

Systematic Literature Review of Graduate Thesis on Instructional Technologies in the Fields of Physics, Chemistry, Biology and Science Education¹

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Abstract: Instructional technologies are an important tool used in the field of education as they support and improve teaching processes. For this reason, examining the studies on learning environments where instructional technologies are used will provide us with important clues about how teaching will be done. The studies were examined using systematic literature review as they contain more scientific information and provide more solid evidence. In this study, a systematic literature review of 67 postgraduate theses on instructional technologies in the fields of Physics education, Chemistry education, Biology education and Science education was conducted between 2013 and 2024. The purpose of this study is a systematic literature review modelled by qualitative method. In the research, postgraduate theses published in Türkiye between 2013 and 2024 were obtained by accessing the YÖK thesis database. A form was prepared for the systematic literature review of postgraduate theses within the scope of the research. Descriptive analysis was used to analyse the data. The data was analysed by calculating percentages and frequencies, and tables were created to visualize and make meaningful the findings. In the research, it was determined that 49 of the 67 postgraduate theses were master's theses and 18 were doctoral theses. It has been observed that these theses on instructional technologies were written the most in 2022 and the least in 2013. When examined on the basis of universities, it was revealed that the most studies were done at Gazi University. It was determined that in graduate theses, quantitative research methods (N: 34) and experimental design (N: 28) were used the most, and document analysis and action research were used the least. In the studies examined, while dependent-independent t-test was used in quantitative analyses, at least non-parametric statistical analyses were used. In qualitative analyses, it was determined that content analysis was used most. As a result of the study, it is recommended that more research be conducted in science fields in this period when the importance of distance education and teaching technologies is realized.

Keywords: *Biology Education, Chemistry Education, Instructional Technologies, Physics Education, Science Education, Systematic Literature Review*

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1. INTRODUCTION

Physics, chemistry, biology, mathematics, astronomy, geology and other natural sciences all fall within the field of science. Science is a branch of science that analyses nature and natural phenomena in a multidimensional way that people can understand (Kaman, 2013). In courses with abstract concepts such as science, different concretisation tools are needed to increase students' effective experience opportunities and to enable them to observe experiments that are difficult and costly to observe in real life (Şahin, 2016).

Technology has two sub-dimensions in the field of education: educational and instructional technology. Educational technology includes planning the learning environment, designing the processes to be applied and developing them by evaluating them; instructional technology includes all materials such as pen, paper, smart board, computer, internet, courseware that are activated in the learning environment (Adıgüzel & Yüksel, 2012). By integrating technology in lessons, students can gain concrete experiences (Karamustafaoğlu et. al., 2012). Technology supported education contributes to the use of teaching modules by students without the need for a teacher and computer-based education activities and distance education activities can be carried out (Budak & Budak, 2012).

2. LITERATURE REVIEW

When the studies on instructional and educational technologies are examined, it is seen that analyses of different years have been conducted. Şimşek et al. (2008) aimed to analyse the general trends of 64 doctoral theses written on educational technologies in five universities in Türkiye between 1996 and 2006. As a result of the study, the researchers determined that these theses were mostly quantitative, the quantity and quality of the theses differed according to the universities, achievement tests and attitude scales were used, and many studies on educational technology have not yet been conducted in Türkiye. Akça Üstündağ (2013) examined 133 theses written in the master's programs of Computer Education and Instructional Technology Education (CEIT) departments between 2002-2007. In the study, the universities where the theses were conducted, the subjects they dealt with and the research models they preferred were grouped. As a result of the research, it was determined that the total number of theses produced in the field of CEIT per year remained around 30 on average after 2004, the most studies were conducted at Gazi University, quantitative researches were preferred more and computer assisted instruction was at the forefront as a subject area. Erdoğan and Çağıltay (2009) aimed to determine the general trends in terms of subject, sampling, and methodology in postgraduate theses in the field of educational technologies in our country and examined 248 postgraduate theses published by all universities with master's and doctoral departments in the field of ICT. Until 2008, the methodology, sampling techniques, data collection inventories and research topics used in these theses were analysed and classified. According to the results of the research, it has been determined that there are very few master's and doctoral programs in this field in Turkey, the number of academic staff working in these programs is insufficient, most of the published theses are published in METU, the majority of the theses focus on media and media comparison, and the studies mostly use experimental, survey and case study methodologies. Demirci Güler and Irmak (2018), who examined the articles and theses on the

