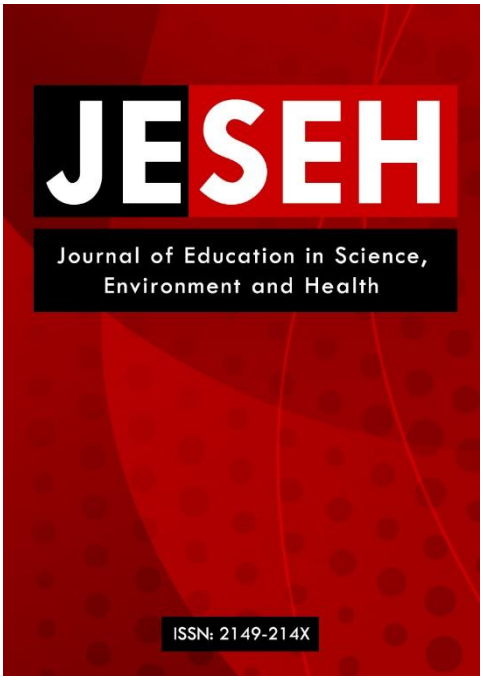

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The Relationship Between Science Teachers' Self-Efficacy and Anxiety Regarding Out-of-School Learning and Middle School Students' Informal Science Experiences

Neslihan Er[1], Bilge Gok [2]
[1]Gazi University
[2]Hacettepe University

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Neslihan Er, Bilge Gök

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Abstract

Pestalozzi emphasised that nature and life outside school are valuable teachers for children, stating, 'When the birds are chirping beautifully and a worm is crawling on a leaf, stop your language studies immediately. Know that the bird and the worm teach the child better and more.' All educational activities that take place outside of school throughout an individual's life are defined as 'out-of-school education,' and the learning occuring during this process is defined as 'out-of-school learning.' The scope of out-of-school learning environments is quite broad, and these environments are often considered as 'learning laboratories.' The aim of this study is to determine the relationship between science teachers' self-efficacy beliefs and anxiety levels regarding out-of-school learning and the levels of science experience acquired by the secondary school students taught by these teachers in informal settings. A correlational research design was utilized as a quantitative method in the study. The study sample consisted of 100 science teachers working in state schools in Eskişehir during the academic year of 2022-2023 and 2,767 secondary school students attending these teachers' classes. Convenience sampling was adopted to determine the study sample. The following data collection tools were used: Teacher Self-Efficacy Beliefs Scale for Out-of-School Learning Activities, Anxiety Level Assessment Scale for Out-of-School Learning Environments, a personal information form, and the Science Experience in Informal Settings Scale. The findings indicate a significant relationship between science teachers' self-efficacy beliefs regarding out-of-school learning and their ability to design and organize out-of-school learning activities. However, no significant differences in self-efficacy beliefs were observed with respect to training related to out-of-school learning environments, years of professional experience, or graduation background. Furthermore, science teachers' levels of anxiety toward out-of-school learning did not differ significantly across any of the examined variables. A moderate negative correlation was identified between teachers' anxiety levels and their self-efficacy beliefs. Finally, science teachers' self-efficacy beliefs and anxiety levels were found not to significantly predict students' science experiences acquired in informal learning settings.

Introduction

With the recent rapid developments, the understanding of education and even the perspective on education have changed. With this change in perspective in education, directly imparting knowledge is no longer preferred (Akdağ & Çoklar, 2009). At this point, the goal for individuals who are part of a learning process without boundaries is to benefit effectively from this situation and experience lasting and desirable behavioral change. For individuals, who are expected to gain certain achievements through their social interactions with their environment, to acquire process-oriented and performance-based learning rather than outcome-oriented learning, the environments where lessons are conducted must be diverse (Aydoğdu, Aydoğdu & Aktaş, 2023). In this regard, education and teaching have become a lifelong process that continues everywhere and in every environment (Bozdoğan, Okur & Kasap, 2015). Pestalozzi stated that nature and life outside of school are wonderful teachers for children, saying, "When the birds are chirping beautifully and a worm is crawling on a leaf, stop your language studies immediately. Know that the bird and the worm teach the child better and more" (Akhan & Kaymak, 2020).

