview questions prepared by the researcher to serve the purpose of the research were used as data collection tools in the study. The interview questions, which were prepared to examine the preference of mathematics teachers to use school gardens in their lessons by considering different factors, consist of questions aimed at making teachers think about this issue. After the necessary reading and research, the interview questions were developed and the opinions of an expert in the field of mathematics education who had previously worked on out-of-school learning environments and two mathematics teachers were consulted. The opinions of the experts as 'appropriate', 'not appropriate' and 'correction' were taken into consideration by the researcher and the questions were organized. In order to test the language and expression rules and the comprehensibility of the questions, the opinions of two Turkish teachers were taken and necessary corrections were made. At the end of this process, the interview questions were finalized and the interview questions form consisting of open-ended questions was prepared.

Data Collection Process

The data of this study were collected through semi-structured interviews. As a research technique, an interview is a form of controlled and purposeful verbal communication between the researcher and the subject of the research ([Türnüklü, 2000](#)). In order to obtain data for this study, teachers were contacted and given general information about the study and it

was stated that the study was voluntary. Considering the ethical principles, they were informed that their personal information would not be included in the study and that they would be given codes if they agreed to participate in the study. The researcher interviewed the participants one-on-one. Each interview lasted 25 to 40 minutes. In the research, the questions in the data collection form prepared in advance were asked to the participants and their answers were taken. The answers were recorded with the note-taking technique. Each note-taken interview was compiled by the researcher as an MS Word file.

Data Analysis

Content analysis method, one of the qualitative data analysis methods, was used to analyze the data obtained from the interviews. In content analysis, similar data are brought together within the framework of certain concepts and themes, organized and interpreted in a way that the reader can understand ([Yıldırım & Şimşek, 2011](#)). In the study, all interview data were analyzed by transferring them to the computer environment. The analyzed data were coded. The codes were examined by bringing them together, and categories were formed by determining the commonalities between them and grouping them within themselves. The frequencies of the codes obtained were presented in tables as numerical data. In order to support the data, the answers given by the participants were included directly.

The research data were collected under various main headings and subheadings in a way that everyone could understand and grouped according to the frequency of repetition of the opinions. While adding the opinions of the teachers, abbreviations representing the teachers were used. Participant teachers were numbered according to the order of the interview and expressed as 'O1, O2, ..., O27'.

Validity and Reliability

The quality and usefulness of a scientific research is related to its quality ([Arastaman et al., 2018](#)). The quality of scientific research is ensured by validity and reliability. It is very important to be unbiased by ensuring validity and reliability in qualitative researches since qualitative researches are researches in which the researcher can observe the participants

in their own environments by making one-to-one observations, interpret the analysis based on the observations and the data obtained, and try to determine the nature of the situation under investigation (Kir, 2023).

In this study, comprehensibility and participant confirmation were used to ensure validity and consistency strategies were used to ensure reliability. In this context, the open-ended questions prepared by the researcher were presented to the expert opinion before the application and the comprehensibility of the questions was supported. The data obtained were read to the teachers at the end of the interview and participant confirmation was provided by taking their opinions about the accuracy of the data. The validity of the study was supported by expert opinion and participant confirmation.

In order to ensure the reliability of the research, the questions in the data collection tool were presented to the participants in a clear and understandable way. In the process of developing the data collection tool, it was tried to provide data diversification by utilizing different sources. The researcher analyzed the data obtained from the research and created codes. At the end of the analysis, the codes created by the researcher were presented to the expert opinion. As a result of the expert opinion, the codes were finalized and the findings were created and the reliability of the research was ensured by presenting the answers obtained from the participants as raw data directly in the findings section without any interpretation.

Findings

In this section, the findings obtained from mathematics teachers' views on the use of school gardens are presented in tables. The participants' answers are given directly under the tables as raw data and with the codes assigned to them in order to support the findings.

Findings on the Use of School Gardens

The teachers were asked the question 'Do you use the school garden, which is one of the out-of-school learning environments, in mathematics lessons?' and the data obtained regarding the use of out-of-school learning environments are presented in Table 1.

Table 1 Teachers' use of School Garden

Category	Code	Participant	f
Use Case	Using	O1, O7, O15, O16, O20, O21, O23, O24, O25, O27	10
	Non- use	O2, O3, O4, O5, O6, O8, O9, O10, O11, O12, O13, O14, O17, O18, O19, O22, O24, O26	18
	Willingness to use	O3, O6, O8, O11, O24	6

When the answers to the question posed were analyzed, it was seen that ten teachers preferred to use the school garden in their lessons.

O7: Yes. In general, such activities attract attention and increase children's interest. I look positively at the use of these areas.

O16: I use it. I think it should be used. It positively affects children's view of the lesson.

