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Araştırma Makalesi/ Research Article

Türkiye'deki Sosyobilimsel Çevre Konularına Yönelik Tezlerin İçerik Analizi*

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Özet: Sunulan çalışmada Türkiye'de öğretmen yetiştirme düzeyinde yayımlanan ve sosyobilimsel çevre konularını içeren tezler betimsel içerik analizi ile incelenmiştir. Anahtar kelime olarak "sosyobilimsel" kelimesi kullanılmış ve Yükseköğretim Kurulu Tez Merkezi veri tabanında 2021 yılı Kasım ayına kadar yayımlanmış 118 teze ulaşılmıştır. Bu tezlerden 66'sı öğretmen yetiştirme düzeyinde olmadığı, 29'u ise sosyobilimsel çevre konularını içermediği için analiz dışı bırakılmıştır. 23 tez; tezin basım yılı, düzeyi, katılımcıları, tezde kullanılan sosyobilimsel çevre konusu ve tezin yöntemi açısından analiz edilmiştir. Yöntemi deneysel araştırma olan tezler, tezde kullanılan öğrenme yaklaşımı ve tezdeki bağımlı değişkenler açısından da incelenmiştir. Analiz sonuçlarına göre öğretmen yetiştirme düzeyinde ilgili anahtar kelime kullanılarak ulaşılan ve sosyobilimsel çevre konularını içeren tezlerin 2008-2021 yılları arasında yayımlandığı saptanmıştır. Bu tezler yoğun olarak 2014 ve 2019 yıllarında yayımlanmıştır. Yüksek lisans ve doktora tezlerinin birbirine yakın sayıda olduğu belirlenmiştir. Bununla birlikte en sık kullanılan sosyobilimsel çevre konusunun nükleer santraller/nükleer enerji olduğu saptanmıştır. Tezlerde tarama araştırmalarının deneysel araştırmalara göre daha fazla olduğu, deneysel araştırmalarda en çok kullanılan öğrenme yaklaşımının ise argümantasyon olduğu tespit edilmiştir. Tezlerde en çok tercih edilen katılımcılar fen bilimleri öğretmen adayları iken kimya öğretmen adaylarının katılımcı olarak yer aldığı bir tezin bulunmadığı dikkat çekmiştir. Kimya gibi sosyobilimsel konuları yoğun olarak içeren bir alanda kimya öğretmen adaylarının katılımcı olduğu hiçbir tezin bulunmaması en ilginç sonuçlardan biridir.

Anahtar kelimeler: Betimsel içerik analizi, çevre eğitimi, sosyobilimsel konular

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GENİŞ ÖZET

Giriş

Gelişen teknoloji ve bilim, birçok tartışmalı konuyu da beraberinde getirmiştir. Çevre sorunları da bu konulardan biridir. Çevre sorunları, içerdiği ikilemlerdeki bilimsel ve sosyal faktörlerin merkezi rolleri nedeniyle sosyobilimsel konular olarak ele alınmaktadır (Sadler, 2004).

Çevre eğitiminde kullanılacak sosyobilimsel çevre konuları, öğretmen adaylarını daha derin düşünmeye ve çevre koruma konusunda farklı bir bakış açısı ve de farkındalık kazanmaya sevk edecektir. Bu nedenle öğretmen yetiştirme düzeyindeki sosyobilimsel çevre konularına yönelik çalışmalar büyük önem taşımaktadır.

Yöntem

Sunulan çalışmada Türkiye'de yayımlanan, öğretmen yetiştirme düzeyinde olan ve sosyobilimsel çevre konularını içeren tezler betimsel içerik analizi ile incelenmiştir. Bu amaçla ilk olarak Yükseköğretim Kurulu Tez Merkezi veri tabanında 2021 yılı Kasım ayına kadar yayımlanmış olan tezlere anahtar kelime olarak "sosyobilimsel" kelimesi kullanılarak ulaşılmıştır. Toplamda 118 teze ulaşılmış, bu tezlerden 66'sı öğretmen yetiştirme düzeyinde olmadığı için 29'u ise sosyobilimsel çevre konularını içermediği için analiz dışı bırakılmıştır. Geriye kalan öğretmen yetiştirme düzeyinde ve sosyobilimsel çevre konularını içeren 23 tezin içeriği aşağıdaki temalar temel alınarak analiz edilmiştir:

- Tezin basım yılı
- Tezin düzeyi
- Tezin katılımcıları
- Tezde kullanılan sosyobilimsel çevre konusu
- Tezin yöntemi

Ayrıca deneysel yöntemi kullanan tezler, tezde kullanılan öğrenme yaklaşımı ve tezdeki bağımlı değişkenler açısından da incelenmiştir.