According to the effective education approach, students should be active during the learning process, learn by doing and experiencing, and establish connections between what they learn and their lives (Eshach, 2007).

According to Eshach (2007), 85% of the children's time apart from sleep is spent outside the classroom, and this percentage is of great importance. Learning that takes place outside of school provides learning experiences that go "beyond and above" school (Gürbey, Mertoğlu, Sayan & Maroğlu Akgül, 2022). Out-of-school learning environments are effective in relating the knowledge acquired in schools to daily life and adopting it as part of one's lifestyle (Karademir & Tezel, 2010).

The concept of out-of-school education has appeared in the literature under different terms and with a range of definitions. Among them are informal education, out-of-classroom education, out-of-place education, and field education. Although different terms and definitions are used, they all share the common goal of encompassing learning processes that take place outside the school walls, without confining the student within the school (Karamustafaoğlu & Ermiş, 2020). Out-of-school education refers to all education and learning that take place outside of school throughout an individual's life (Tösten, 2020). The boundaries of out-of-school learning environments are quite broad, and these environments are defined as "learning laboratories" (Akhan & Kaymak, 2020). The use of environments outside the school walls in the education and training process is defined as out-of-school learning (Salmi, 1993). Out-of-school learning also encompasses many areas, from various living spaces outside the school boundaries to virtual environments (Eshach, 2007). As stated by Karademir (2018), out-of-school learning environments include museums, science centers, industrial institutions and organizations, zoos, observatories, and nature camps, as well as "digital or virtual out-of-school learning environments" consisting of online spaces such as social media platforms, educational websites, and Web 2.0 tools.

The Ministry of National Education requires that out-of-school learning environments be aligned with education and training programs. In this regard, the Out-of-School Learning Environments Guide has been prepared and published. According to the information in the guide, out-of-school learning environments are defined as a wide range of places, from museums affiliated with state institutions and registered private museums to science and art centers serving within public institutions, from historical and cultural areas determined by the Ministry of Culture and Tourism to public libraries and libraries in literary museum. In addition, natural sites and archaeological sites, technology parks, industrial facilities open to visitors, and universities are also considered within this scope. Furthermore, national and thematic parks, as well as various gardens, are among the other components of out-of-school learning environments (MEB, 2019, p. 4).

Unlike schools and informal classroom settings, out-of-school learning environments are more flexible in terms of allowing individuals and groups to choose what, where, with whom and how they learn since they offer rich learning opportunities and kinesthetic and social experiences (Cooper, 2011; Falk & Dierking, 2013; Wright & Parkes, 2015). Out-of-school learning environments, which enable students to use various types of intelligence, are expected to help students develop the following skills (Eshach, 2007; Worth, 2010):

- They can make observations and draw conclusions.
- They can learn and classify tools and equipment related to the lesson.
- They develop a problem-solving personality.
- They cooperate with their social groups.
- In addition to their discovery skills, they also possess questioning skills.
- They can discover tools and equipment that they cannot see at school or in the classroom.

The effectiveness of teaching activities conducted in out-of-school learning environments depends on the teacher's ability to plan and manage the process correctly. However, implementing such teaching practices on a regular basis poses significant challenges for teachers. This is because the teacher must determine the most appropriate environment and pedagogical method for the content, internalize their responsibilities, and structure the teaching process in detail (Sarıoğlan & Küçüközer, 2017). Teachers' self-efficacy levels and attitudes and behaviors play a decisive role in the effectiveness of the teaching programs implemented. In this regard, it is important for teachers to demonstrate positive attitudes towards out-of-school learning activities. In fact, teachers with a positive attitude towards such activities can better encourage students and parents to participate in out-of-school learning. However, factors such as the difficulty of monitoring the teaching process, lack of time, difficulties in ensuring safety and control (Yaşar-Çetin, 2021), economic barriers, avoidance of responsibility (İnce & Akcanca, 2021), and low motivation (Ay, Anagün & Demir, 2015; Çiçek & Saraç, 2017) can cause teachers to develop reluctance and anxiety towards out-of-school learning activities. It can be said that factors such as anxiety and self-efficacy underlie teachers' avoidance of out-of-school learning activities. In this context, the purpose of the present study was to determine the relationship between science teachers' self-efficacy beliefs and their anxiety levels regarding out-of-school learning and the levels of science experience of middle school students in informal settings. In line with this purpose, this study sought answers to the following questions.