It was understood that the teachers who stated that they used school gardens in mathematics lessons stated that they preferred to use school gardens while teaching lessons for reasons such as the use of school gardens is remarkable, it increases students' interest, it contributes to students' development of a positive perspective on the lesson, etc. Again, when the table is examined, it is seen that eighteen teachers have never used the school garden, which is one of the out-of-school learning environments, in their lessons;

O5: I don't use it. I can't use it. Our school garden is only big enough for students who have physical education classes.

O8: I don't use it...

It was observed that six participant teachers who gave this answer stated that they would like to use the school garden in their lessons when appropriate conditions are provided.

O8: ...I would use it if I had the opportunity, I would like to use it. I would like to do activities there.

O11: I would like to use it. But I can't find many opportunities...

When the answers are analyzed, it is understood that teachers do not use the school garden in their lessons due to lack of opportunity and insufficient

time. However, some of them expressed that they would like to use the school garden in their mathematics lessons and do activities related to the lesson in the school garden if the conditions are appropriate.

Findings Related to the Phase of the Lesson in which School Gardens are Used

The teachers were asked the question ‘At which stage of the mathematics lesson do you use the school garden (Introduction, Exploration, Explanation, Deepening, Evaluation)?’ and the answers are presented in Table 2.

Table 2 Opinions on at which Stage of the Lesson School Gardens are used

Category	Code	Participant	f
Lesson Phase	Deepening	O3, O4, O5, O7, O9, O10, O11, O12, O15, O20, O22, O23, O24, O26, O27	15
	Discovering	O1, O2, O5, O6, O16, O20, O21, O23, O24, O25, O26	12
	Introduction	O6, O13, O14, O17, O21, O24, O25, O26	8
	Evaluation	O2, O4, O8, O24, O26	5
	Description	O24, O25, O26, O27	4

When Table 2 is examined, it is seen that the participant teachers stated that they mostly prefer teaching in the school garden at the deepening stage of the lesson (f=15).

O3: I prefer to use the school garden at the deepening stage of the lesson. Because it is the stage where the student is active and learns with games, I think it would be more accurate to use it in the deepening stage.

O7: I use it in the deepening stage as a review after the lesson.

O9: I use it in the deepening phase.

According to some teachers, the deepening phase of the lesson is the phase in which students actively learn, and the deepening phase of the lesson is the most appropriate phase for doing mathematics lessons in school gardens. After teaching the lesson, the deepening phase of the lesson can be preferred to use the school garden to reinforce the subject. When the table and the answers given by the participant

teachers are continued to be analyzed, it is seen that 12 teachers preferred teaching in the school garden at the discovery stage.

O10: ... if necessary, I think the exploration phase would be more appropriate.

O16: I use it in the exploration phase.

It was understood that the teachers who stated that they preferred the use of school gardens in the discovery phase of the mathematics lesson stated that they preferred the use of school gardens in the discovery phase of the lesson because they thought it was appropriate, without justifying this for any reason. Eight teachers stated that they used the garden in the introduction phase of the lesson.

O13: I use it in the introduction phase. It is well supported with activities.

Five teachers stated that they used the school garden in the evaluation phase of the lesson;

O8: I think the evaluation phase is the most appropriate.

Four teachers stated that they preferred to use the school garden in the explanation phase of the lesson.

O25: ... it is very effective in terms of teaching in the explanation parts...

According to O25, using school gardens in the explanation part of the lesson is more effective for the lesson content and teaching than using them in other stages. In addition, four teachers who responded to the question stated that they thought that at which stage of the mathematics lesson the school gardens would be used varied according to the subject.

O10: ...It may vary according to the subject...

O17: It can be used in all of these stages as required by the subject...

According to some teachers, all phases of the lesson are suitable for the use of school gardens during the lesson. However, which stage is more appropriate for that lesson varies according to the subject. This was understood from the answers given by O10 and O17. Two of the teachers stated that they did not prefer to use school gardens at any stage of the lesson.

O19: I never use it

According to most teachers, certain phases of the lesson, or even all phases according to some of

them (f=4), were suitable for teaching in the school garden, while there were teachers who argued that none of the phases of the lesson were suitable for teaching in the school garden (f=2). When the answers given were analyzed, it was seen that the participant teachers who responded in this direction did not explain their opinions for any reason.

Findings Related to Problems Encountered in Classes held in School Gardens

The teachers were asked the question ‘Do you encounter any problems while teaching your lesson in the school garden? If so, what are these problems?’ and the answers are presented in Table 3.