Tezlerin betimsel içerik analizi iki araştırmacı tarafından birbirinden bağımsız olarak yapılmıştır. Analizin ilk aşamasında tezler T1, T2, …, T23 şeklinde kodlanmıştır. Ardından araştırma temalarına göre frekans değerleri hesaplanmıştır. Son aşamada araştırmacıların değerlendirmeleri karşılaştırılarak analiz sonuçları için nihai karara varılmıştır.

Sonuç ve Tartışma

Analiz sonuçlarına göre öğretmen yetiştirme düzeyinde sosyobilimsel çevre konularını içeren tezler 2008-2021 yılları arasında yayımlanmıştır. Sosyobilimsel çevre konularına yönelik ilk tez 2008 yılında yayımlanmıştır. Bu durum, öğretmen yetiştirme düzeyinde yürütülen tezlerde sosyobilimsel konuların kullanılma tarihinin çok eski olmadığını göstermiştir. En fazla sayıda tez (f=4) 2014 ve 2019 yıllarında yayımlanmıştır. 2016-2021 yılları arasında yayımlanan tezlere bakıldığında ise öğretmen yetiştirme düzeyinde son yıllarda sosyobilimsel çevre konularına daha fazla ilgi olduğu belirlenmiştir.

Öğretmen yetiştirme düzeyinde sosyobilimsel çevre konularını içeren yüksek lisans (%57) ve doktora tezlerinin (%43) birbirine yakın sayılarda olduğu saptanmıştır. Bu tezlerin katılımcıları sosyal bilgiler, sınıf öğretmenliği, fen bilimleri, ilköğretim matematik, okul öncesi ve biyoloji öğretmen adaylarıdır. En çok tercih edilen katılımcılar ise fen bilimleri öğretmen adaylarıdır. Bununla birlikte kimya öğretmen adaylarının katılımcı olarak yer aldığı bir tez bulunmamaktadır. Kimya öğretmenliği lisans öğretim programında çevre ile ilgili zorunlu ve seçmeli dersler yer almasına ve kimyanın sosyobilimsel pek çok konu ile bağlantılı olmasına rağmen kimya öğretmen adaylarının katılımcı olduğu bir tez yürütülmemiş olması dikkat çekmektedir.

Tezlerde kullanılan sosyobilimsel çevre konuları en çok kullanılandan en az kullanılana doğru nükleer santraller/nükleer enerji, küresel ısınma, küresel iklim değişikliği, alternatif enerji kaynakları, CO_2 emisyonunun azaltılması, sera gazları, hidroelektrik santraller, biyoçeşitlilik, geri dönüşüm, elektrikli arabalar, yenilenebilir enerji kaynakları, enerji santralleri, su kıtlığı, hava kirliliği, fosil yakıtlar, yeşil yol, biyoyakıtlar, hidrojen enerjisi, hidrolik enerji, hidrolik kırılma/su kirliliği, korunan alan yönetimi olmuştur. Sonuçlara göre tezlerde ele alınan sosyobilimsel çevre konularının kısıtlı olduğu tespit edilmiştir.

Tezlerin metodolojisi incelendiğinde, tarama araştırmalarının deneysel araştırmalara göre daha fazla tercih edildiği tespit edilmiştir. Ayrıca tarama araştırmalarının yüksek lisans tezlerinde, deneysel araştırmaların ise doktora tezlerinde daha fazla kullanıldığı görülmüştür. İncelenen 23 tezin 11'inde deneysel araştırma tercih edilmiştir. Tezlerde kullanılan öğrenme yaklaşımları en çok kullanılandan en az kullanılana doğru argümantasyon, sosyobilimsel çevre konularına dayalı öğretim, sorgulamaya dayalı öğrenme, bilimin doğası, sosyobilimsel konuları içeren doğrudan yansıtıcı yaklaşım ve ortak bilgi yapılandırma modelidir. Bu sonuçlar doğrultusunda tezlerde argümantasyon becerisi (en çok kullanılan) ve argümantasyonun kalitesi gibi argümantasyonla ilgili birçok bağımlı değişkenin gelişimi ve değişimi araştırılmıştır.

Öneriler

Sunulan çalışmada yapılan betimsel içerik analizi ile sosyobilimsel çevre konularında, öğretmen yetiştirme düzeyinde özellikle de deneysel araştırma yapmak isteyen araştırmacılara yol gösterici olunması hedeflenmiştir. Çalışmanın sonuçlarına göre gelecek araştırmalar için aşağıdaki önerilerde bulunulmuştur.