1. What is the level of science teachers' self-efficacy beliefs regarding out-of-school learning?
2. What is the level of science teachers' anxiety regarding out-of-school learning?
3. What is the level of informal science experience among middle school students taught by science teachers?
4. What is the relationship between science teachers' self-efficacy beliefs and anxiety levels regarding out-of-school learning, and the levels of science experience of students in informal settings?

Method

Study Design

This study, conducted to examine the relationship between science teachers' perceived self-efficacy regarding out-of-school learning, their anxiety levels related to out-of-school learning processes, and the levels of science-related experiences of the middle school students taught by these teachers in informal learning environments, employed the correlational research method as a quantitative research design. The correlational research method aims to reveal the presence of a relationship between two or more variables and the effect of these variables on each other (Keser-Özmantar, 2019). In this study, since the aim was to determine the degree of relationship between the variables, the explanatory model of the correlational design was deemed appropriate and used (Tekbıyık, 2019).

Study Sample

The study sample consisted of 100 science teachers working in public schools in Eskişehir during the academic year of 2022-2023 and a total of 2.767 middle school students attending these teachers' classes. The convenience sampling method was chosen to determine the study sample. Convenience sampling is based on including individuals accessible to the researcher into the sample, depending on factors such as time, cost, and spatial possibilities. The main reason for choosing this method is to minimize time, cost, and labor loss during the research process, ensuring that the study is conducted more quickly and practically (Fraenkel & Wallen, 2006). Although convenience sampling enabled the researchers to reach participants in a practical and time-efficient manner, this method has certain limitations. Since the participants were selected based on accessibility rather than random selection, the sample may not fully represent the broader population of science teachers and middle school students. Therefore, the findings of this study should be interpreted with caution, particularly in terms of generalizability beyond the study context. In the present study, schools of different achievement levels were included in the sample to ensure maximum diversity in sampling. Information about science teachers and students is provided in Table 1 and Table 2.

Table 1. Demographic information about science teachers

		n	%
Receiving Education about out-of-school learning	Yes	31	31.3%
	No	68	68.7%
Event Design	Yes	68	68.7%
	No	31	31.3%
Organizing Event	I edited it 1-3 times.	37	37.4%
	I edited it 3-5 times.	6	6.1%
	I have organized 5 and more	5	5.1%
	Would like to organize 1-3 times	34	34.3%
	Would like to organize 3-5 times	13	13.1%
	Would like to organize 5 and more	4	4.0%
Work Experience	Less than 10 years	24	24.2%
	11-15 years	35	35.4%
	16 years and over	40	40.4%
Education	Bachelor of Education	84	84.8%
	Postgraduate degree	15	15.2%

Table 1 contains demographic information about science teachers. Of all the teachers, 68.7% had not previously received training on informal (out-of-school) settings. The percentage of the teachers who had previously designed and implemented science activities in informal settings was 68.7%. The percentage of the teachers who were able to organize activities in informal settings 1-3 times during an academic year was 37.4%, while the percentage of

the teachers who said they would like to organize science activities in informal settings 1-3 times was 34.3%. Besides, 40.4% of the teachers had work experience of 16 years or more, and 84.8% had a bachelor's degree.

Table 2. Demographic information on middle school students

	N	%
5th Grade	604	21.8%
6th Grade	645	23.3%
7th Grade	816	29.5%
8th Grade	702	25.4%

Table 2 presents demographic information about middle school students. Eighteen schools were included in the study. Of all the students, 21.8% were in the 5th grade, 23.3% were in the 6th grade, 29.5% were in the 7th grade, and 25.4% were in the 8th grade.

Data Collection Tools

Data were gathered from the science teachers with the "Teacher Self-Efficacy Beliefs Scale for Activities Related to Out-of-School Learning Environments," developed by Güloğlu-Demir & Çetin (2021), the "Out-of-School Learning Environment Anxiety Level Assessment Scale", developed by Üner (2019), and a personal information form prepared by the researchers. The "Science Experience Scale in Informal Settings," adapted into Turkish by Bakioğlu & Karamustafaoğlu (2021), was used to collect data from the students.