Table 3 Opinions on the Problems Encountered during Lessons in School Gardens

Category	Code	Participant	f
Problems caused by teachers and students	Difficulty maintaining discipline	O1, O3, O4, O5, O7, O11, O16, O23, O24, O25, O26	13
	Difficulty focusing the student on the lesson	O1, O2, O4, O9, O10, O11, O23	12
	Failure to attract attention	O1, O4, O8, O10, O17, O21	7
	Excessive class size	O3, O7, O25	4
Environmental factors	External factors	O10, O12, O21, O26	5
	Synchronization with other courses	O2, O4, O13	3
	Inaudibility of sound in open space	O5, O11	2
Other factors	Insufficient class time	O21, O23	3
	Refusal of permission by the administration	O13, O14	2
	Parent reluctance	O14	1
	Colleague influence	O14	1

Not teaching in the garden	O6, O18, O19	3
No problem encountered	O15, O20, O22, O27	4

When Table 3 is examined, it is seen that teachers have problems mostly due to teacher and student-related factors while teaching in the school garden; within the scope of these problems, it was seen that they expressed that they had the most problems in terms of providing discipline (f=13) and focusing students on the lesson (f=12).

O4: ...There may be problems with discipline when students are taken out...

O9: It can be difficult to keep students focused.

When the problems mentioned by students and teachers were further analyzed, it was found that attracting the attention of the students and the excessive class size were the factors that teachers had difficulty in teaching in school gardens.

O8: There are too many factors to distract children. It is difficult to attract attention.

O4: If the number of classes is high, the number of problems that may occur may be high.

When Table 3 is continued to be analyzed, it is understood that the other problems encountered by the teachers while teaching in the school garden are caused by environmental factors. The teachers who expressed their opinions in this direction expressed these problems as external factors (f=5), synchronization with other lessons (f=3) and difficulty in hearing the sound in the open space (f=2).

O10: Another main factor is external stimuli as I mentioned in the questions above...

O2: ...If there is a physical education class at that time, they may want to participate in it. These situations can be encountered.

O11: I have difficulty making myself heard.

The factors of insufficient class time (f=3), the administration’s refusal to allow teaching in the school garden (f=2), parental reluctance (f=1) and peer influence (f=1) were identified as the problems that teachers encountered due to other factors while teaching in the school garden.

O23: ... situations such as limited time cause the lesson to take longer...

O13: The administration does not want lessons to be held in the garden.

O14: ...I have problems with parents...

O14: Our colleagues sometimes have the same opinion and can have a limiting effect.

Four teachers stated that they did not encounter any problems while teaching in the garden.

O6: I do not teach in the garden...

O19: I do not process.

It was also understood that there were a small number of teachers (f=4) who stated that they did not encounter any problems while teaching in the garden.

O20: No.

O22: I do not encounter.

Findings Related to the Opinions on the Comparison of the Use of the School Garden with Other Out-of-School Learning Environments in Mathematics Lessons

The teachers were asked the question ‘Can you compare the use of the school garden with other out-of-school learning environments in mathematics lessons (positive and negative aspects, easy and difficult aspects)?’ and the answers are presented in Table 4.

Table 4 Use of Other Out-of-School Learning Environments and the School Garden in Mathematics Lessons Views on the Comparison

Category	Code	Participant	f
Positive aspects of the school garden	Easy to use	O1, O4, O6, O8, O13, O14, O15, O19, O24	10
	Being safe	O6, O11, O20, O21, O24	5
	No permission required	O11, O13, O14	4
	Ease of discipline	O4, O12, O21	3
	Providing permanent learning	O2	1
	Ease of addressing	O5	1

	Low cost	O9	1
	Ease of transportation	O21	1
Negative aspects of the school garden	Remaining limited in gains	O4, O23	2
	Difficult to use	O7	1
	Difficulty in being heard	O8	1
	Limited observation area	O9	1
	Difficulty attracting attention	O2	1

When the answers of the teachers comparing the use of other out-of-school learning environments and school gardens in lessons were analyzed, it was seen that the fact that school gardens are easier to use (f=10) and safer (f=5), that permission is not required to teach in the school garden (f=4) and that it is easier to maintain discipline (f=3) were mentioned among the positive aspects of the school garden by the teachers.

O6: The school garden is of course easier than other outdoor environments...

O11: ... The schoolyard is safer...

O13: Permission is required for outside the school. It is not necessary in the school yard.

O21: ... Student control is easier because it is an environment that students are used to...

Only one of the teachers stated that teaching in the school garden was more permanent.

O2: ... reinforced with out-of-school learning in the school garden and remains as a trace in their lives...

According to O2, the knowledge acquired by the students in the school garden reinforces and remains as a trace in their lives. Thus, the education given in the school garden is more permanent. Again, only one teacher expressed that he thought it was easier to address students in lessons taught in the school garden than in lessons taught in other out-of-school learning environments.

O5: ... But I think that it will be easier to control the oratory in the school garden.

It is seen that the number of teachers who think that the low cost of the school garden is an advantage is one.

O9: The cost of the school garden is low...

When the table continues to be examined, it is seen that there is a teacher who thinks that ease of transportation is a positive aspect of the school garden.