use of technology in the field of science education between 2005-2018, conducted a content analysis of the theses and dissertations they determined with the criterion sampling technique and the journals scanned in the determined indexes as criteria. In the data analysis phase, they developed a coding framework and classified the articles and theses according to the categories and then presented the frequencies and percentages of each sub-category in the form of tables and graphs. In their research, they concluded that the topics that were the basis of the theses and articles examined in general were the effect of technology use in science education on various fields, computer assisted instruction, web design, smart board use, scale development, comparison of science programs and book review. In addition, it was determined that quantitative, qualitative and mixed design were adopted, descriptive survey and experimental design studies were predominant, achievement tests, affective scales and interview forms were highly preferred as data collection tools, and the majority of the participants consisted of students, pre-service teachers and teachers. In another study, Töngel et al. (2020) analyzed 206 postgraduate theses conducted in Türkiye between 2013 and 2018 in the disciplines of ICTE and Educational Technologies in terms of content and methodology. According to the results of the study, it was determined that web-based learning environments were studied more, there was an increase in the number of theses using mixed methods, more studies were conducted with university students as the sample group and quantitative methods were more preferred. Tosuntaş, Emirtekin and Süral (2019), who aimed to examine the postgraduate theses on educational technologies and instructional technologies thematically and methodologically, studied 148 theses between 2013-2018. As a result of the research, it was determined that there was a decrease in the number of postgraduate theses, master's theses were more than doctoral theses, researchers had insufficient knowledge in determining sampling, most of the theses were conducted with teachers and prospective teachers, and keywords such as educational technology, FATİH project, attitude, self-efficacy and technological pedagogical content knowledge were mostly used in the theses. Yılmaz and Deniz Çeliker (2022) conducted a document analysis based on the distribution of theses according to master's and doctoral theses, the technological tools used, the research design used in the thesis, the distribution of theses according to years, the subjects and units included in the thesis, the grade levels applied and the most repeated words in the keywords in their research in which they examined 59 graduate theses written within the scope of technology-based science education between 2010-2020. According to the results of the research, it was determined that master's theses were more than doctoral theses; computer assisted instruction was preferred more than other technological tools; experimental design was used more among the methods used. It was determined that the most preferred science subject was the subjects related to the force and motion unit, the 7th grade students were mostly studied, and the key concepts in the theses were academic achievement, smart board, computer assisted instruction, science, and attitude. Devran, Öztay and Tarkın Çelikkıran (2021), in their research, examined the studies conducted with teachers on technology integration in science education published between 2013-2020 in our country. They analyzed a total of 49 scientific researches (articles, master's and doctoral theses), which they identified by searching with the keywords "science", "physics", "chemistry" and "biology" and the binary combinations of the keywords "technology integration", "technology use" and

"technological pedagogical content knowledge (TPACK)", in terms of publication year, subject area, research method, sample characteristics, data collection tools, data analysis methods, validity and reliability strategies, and educational technologies studied according to the content analysis method. According to the results of the research, it was determined that more research has been conducted in the related field in recent years, the researches mostly focused on teachers' views on the integration of technology into science education, qualitative and quantitative research design was preferred more than mixed design, researches were mostly conducted on smart board from educational technologies, the use of questionnaire/scale was the most preferred data collection tool, expert review was preferred for validity and Cronbach's alpha coefficient was preferred for reliability.

Among the objectives of the Ministry of National Education's (2018) 2023 Education Vision, it is emphasized that the courses should be enriched in terms of digital content (MoNE, 2018). For this reason, examining the studies on instructional technologies in the fields of physics education, chemistry education, biology education and science education, seeing the changes and developments related to instructional technologies will provide information on the use of technology in education and training. In addition, examining the studies on instructional technologies will provide information about how instructional technologies are used in teaching and how they have developed over time (Şimşek et al., 2008). The examination of theses related to a subject provides an understanding of the national development of the field in the context of that country (Töngel et al., 2020). For this reason, it is thought that the examination of postgraduate theses related to instructional technology will contribute to the literature, education, and training. It is thought that examining the postgraduate theses related to instructional technologies will contribute to the literature, education and training since both the Ministry of National Education's (2018) education vision goals include supporting technology-based teaching in enriching the courses in terms of content and instructional technologies are generally an important tool used in teaching in terms of supporting and developing teaching processes.

In line with this purpose, with the foresight that examining the studies on learning environments in which instructional technologies are used will provide us with important clues about how to teach, a systematic literature review of postgraduate theses on instructional technologies has been carried out since postgraduate theses contain more scientific information and provide more solid evidence, and information about the current situation on this subject has been presented. The research is limited to 67 postgraduate theses related to instructional technologies in the fields of Physics Education, Chemistry Education, Biology Education and Science Education between 2013-2014.