The Teacher Self-Efficacy Beliefs Scale for Out-of-School Learning Activities consists of a total of 29 items, of which 15 were negative statements and 14 were positive statements. The scale has a four-factor structure. These four factors are "Preparation Self-Efficacy," "Implementation and Evaluation Self-Efficacy," "Learning Support Self-Efficacy," and "Knowledge and Experience Self-Efficacy." Cronbach's Alpha was reported to be 0.78 and above for the scale and its four factors (Güloğlu-Demir & Çetin, 2021). In this study, Cronbach Alpha was found to be 0.92 for the scale measuring teachers' self-efficacy beliefs regarding out-of-school learning activities.

The Anxiety Level Assessment Scale for Out-of-School Learning Environments is composed of of 25 items. Cronbach Alpha was reported to be 0.94 for the scale (Üner, 2019). In this study, Cronbach Alpha was found to be 0.92 for the teachers' anxiety level assessment scale for out-of-school learning environments.

Informal Science Experience Scale; As a result of the analysis conducted for reliability, Cronbach alpha for the scale and its subscales of observation, collection, activity, and experiment was found to be 0.85, 0.71, 0.87, 0.63, and 0.71 respectively (Bakioğlu & Karamustafaoğlu, 2021). In this study, Cronbach Alpha was found to be 0.84 for the informal setting science experience scale for the middle school students.

Data Analysis

The data obtained within the scope of the research were transferred to a computer environment, organized using Microsoft Excel, and then analyzed using Statistical Package for the Social Sciences 29.0. Before proceeding to the analysis process, the normality of the distribution of numerical variables was evaluated using Kolmogorov-Smirnov and Shapiro-Wilk tests, along with Skewness and Kurtosis values; visual inspections were also performed using Histogram and Q-Q Plot graphs. As a result of these evaluations, it was determined that the data met the assumption of normal distribution. In the study, categorical variables were reported using frequency and percentage values, while numerical data were reported using mean and standard deviation measures. However, the number of observations for some variables was below 30. In this case, the evaluations related to these variables were performed using non-parametric statistical tests. The "Independent Samples T Test" was preferred to compare two independent groups when the data showed a normal distribution and the number of observations was above 30; otherwise, the "Mann Whitney U Test" was preferred. The "Kruskal-Wallis Test" was applied in comparisons involving more than two groups; when a significant difference was detected as a result of this test, post-hoc analyses were used to determine which groups the difference originated from, and group differences were indicated with letter codes. Groups marked with different letters were considered to be significantly different from each other. The Pearson Correlation Test was used to examine the relationship between two numerical variables, while multiple regression analysis was utilized to determine the effect of numerical variables on each other. The significance level for all the statistical tests was set at $p < 0.05$.

Results

Findings Related to the First Sub-Problem

Findings regarding science teachers' self-efficacy beliefs about out-of-school learning activities according to various variables are presented in Table 3.

Table 3. Science teachers' self-efficacy beliefs regarding out-of-school learning activities according to various variables

		Mean	Sd	$t^1/U^2/K\text{-}W^3$	p
Receiving Education about out-of-school learning	Yes	109.42	12.27	1.20^1	0.23
	No	105.84	14.32		
Event Design	Yes	110.03	13.12	3.47^1	**0.00***
	No	100.23	12.84		
Organizing Event	I edited it 1-3 times[a]	110.16	14.92	11.18^3	**0.04***
	I edited it 3-5 times[ab]	105.50	11.64		
	I have organized 5 and more[ab]	100.80	9.44		
	Would like to schedule 1-3 times[b]	102.59	12.20		
	Would like to schedule 3-5 times[ab]	109.15	13.76		
	Would like to arrange 5 and more[a]	117.25	13.94		
Work Experience	Less than 10 years	102.50	12.81	3.60^3	0.16
	11-15 years	107.34	10.38		
	16 years and over	109.30	16.32		
Education	Bachelor's degree graduate	106.07	14.07	1.77^2	0.08
	Postgraduate	111.93	10.92		