O21: It is easier to access the school garden compared to other out-of-school learning environments...

When Table 4 is continued to be examined, it is understood that the teachers who compared the use of other out-of-school learning environments and school gardens in the lessons in school gardens stated that the achievements remained limited ($f=2$), the school garden was difficult to use ($f=1$), they had difficulty in making themselves heard in the school garden ($f=1$), the school garden provided a limited observation area ($f=1$) and they had difficulty in attracting attention ($f=1$) and stated these as the negative aspects of the school garden.

O4: ... The school garden can be limited in terms of implementing certain learning outcomes...

O7: ... Therefore, it can be said to be more difficult...

O8: ... However, since it is an open area, it is more difficult to make students heard than in other areas.

O9: There is limited space in the schoolyard for students to make observations.

O2: ... it can be difficult to get their attention and make them understand why they are there...

When the answers of the participant teachers were analyzed in their entirety, it was noticed that they thought that the positive aspects of teaching in school gardens were more dominant. It is seen that the fact that the official procedures for transportation and obtaining permission are smoother in the trainings held in school gardens and that permanent learning can be realized easily and with activities in mathematics lessons held in school gardens are effective in teachers' thinking. Based on all these, it was noticed that teachers stated the positive aspects of school gardens more when compared to other out-of-school learning environments.

Discussion, Conclusion and Recommendations

The following results were obtained in the study conducted to determine the opinions of primary school mathematics teachers on the use of school gardens, one of the out-of-school learning environments. In addition, the results obtained were discussed based on the literature.

Of the twenty-seven participants in the study, ten teachers preferred to use school gardens, one of the out-of-school learning environments, in their mathematics lessons, while eighteen teachers did not prefer to teach mathematics in school gardens. In addition, six of the teachers who did not prefer to use school gardens stated that they would like to use school gardens in their lessons.

When the opinions of elementary school mathematics teachers on at which stage of the mathematics lessons they prefer school gardens, which is one of the out-of-school learning environments, were examined, it was determined that they preferred school gardens mostly at the deepening stage of the lesson and then at the discovery stage of the lesson. It was observed that the explanation phase of the lesson was least preferred in the use of the school garden. [Gülen \(2021\)](#) stated that the teachers who participated in his study mostly used the school garden during the lesson-lesson explanation, while the remaining teachers used it for evaluation at the end of the lesson. In this respect, the results do not overlap with each other. This situation shows that the lesson phase in which science teachers prefer to teach in the school garden is not parallel to the preferences of mathematics teachers. It is thought that the content of science and mathematics lessons and the difference in the flow of the lessons may be effective in the emergence of such a result.

Teachers who preferred to use school gardens, one of the out-of-school learning environments, in their mathematics lessons stated that the most common problems they faced were ensuring discipline and focusing students on the lesson, respectively. Similarly, [Gülen \(2021\)](#) stated that one of the reasons for not using school gardens is the teacher's inability to provide adequate classroom management and lack of time. It was concluded that some of the teachers expressed these reasons more comprehensively, stating that it is difficult to spread

the sound in the garden, that other simultaneous lessons make it difficult to teach their own lesson, and that the classes are too crowded to teach in the garden. In their study, [Malkoç and Kaya \(2015\)](#) concluded that the reasons for not using out-of-class environments such as the school garden were that the garden was physically inadequate and the number of students was too high, which is in line with this result. In addition, three teachers stated that they did not conduct lessons in the garden, while four teachers stated that they did not encounter any problems in the lessons they conducted in the school garden.

When the responses of teachers comparing school gardens with other out-of-school learning environments preferred in mathematics lessons were analyzed, it was seen that teachers found it easier to use the school garden. It was noticed that the main factors mentioned by the teachers were that it was easier to use, safer and did not require permission. According to the teachers, it is more difficult to maintain discipline in other out-of-school learning environments and transportation to these environments is more costly and risky.

Based on the data obtained from the results of this study, the following recommendations can be made:

- Since most of the existing research in the literature is in other fields, mathematics education researchers can also conduct various studies on the use of school gardens.
- This study was conducted with the participation of 27 mathematics teachers. By expanding the application framework, the number of participants can be increased and a quantitative study can be conducted with a wider audience.
- The gardens of the schools where the teachers participating in this study work have almost similar structures. Schools with different school garden landscapes and practices can be identified and the opinions of schools with classical school gardens can be compared.
- Some teachers stated that there was not enough time to teach in the school garden and that the curriculum was too intense. Since it is difficult to use the school garden in terms of lesson durations and course contents, an arrangement can be made in this regard.

- In higher education programs, the content, implementation and evaluation steps of courses on out-of-school learning environments can be reorganized. School gardens can be especially emphasized while providing training on out-of-school learning environments. The advantages of school gardens over other out-of-school learning environments can be discussed.

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