1. Tezlerde öğretmen adaylarının gelişimine yönelik daha fazla deneysel araştırmaya ihtiyaç vardır.

2. Sosyobilimsel çevre konularına yönelik öğrenme sürecini desteklemek için proje tabanlı öğrenme başta olmak üzere farklı aktif öğrenme yaklaşımları kullanılabilir.

3. Öğrenme yaklaşımlarının öğretmen adaylarının çevreye yönelik algıları, farkındalıkları, tutumları, becerileri vb. gibi farklı değişkenler üzerindeki etkileri araştırılabilir.

4. Tezlerdeki katılımcılar genellikle fen bilimleri öğretmen adaylarıdır. Bu nedenle gelecek çalışmalarda kimya öğretmen adayları gibi çevre konusunu öğrencilerine öğretecek olan diğer öğretmen adayları da tercih edilebilir.

5. Sosyobilimsel çevre konusu olarak en çok nükleer santraller/nükleer enerji konusu kullanılmıştır. Gelecek çalışmalarda farklı sosyobilimsel çevre konuları da tercih edilebilir.

Content Analysis of Dissertations on Socio-Scientific Environmental Issues in Turkey†

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The present study analyzed the dissertations published at the teacher training level in Turkey, including the socio-scientific environmental issues, with descriptive content analysis. The "socio-scientific" was used as a keyword, and 118 dissertations published in the Council of Higher Education Thesis Center database until November 2021 were accessed. Sixty-six (not at the teacher training level) and twenty-nine (not including socio-scientific environmental issues) dissertations were excluded from the analysis. Twenty-three dissertations were analyzed based on the publication year, type (master/doctoral), participants, socio-scientific environmental issues used in the dissertation, and the methodology of the dissertation. Dissertations with experimental research methods were also examined in their learning approach and dependent variables. The results showed that dissertations whose topic socio-scientific environmental issues at the teacher training level were published between 2008 and 2021, and the highest number of dissertations took place in 2014 and 2019. Master and doctoral dissertations had a close percentage to each other. Nuclear power plants/nuclear energy were used as the most frequent socio-scientific environmental issue. The survey research design was preferred more than experimental research in the dissertations, and argumentation was used commonly as a learning approach. One unexpected result was the absence of a dissertation whose participants were preservice chemistry teachers. Preservice science teachers were mainly selected as participants in the dissertations, there was no dissertation whose participants were pre-service chemistry teachers. Socio-scientific issues cover chemical topics. Interestingly however, no dissertation has been conducted on socio-scientific environmental issues related to chemistry at the level of preservice chemistry teachers.

Keywords: Descriptive content analysis, environmental education, socio-scientific issues

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INTRODUCTION

Developing and changing in technology and science bring many controversial issues with them. These controversial social issues based on science called as socio-scientific issues (Topçu, Sadler & Yılmaz-Tüzün, 2010). Decisions about socio-scientific issues affect societies' regional and global future (Topçu, 2017). Socio-scientific issues can be evaluated from different perspectives, including moral and ethical issues, that are open to discussion and includes social dilemmas (Sadler & Zeidler, 2005). There is no single correct answer exist for these dilemmas. Many variables such as people's expectations, lifestyles, educational backgrounds, science, and technology literacy affect decision-making about socio-scientific issues. For instance, the use of motor vehicles is quite common today. In addition to public transportation, many people have personal vehicles. Ships and airplanes are also indispensable means of transportation. All these vehicles are mainly responsible for CO, NO_x, HC emissions and disturb the natural balance in the atmosphere. CO emissions cause severe damage to the blood circulation system, and $C_2H_3NO_5$ from automobile exhausts causes burns in the eyes. In this case, should the use of motor vehicles be abandoned? A person's benefits or environmental knowledge and awareness affect this socio-scientific dilemma.

As in the example above, issues related to environmental problems include dilemmas and are called socio-scientific issues because of the central roles of scientific and social factors in these dilemmas (Sadler, 2004). In environmental protection, a person's benefits and environmental awareness conflict, therefore a dilemma arise about this situation. Environmental education plays a major role in resolving this dilemma. As cited in Sukma, Ramadhan & Indriyani (2020), it is focused on environmental and social issues with environmental education. Environmental education encourages people to work for the benefit of humanity and the environment; to provide these benefits, people must comprehend the cultural and social connection between the environment and humanity by their experience (Clark, Heimlich, Ardoin & Braus, 2020). For this reason, environmental education must take place from pre-school to the undergraduate curriculum.