Note: [1]Independent Sample T Test; [2]Mann-Whitney U Test; [3]Kruskal-Wallis Test
Note: Letters show post hoc analysis results. The differences between different letters were significant ([a,b,ab,c]).
*p<0.05

Teachers' self-efficacy beliefs regarding out-of-school learning activities were evaluated according to various variables and are presented in Table 3. The difference between self-efficacy beliefs regarding out-of-school learning activities and activity design status was statistically significant (t=3.47; p<0.05). The self-efficacy beliefs of the teachers who designed activities (110.03±13.12) were higher than those of the teachers who did not design activities (100.23±12.84). A statistically significant difference was found between self-efficacy beliefs regarding out-of-school learning activities and the number of science activities organized in out-of-school settings during an academic year (χ^2=11.18; p<0.05). According to the post hoc analysis, the differences were indicated by letters. Statistically significant differences were observed between different letters. Teachers who stated that they would like to organize 5 or more activities had the highest self-efficacy beliefs (117.25±13.94). The self-efficacy beliefs of the individuals who received training and those who did not, as well as those who designed activities and those who did not, were found to be quite similar. Although there was a slight difference, the self-efficacy beliefs of the teachers who received training and designed activities were higher (109.42±12.27). No statistically significant difference was found in teachers' self-efficacy beliefs regarding out-of-school learning in terms of the variables of work experience (χ^2=3.60; p>0.05) and education (U=1.77; p>0.05).

Findings Related to the Second Sub-Problem

Findings regarding science teachers' levels of anxiety about out-of-school learning according to various variables are presented in Table 4. Findings regarding teachers' levels of anxiety about out-of-school learning according to various variables are presented in Table 4. No statistically significant differences were found between various variables and the level of anxiety about out-of-school learning (p>0.05). However, as shown in Table 4, the teachers who stated that they had not previously received training on informal (out-of-school) environments were found to have higher levels of out-of-school learning anxiety (74.00±14.04). The teachers who stated that they had not previously designed activities also had higher levels of out-of-school anxiety (75.00±14.08). The anxiety levels were 81.08±15.27 for those with less than 10 years of work experience, 73.06±11.97 for those with 11-15 years of work experience, and 70.02±13.72 for those with more than 16 years of work experience. As years of work experience increased, non-school-related anxiety decreased, without a significant difference. When examining educational backgrounds, the anxiety levels of the teachers with a bachelor's degree (74.26±14.70) were higher than those of the graduate degree holders (71.07±9.87).

Table 4. Science teachers' out-of-school learning anxiety status according to various variables

		Mean	Sd	t[1]/U[2]/K-W[3]	p
Receiving Education about out-of-school learning	Yes	73.29	14.40	0.23[1]	0.82
	No	74.00	14.04		
Event Design	Yes	73.22	14.15	0.58[1]	0.28
	No	75.00	14.08		
Organizing Event	I edited it 1-3 times	72.03	15,86	4.08[3]	0.53
	I edited it 3-5 times	75.00	10.56		
	I have organized 5 and more	71.40	14.96		
	Would like to schedule 1-3 times	73.65	11.72		
	Would like to schedule 3-5 times	78.38	17.14		
	Would like to arrange 5 and more	77.25	11.35		
Work Experience	Less than 10 years	81.08	15.27	2.83[3]	0.09
	11-15 years	73.06	11.97		
	16 years and over	70.02	13.72		
Education	Bachelor's degree graduate	74.26	14.70	656.00[2]	0.36
	Postgraduate	71.07	9.87		

*[1]*Independent Sample T Test; [2]Mann-Whitney U Test; [3]Kruskal-Wallis Test*

Findings Related to the Third Sub-Problem

Findings regarding middle school students' science experiences in informal settings according to various variables are presented in Table 5 and Table 6.