Teachers can shape students' behavior on the conservation and protection of the environment (Esa, 2010). Therefore, the training of preservice teachers is a key for effective environmental education. Current curricula (URL-1) such as chemistry, science or elementary teacher training programs in Turkey include environmental science/chemistry lessons. Furthermore, several environmental issues exist in the current science curriculum (Ministry of Education, 2018a). There are three units in the high school chemistry curriculum (Ministry of Education, 2018b) "Nature and Chemistry," "Chemistry is Everywhere," "Energy Resources and Scientific Developments" that are

directly related the environmental issues such as recycling and fossil fuel. Therefore, these preservice teachers will learn the environmental issues in their academic life and teach them in their future classes. On the other hand, the importance and protection of the environment are highlighted by everybody. However, people have a dilemma when their benefits conflict with environmental protection activities. Even with one's benefits, choosing to protect the environment is essential to the world of future generations. For this reason, well-planned environmental education including socio-scientific environmental problems is a major need for teacher training programs. Socio-scientific environmental issues in environmental education will prompt preservice teachers to think deeply and gain a different perspective and awareness on environmental protection. For this reason, studies on socio-scientific environmental issues have major importance at the teacher training level.

In the previous research, it was investigated contents of socio-scientific issue studies conducted/published in Turkey. Genç and Genç (2017) analyzed 36 articles published between 2000-2014 years published in Turkey. They found that there was no article in the years 2002, 2003, and 2004. The most preferred variable was the understanding of teachers about the socio-scientific issue and the most used data collection tool was the survey. Aydın and Kılıç-Mocan (2019) analyzed articles and theses on socio-scientific issues published in Turkey between 2008-2018 years. Some important results were that there were limited theses on socio-scientific issues and the most preferred participants were pre-service teachers and middle school students. Değirmenci and Doğru (2017) analyzed 12 articles and four master dissertations on socio-scientific issues published in Turkey between 2011-2015 years. Their findings indicated that the most used research methodology was the survey and the most used socio-scientific issues were nuclear energy and genetically modified organisms. The present research differs from the other content analysis studies on socio-scientific issues with their focus. This study aimed to investigate the trends of studies on socio-scientific issues, more specifically. Previous research presented the framework generally but this study focused on the dissertations on socio-scientific environmental issues at the teacher training level. Thus, the results of the study will present more detailed and specific data to researchers who want to work on both socio-scientific issues and environmental education at the teacher training level. In addition to these, the dissertations including socio-scientific environmental issues up to 2021 were analyzed in this study. Therefore, it presented current trends of studies on socio-scientific environmental issues.

In this sense, the study aims to examine dissertations on socio-scientific environmental issues at the teacher training programs in Turkey in terms of descriptive content analysis. In this context, the following questions were investigated;

- What is the distribution of dissertations by publication year?
- What is the distribution of dissertations by master and doctoral studies?
- What is the distribution of the dissertations according to the characteristics of the participants?
- What is the distribution of dissertations according to the socio-scientific environmental issues they include?
- What is the distribution of the dissertations according to the research methodology?

METHOD

In this study, descriptive content analysis was used. In the context of the descriptive content analysis, a systematic review is conducted and a description of the results of the studies and trends in the research discipline were presented (Çalık & Sözbilir, 2014). With this analysis, qualitative and quantitative studies on a specific subject can be examined in-depth, and general trends are determined for future studies (Ültay, Akyurt & Ültay, 2021).

Data Gathering

Dissertations including socio-scientific environmental issues in teacher training programs in Turkey were analyzed in this study. Firstly, the keyword was determined to search the relevant dissertations. The term "socio-scientific" was selected as a keyword of the dissertations and all dissertations that included socio-scientific issues in their keywords and abstract parts were searched. The dissertations, including socio-scientific issues up to 2021, were accessed from the Council of Higher Education Thesis Center database. The search, conducted in November 2021, resulted in 118 dissertations.

Analysis of the Data

Before the descriptive content analysis, dissertations were selected for analysis according to research criteria. This study focused on teacher training programs and socio-scientific environmental issues. For this reason, the first 66 dissertations (not at the teacher training level) and then 29 dissertations (do not include socio-scientific environmental issues) were excluded from the analysis. Finally, 23 dissertations were analyzed in terms of the following themes:

- Publication year
- Master and doctoral studies
- Participants
- The socio-scientific environmental issue
- Methodology

The methodology of the dissertation was also examined in terms of the learning approach used in the dissertation and dependent variable in the dissertation if the methodology of the dissertation was experimental. The criteria of the study are presented in Figure 1.

The dissertations were coded as T1, T2, …, and T23. Descriptive content analysis of the dissertations was independently conducted by the researchers. In the context of the analysis, the frequency was calculated based on research themes. Then, the dissertations were reanalyzed after a week. Lastly, the researchers' assessments were compared to reach a final decision.

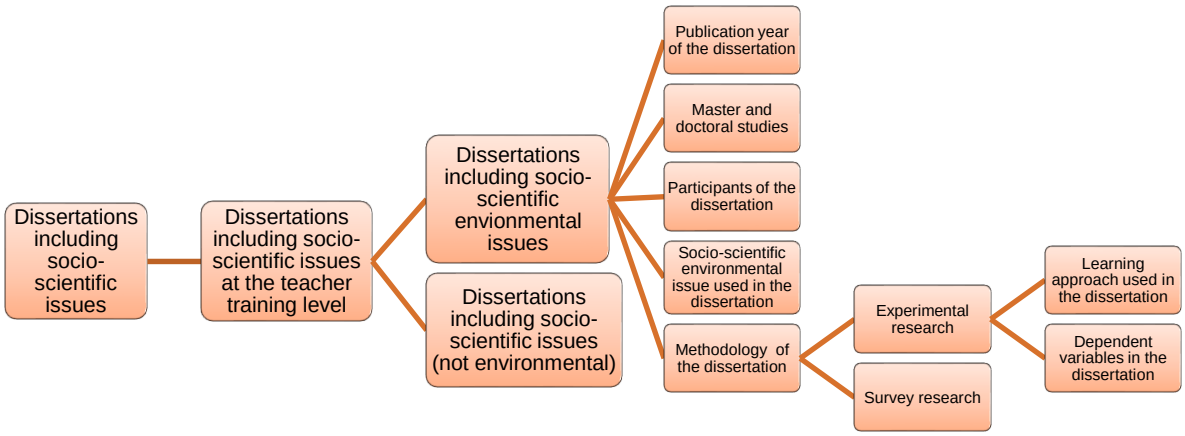

Figure 1

Themes of the study

FINDINGS

The first research question of the study was related to publishing years of dissertations. The distribution of the dissertations by publication year was presented in Figure 2.

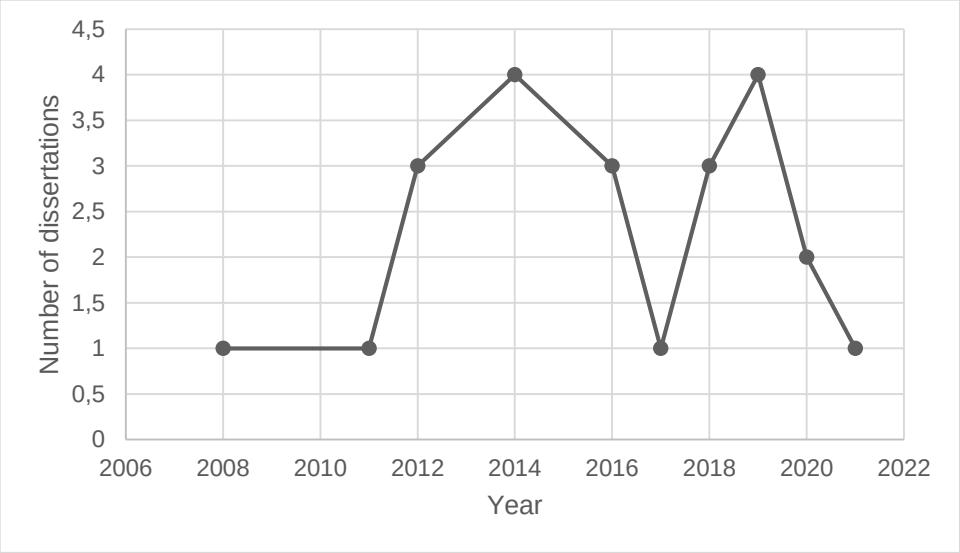

Figure 2

Distribution of the dissertations by publication year

As seen in Figure 2, the first dissertation related to socio-scientific environmental issues was published in 2008. There was no dissertation published in 2009, 2010, 2013, and 2015; the largest number of dissertations was published in 2014 and 2019.

The second research question was related to the type of dissertation. The distribution of the types of dissertations was presented in Figure 3.