Table 5. Descriptive statistics on middle school students' science experiences according to their grades

	N	Mean	Sd
5th Grade	604	58.67	8.48
6th Grade	645	56.66	8.44
7th Grade	816	55.18	8.56
8th Grade	702	54.17	8.80
Total	2767	56.03	8.73

Table 6. ANOVA results for middle school students' science experience according to their grades

	Sum of Squares	df	Mean Square	F	p
Between Groups	7485.12	3	2495.04	33.93	0.00*
Within Groups	2031159.01	2763	73.53		
Total	210644.137	2766			

* $p<0.05$

The informal science experiences of the middle school students according to their grades are presented in Table 5 and Table 6. Science experiences also showed statistically significant differences according to their grade ($F=33.93$; $p<0.05$). The average science experience scores were 58.67 for the 5th grade students, 56.66 for the 6th grade students, 55.18 for the 7th grade students, and 54.19 for the 8th grade students. Science experiences decreased as grade increased.

Findings Related to the Fourth Research Problem

Table 7. Analysis of the relationship between science teachers' anxiety levels and their self-efficacy beliefs

		Anxiety	Self-Efficacy Beliefs
Anxiety	Correlation Coefficient	1	**-0.51**
	p		**0.00****

**Pearson's Correlation Analysis*
** $p<0.01$

Findings regarding the relationship between science teachers' self-efficacy beliefs and anxiety levels in out-of-school learning environments are presented in Table 7. A moderate negative relationship was found between science teachers' anxiety levels and their self-efficacy beliefs (r=-0.51; p<0.01). As teachers' self-efficacy beliefs increased, their anxiety levels decreased.

Table 8. The effect of science teachers' anxiety levels and self-efficacy beliefs on students' science experience

	$\widehat{\beta}$	SE $\widehat{\beta}$	Beta	t	p	R^2	Adj. R^2	F	p
Constant (Students' Science Experiences)	59.81	11.830		5.05	0.00				
Teachers' Anxiety Levels	-0.01	0.07	-0.02	-0.20	0.84	0.00	-0.02	0.02	0.98
Teachers' Self-Efficacy Beliefs	-0.00	0.07	-0.01	-0.05	0.96				

**Multiple Regression Analysis*

Findings regarding science teachers' self-efficacy beliefs about out-of-school settings and their anxiety levels about out-of-school learning, as well as their middle school students' science experiences in informal settings, are presented in Table 8. Science teachers' anxiety levels and self-efficacy beliefs did not predict students' science experiences (F=0.02; p=0.98; p>0.05). In other words, teachers' anxiety levels and self-efficacy beliefs did not have a significant effect on students' science experiences.

Conclusion and Discussion

This study examined the effect of science teachers' self-efficacy beliefs and anxiety levels regarding out-of-school learning on the informal science experiences of middle school students in their classes. To our knowledge, the studies reported in the literature have examined self-efficacy beliefs and anxiety levels separately (Demir & Çetin, 2022; Pekin & Bozdoğan, 2021; Çetingüney & Büyük, 2022; Acar, 2023; Temel & Kölemen, 2021; Özbilen, 2023) or focused on the relationship between self-efficacy beliefs and anxiety levels (Güngör & Gül, 2021; Yıldırım & Efendioğlu, 2023; Gönüldaş & Gümüşkaya, 2022).

In the current study, the difference between science teachers' self-efficacy beliefs regarding out-of-school learning and their activity design status was found to be statistically significant. Teachers who designed activities related to out-of-school learning had higher self-efficacy beliefs. A statistically significant difference was found between science teachers' self-efficacy beliefs regarding out-of-school learning and their ability to organize activities in out-of-school settings. The teachers who organized numerous activities were found to have higher self-efficacy beliefs. Pekin & Bozdoğan (2021) determined that the teachers participating in their studies had high self-efficacy beliefs regarding their ability to organize educational trips to out-of-school environments.

Gürsoy (2018) reported that the pre-test and post-test self-efficacy scores of the teacher candidates participating in out-of-school field trip activities changed significantly in favor of the post-test. Similarly, Sarışan Tungaç (2015) also revealed that science teachers' perceived self-efficacy regarding out-of-school environmental education were high. In line with these findings, Temel & Kölemen's (2021) study concluded that as the number of field trips teachers conducted during the year increased, so did their self-efficacy beliefs. It can be suggested that teachers who plan more frequent field trips feel more competent largely because of the experience they gain during the field trip process.