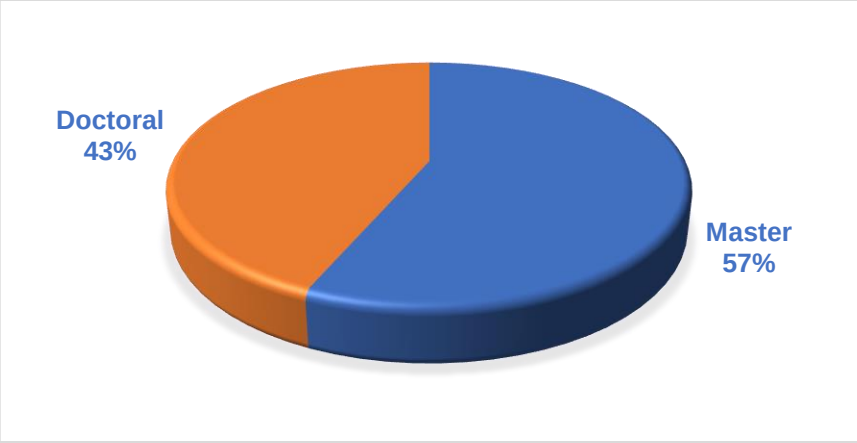

Figure 3

The distribution of the types of the dissertations

According to Figure 3, master dissertations (57%) were conducted more than that of doctoral dissertations (43%). The distribution of the types of dissertations by years was given in Figure 4.

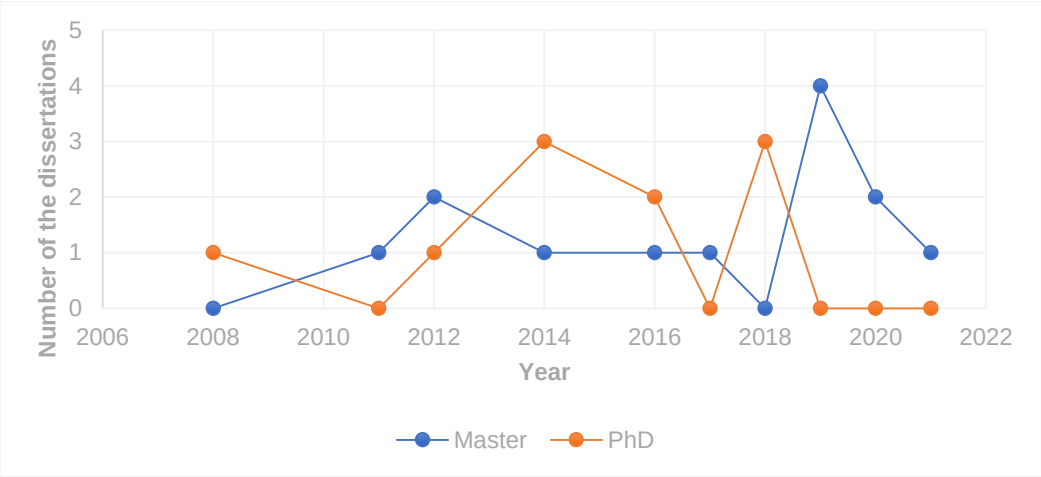

Figure 4

The distribution of the types of the dissertations by years

The third research question was related to the participants. Findings were detailed in Table 1.

Table 1

Participants in the dissertations

Participants	Frequency
Preservice science teachers	20
Preservice social science teachers	3
Preservice elementary teachers	6
Preservice mathematics teachers	1
Preservice early childhood teachers	1
Preservice biology teachers	1

Preservice science teachers were mainly selected participants in the dissertations (f=20). Preservice teachers in mathematics, early childhood, and biology were identified as participants in only one dissertation. Interestingly, however, there was no dissertation whose participants were preservice chemistry teachers. In addition, some dissertations investigated multiple preservice teacher groups together. For example, T2 investigated

preservice social science, elementary, and mathematics teachers, T11 investigated preservice social science, elementary and science teachers.

The fourth research question was related to distributing dissertations according to socio-scientific environmental issues they include. Socio-scientific environmental problems used in the dissertations and their frequencies were presented in Table 2.

Table 2

Socio-scientific environmental issues used in the dissertations

Socio-scientific environmental issues	Frequency
Nuclear power plants/Nuclear energy	16
Global warming	6
Global climate change	6
Alternative energy sources	3
Decrease of CO_2 emission	2
Greenhouse gases	2
Hydroelectric power plants	2
Biodiversity	2
Recycling	2
Electric cars	2
Renewable energy sources	2
Power plants	2
Scarcity of water	1
Air pollution	1
Fossil fuels	1
Greenway	1
Biofuels	1
Hydrogen energy	1
Hydraulic energy	1
Hydraulic fracturing/water pollution	1
Protected area governance and management	1

Based on the results are shown in Table 2, nuclear power plants/nuclear energy were the most used socio-scientific issue (f=16) followed by global warming (f=6) and global climate change (f=6). Some dissertations included one more than socio-scientific environmental issues. For example, T2, which had a descriptive research methodology, used global climate change, decrease of CO_2 emission and greenhouse gases scenarios to identify preservice 'teachers' scientific thinking habits. In addition, there were only two dissertations conducted in the context of the environmental science lesson.