There was no statistically significant difference in science teachers' self-efficacy beliefs regarding out-of-school learning in terms of variables such as training related to out-of-school learning environments, work experience, and education. Temel & Kölemen (2021) concluded in their study that preschool teachers' self-efficacy beliefs did not show a significant difference according to the education status variable. Acar (2023) found no significant difference in science teachers' self-efficacy beliefs regarding out-of-school activities in terms of work experience. In the research conducted by Pelin & Bozdoğan (2021), no statistically significant difference was found between teachers' self-efficacy in organizing educational trips to out-of-school environments and their length of work experience. The self-efficacy scores of the teachers with different durations of work experience were similar, indicating that professional experience does not have a decisive effect on teachers' self-efficacy beliefs. Similarly, studies conducted by Pas, Bradshaw & Hershfeldt (2012) and Yılmaz & Çokluk-Bökeoğlu (2008) also revealed that teachers' self-efficacy beliefs did not change with respect to professional experience. In contrast, Acar (2023) found in his research on science teachers that postgraduates had higher self-efficacy beliefs regarding out-of-school learning environments compared to those with undergraduate degrees. Furthermore, Gönüldaş &

Gümüşkaya (2022) reported a positive relationship between self-efficacy perceptions and educational status among individuals continuing their postgraduate education.

Pekin & Bozdoğan (2021) compared the mean self-efficacy scores of teachers' educational levels with their ability to organize educational trips to out-of-school environments and discovered that middle school teachers with postgraduate education had higher mean self-efficacy scores than middle school teachers without postgraduate education with a statistically significant difference. Sontay & Karamustafaoğlu (2017) found in their study that the self-efficacy beliefs of the teachers with a master's degree were significantly higher than those of the teachers with a bachelor's degree. Temel & Kölemen (2021) observed that preschool teachers' self-efficacy beliefs showed a significant difference in terms of their professional experience. This finding reveals that as teachers' length of education increases, so does their self-efficacy beliefs.

Demirtaş & Akkocaoğlu-Çayır (2021) found in their study that the activities and program developed and implemented as part of the "Out-of-Class Educational Activities for Classroom Teachers" project positively improved classroom teachers' self-efficacy beliefs regarding their ability to organize educational trips to out-of-school environments. Similarly, in İşlek's (2017) research with art teachers, a significant increase in teachers' self-efficacy beliefs was observed after they received in-service training on out-of-school education.

In the present study, no statistically significant difference was found in the anxiety levels of the science teachers regarding out-of-school learning across all variables. However, the teachers who had not received training related to out-of-school learning and had not previously designed activities had higher anxiety levels. The teachers' anxiety levels regarding out-of-school learning decreased as their years of work experience increased without a statistically significant difference. In terms of educational background, the teachers with bachelor's degrees had higher anxiety levels than those with master's degrees. Receiving professional training in a given field increases individuals' levels of knowledge in that area and reduces their anxiety levels (Şahin, 2022).

Uğurlu (2022) reported that the average score obtained by classroom teachers on the anxiety assessment scale ranged from 65.01 to 85, and considered the teachers as "Moderately Anxious". Similarly, Şahin (2022) found that prospective classroom teachers had moderate levels of general anxiety regarding out-of-school learning. Furthermore, this study observed a statistically significant difference between prospective classroom teachers' anxiety levels and their course enrollment status regarding out-of-school learning. According to the findings, the anxiety levels of the teacher candidates who did not take courses on out-of-school learning were higher than those of the candidates who took these courses.

When the middle school students' science experiences were examined, they showed statistically significant differences according to their grades. As grade level increases, science experiences decrease. This situation has been interpreted as potentially arising from students' anxiety about classes and examinations taking precedence over their daily activities. As students progress to higher grade levels, their exam-related anxiety increases, they become increasingly disengaged from daily life, and their interactions with their surrounding environment diminish. Consequently, this situation leads to a reduction in students' informal science experiences.

Aksoy (2024) found that fifth-grade students' science experience scores in informal learning settings were higher than those of sixth-, seventh-, and eighth-grade students. Similarly, İlik (2023) reported that informal learning is generally a process that begins and develops within the family, whereas formal learning environments and academic achievement tend to replace informal experiences in later years. In addition, Subay (2011) stated that the level of conceptual understanding is inversely related to grade level and reported that eighth-grade students exhibited the lowest level of conceptual understanding. The author attributed this unexpected finding to the influence of national examinations within the education system. A moderate negative relationship was found between science teachers' anxiety levels and their self-efficacy beliefs. That is, as teachers' self-efficacy beliefs increase, their anxiety levels decrease.

In a study conducted by Yıldırım & Efendioğlu (2023), a significant, moderate, negative relationship was found between teachers' overall self-efficacy beliefs and their overall anxiety levels. Similarly, Gönüldaş & Gümüşkaya (2022) revealed a negative relationship between individuals' perceptions of competence and anxiety and burnout. These findings show that individuals with high perceptions of professional competence have lower levels of anxiety and burnout. Güngör & Gül (2021) found a high-level negative relationship between teacher candidates' self-efficacy perceptions and their professional anxiety. In a study conducted by Yıldırım (2011), a high-level, statistically significant inverse relationship was found between elementary teacher candidates' professional self-efficacy perceptions and their professional anxiety. Similarly, a study conducted by Dadandı, Kalyon & Yazıcı (2016) also found a significant negative relationship between teacher candidates' self-efficacy perceptions and

their professional anxiety. In contrast, studies conducted by Kafkas, Açak, Çoban & Karademir (2010) and Deniz & Tican (2017) on teacher candidates showed a low level of significant, positive relationship between self-efficacy beliefs and professional anxiety. In view of the evidence from the present study, it can be suggested that while teacher candidates' self-efficacy beliefs increase, they experience low levels of positive professional anxiety, which is conflicting with the findings from previous studies.

Science teachers' anxiety levels and self-efficacy beliefs do not predict students' science experiences. In other words, teachers' anxiety levels and self-efficacy beliefs have no significant effect on students' science experiences. Çoban (2022) defines informal learning as a lifelong process through which individuals acquire knowledge, skills, and attitudes from their experiences and environment as part of daily life activities, such as those occurring at home, in the workplace, during leisure activities, while traveling, through observation of the behaviors of family members or friends, and via reading newspapers and books, listening to the radio, or watching films and television. Based on this definition, it may be interpreted that science teachers' anxiety levels and self-efficacy beliefs do not directly influence students' science experiences in informal learning settings. Rather, students' informal science experiences may be more strongly shaped by interactions with family members and peers.

This study is limited to a sample of 100 science teachers working in public schools in Eskişehir and 2.767 middle school students enrolled in these teachers' classes. In addition, the use of convenience sampling constitutes an important limitation of the study. Although schools with different achievement levels were included to increase diversity, the non-probabilistic nature of the sampling method may have restricted the representativeness of the sample. As a result, the findings may not be generalized to all science teachers and middle school students. Future studies employing probabilistic sampling methods with larger and more diverse samples are recommended to enhance the generalizability of the results.

Recommendations

In light of the results of this study, the following recommendations could be made for future studies:

1. Qualitative research should be conducted to understand the reasons for teachers' anxiety and self-efficacy levels.
2. Educational programs and sample materials encouraging teachers to utilize learning environments outside of school could be planned.
3. Applied learning activities that will increase science experience at upper grade levels should be developed.
4. Continuous cooperation should be established between schools and museums, science centers, technology parks, and universities.
5. Differentiated support programs tailored to teachers at each seniority level should be prepared.
6. Out-of-school learning activities that increase parents' participation should be designed.

Scientific Ethics Declaration

* The authors declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the authors

* Ethical approval for this research was approved by the Scientific Research and Ethics Committee of Hacettepe University with the decision dated April 26, 2022 (No: E-35853172-600-00002165987).

Conflict of Interest

* The authors declare that they have no conflicts of interest

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Author(s) Information

Neslihan Er
Gazi University, Graduate School of Educational Sciences, Ankara, Türkiye
Contact e-mail: neslihaner26@hotmail.com
ORCID iD: https://orcid.org/0000-0003-0773-3154

Bilge Gok
Hacettepe University, Faculty of Education, Department of Elementary Education, Ankara, Türkiye
ORCID iD: https://orcid.org/0000-0002-1548-164X