The last research question was related to research methodology. The distributions of the methodologies were presented in Figure 5.

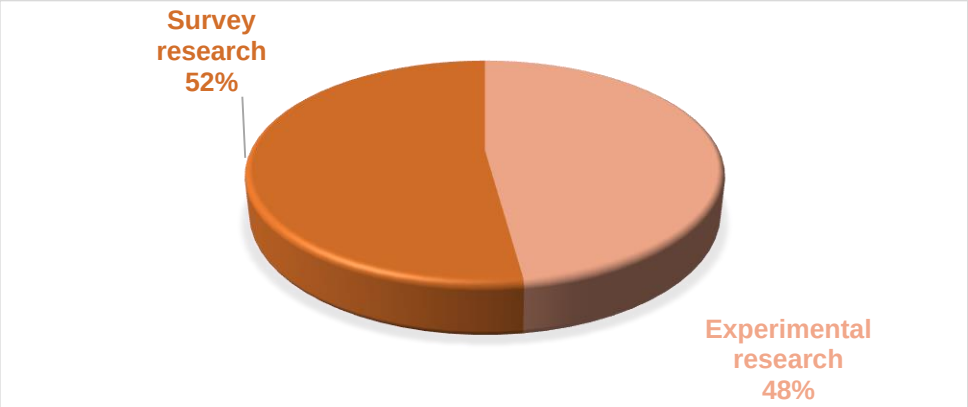

Figure 5

The distribution of the research methodology of the dissertations

According to Figure 5, survey research design (52%) was used a bit more than that of experimental research design in the dissertations (48%). The survey research design was more preferred in the master dissertations (f=10) than the doctoral dissertations (f=2). Conversely, the experimental research design was more used in doctoral dissertations (f=8) than master dissertations (f=3).

Learning approaches, used in dissertations that preferred experimental research design, were presented in Table 3. As seen in Table 3, argumentation was mainly used learning approach to develop several learning outcomes related to socio-scientific environmental issues (f=5). Some dissertations used only socio-scientific environmental issues without any learning approach in the implementation process (f=3). Some dissertations preferred one more than the learning approach. For example, T12 used both argumentation and nature of science to improve preservice science teachers' understandings of the nature of science and opinions about the nature of science, argumentation, and science education.

Table 3

Learning approaches used in dissertations that preferred experimental research design

Learning Approach	Frequency
Argumentation	5
Inquiry-based learning	1
Only socio-scientific environmental issue	3
Nature of science	1
Direct reflective approach including socio-scientific issues	1
Common knowledge construction model	1

Lastly, dependent variables in the dissertations that preferred experimental research design were investigated, and findings were detailed in Table 4.

Table 4

Dependent variables in the dissertations that preferred experimental research design

Dependent variables	Frequency
Reflective reasoning skill	1
Argumentation skill	3
Reasoning skill in the socio-scientific issue	1
Understanding of the nature of science	2
Opinion about the nature of science, argumentation, and science education	1
Tendencies for problem solving and decision	1
Science literacy	1
Content knowledge	1
Critical thinking	1
Achievement	1
Forming an argument	1
Knowledge for an understanding of students on socio-scientific issues	1
Opinion about the socio-scientific issue approach	1
Quality of argumentation	2

According to results in Table 4, dissertations focused on several dependent variables, and the most used dependent variable was argumentation skill (f=3), followed by understanding the nature of science (f=2) and the quality of argumentation (f=2).

RESULTS AND DISCUSSION

This study aimed to conduct a descriptive content analysis for dissertations, including socio-scientific environmental issues at the teacher training level accessed from the Council of Higher Education Thesis Center database up to November 2021. It was accessed 118 dissertations using the "socio-scientific" keyword. The dissertations that were not at the teacher training level (66 dissertations) and did not include socio-scientific environmental issues (29 dissertations) were excluded from the analysis. Therefore, 23 dissertations were analyzed in the context of the research.

The first theme of the research was the publication year of the dissertation. According to the results, the dissertations were published between 2008-2021. The first dissertation related to socio-scientific environmental issues at the teacher training level was published in 2008. This dissertation (Topçu, 2008) was also the first published dissertation on socio-scientific issues accessed using the "socio-scientific" keyword. This finding showed that the history of using socio-scientific issues at the teacher training level in the dissertations was not very old. Results also indicated that the largest number of dissertations (f=4) was published in 2014 and 2019.

The distribution of the types of dissertations was investigated, and it was found that master dissertations (57%) and doctoral dissertations (43%) had a close percentage of publication. Participants of these dissertations were preservice social science, elementary, science, mathematics, early childhood, and biology teachers. The most preferred participants were preservice science teachers. There is an environmental science education lesson in the science teacher training curriculum, and there are also several environmental issues in the science curriculum. For this reason, dissertations for preservice science teachers are essential and hopeful. On the other hand, there was no dissertation whose participants were preservice chemistry teachers. It is interesting because there is an environmental chemistry lesson in the chemistry teacher training program and there are three units directly related to the environmental issues in the high school curriculum of chemistry.

Another theme in this study was socio-scientific environmental issues used in the dissertation. Socio-scientific environmental issues addressed in the dissertations from the most used to least followed as nuclear power plants/nuclear energy, global warming,

global climate change, alternative energy sources, decreasing CO_2 emission, greenhouse gases, hydroelectric power plants, biodiversity, recycling, electric cars, renewable energy sources, power plants, water scarcity, air pollution, fossil fuels, greenway, biofuels, hydrogen energy, hydraulic energy, hydraulic fracturing/water pollution, protected area governance and management. However, the dissertations examined in this study did not include many environmental issues. Even though some teacher training programs such as science, elementary, biology, and chemistry teacher training programs include an environmental science/ environmental chemistry lesson, there were only two dissertations conducted in the context of these lessons.

Distributions of the methodology used in the dissertations include socio-scientific environmental issues were investigated in the next step of the content analysis. The survey research design was more preferred than that of experimental research design. Furthermore, survey research design was mostly used in the master dissertations, and the experimental research design was more used in doctoral dissertations. Conducting experimental research is not always easy (Fraenkel, Wallen & Hyun, 2012). Experimental research requires experienced researchers. More preference for survey research in the master dissertation can be interpreted that master students are at the beginning of their academic life and need more research experience.

The experimental research design was preferred in eleven dissertations. Learning approaches from the most used to least used in dissertations follows as argumentation, only socio-scientific environmental issues, inquiry-based learning, nature of science, direct reflective approach including socio-scientific issues, and common knowledge construction model. Argumentation is the most used learning approach in these dissertations. Socio-scientific issues include a dilemma, and this dilemma includes two or more claims. This situation can be interpreted based on the nature of the argumentation approach. Some claims are assessed in the light of the experimental or theoretical evidence in an argumentation process (Erduran, 2007). Therefore, argumentation is a very suitable approach to teach socio-scientific environmental problems. In studies of Tezel and Günister (2018), similarly, it was found that argumentation was the most used learning approach to teach science topics. Following these results, the development of several dependent variables about argumentation, such as argumentation skill (the most used) and the quality of argumentation was investigated in these dissertations.

On the other hand, solving socio-scientific environmental problems is possible by conducting projects since students carry out several activities such as thinking, analyzing, synthesis and consensus by completing a project (Yıldırım, Birinci-Konur & Kurt, 2015). Despite these benefits of the projects, interestingly, there was no dissertation whose learning approach was project-based learning.

SUGGESTIONS

In this study, the descriptive content analysis was conducted to investigate the dissertations including the socio-scientific environmental issues at the teacher training level. It was aimed to be a helpful guide for future researchers who want to study socio-scientific environmental issues, especially researchers willing to conduct experimental research with preservice teachers. Contents of 23 dissertations were analyzed in terms of their publishing year, type, participants, socio-scientific environmental issue and methodology, learning approach (if their method was experimental research), and dependent variables (if their methodology was experimental research). Based on the study results, it was found that socio-scientific environmental issues have not taken place in dissertations, adequately. For this reason, some suggestions were presented in the light of these results.

1. More experimental research for the development of the preservice teachers is needed in the dissertations.
2. Different active learning approaches, especially project-based learning, can support the learning process of socio-scientific environmental issues.
3. Effect on learning approaches can be investigated on different variables, including improving preservice 'teachers' perceptions, awareness, attitudes, or/and some skills.
4. In the dissertations, participants were generally preservice science teachers. For this reason, other preservice teachers majoring in different disciplines than science can be selected as participants. Since preservice teachers in other programs than science education will teach environmental issues to their students. For instance, preservice chemistry teachers will teach environmental problems in their future chemistry lessons. However, preservice chemistry teachers were not selected as participants in the dissertations. Studies whose focus group is preservice chemistry teachers should develop in the future.
5. The nuclear power plant was mainly used as a socio-scientific environmental issue. However, many different socio-scientific environmental issues exist. Future studies should address different socio-scientific environmental issues.

Conflict of Interest Declaration

The author(s) have not declared a potential conflict of interest during this article's research, authorship, and publishing.

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Ethical Committee Decision / Permission

In this research, there is no human participant, and all ethical and legal standards were taken into consideration during the research.

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