2.1. Problem Statement

What are the results of the analyses obtained from the systematic literature review of postgraduate theses on instructional technologies in the fields of physics education, chemistry education, biology education and science education between 2013-2024?

2.1.1. Sub-Problems of the Research

In the research, answers to the following sub-problems were sought. The postgraduate theses in the fields of physics education, chemistry education, biology education and science education between 2013-2024.

1. How is the distribution according to years?
2. How is the distribution according to subject area?
3. How is the distribution according to universities?
4. How is the distribution according to institutes?
5. How is the distribution according to research method?
6. How is the distribution of research models or designs?
7. How is the distribution of data collection tools?
8. What are the cities where they are carried out?
9. How are the periods of implementation in educational institutions?
10. How is the distribution of data analyses?

3. METHODOLOGY

3.1. Research Model

The model of this research is a qualitative systematic literature review. Systematic literature review is a comprehensive review of all studies published on a subject, determining the publications to be included in the review as a result of different types of inclusion and exclusion criteria, evaluating these publications, making a critical analysis and revealing similarities and differences (Burns & Grove, 2007; Karaçam, 2013; cited in Bademci & Halaç, 2021).

3.2. Population and Sample of the Research

When the studies on instructional technologies are examined, it is seen that there are already studies in the systematic literature review model related to the studies conducted from 1996 to 2020 (Akça Üstündağ, 2013; Demirci Güler & Irmak, 2018; Devran, Öztay & Tarkın Çelikkıran, 2021; Şimşek et al., 2008; Tosuntaş, Emirtekin & Süral, 2019; Töngel et al, 20020). Due to the rapid increase in the number of studies on instructional technologies in recent years and the importance of revealing the current situation, a systematic literature review of the theses prepared in the last 10 years was conducted in this study.

Criterion sampling method, one of the purposive sampling methods, was used in the sampling of the study. The basic understanding of the criterion sampling method is to study all situations that meet a predetermined set of criteria (Yıldırım & Şimşek, 2011). The sample is the master's and doctoral theses in the fields of physics, chemistry, biology and science related to instructional technologies conducted between the years 2013-2024. The criterion in this research is that the theses should be conducted between the years 2013-2024 and be related to instructional technologies in the fields of physics, chemistry, biology and science. Within the scope of the research, 67 theses were analyzed and 49 of them (73.13%) were master's theses and 18 of them (26.87%) were doctoral theses.

3.3. Data Collection

Within the scope of the research, master's and doctoral theses related to instructional technologies in the fields of physics, chemistry, biology and science were downloaded from the national thesis centre page in the database of YÖK. Then, these theses were systematically analysed in line with the sub-objectives. In the research, the database was scanned by making binary combinations of the key concepts "instructional technology, physics, chemistry, biology, science". Theses that were not open to access or whose full text could not be accessed were not included.

3.4. The Analysis of the Data

Descriptive analysis was used to analyze the data. The main purpose of this type of analysis is to present the findings to the reader in a summarized and interpreted form (Yıldırım & Şimşek, 2003). Graduate Theses Review Form (Acar, 2023) was used for the systematic review of the postgraduate theses included in the research. Percentage and frequency calculations of the data were made, and tables were created to make the findings meaningful.

In order to ensure data analysis reliability, 20% of 49 master's theses and 18 doctoral theses were randomly selected. Accordingly, 14 randomly selected postgraduate theses, 10 master's theses and 4 doctoral theses, were re-evaluated and classified together with the help of two researchers who have research in this field. For the reliability of the analysis, Miles and Huberman's (1994) reliability formula was used. $Reliability = \frac{Agreement}{Agreement + Disagreement}$. As a result of the calculation, the reliability of the research was calculated as 94%. Reliability calculations above 70% are considered reliable for the research (Miles & Huberman, 1994). According to the result obtained, it is accepted that the analysis is reliable. The points of disagreement were reviewed, discussed and a consensus was reached.

4. FINDINGS

In the study, 67 postgraduate theses were analyzed within the framework of the research questions. The analyzed data were coded in accordance with the themes and their percentages, frequencies, total percentages and total frequencies according to years are given in tables below.

4.1. Findings Related to the First Sub-Problem

The first sub-problem of the research is "How is the distribution of postgraduate theses in the fields of physics, chemistry, biology and science according to years between 2013-2024?". The findings obtained from the analyses are given in Table 1.

Table 1. *Distribution of Theses Analyzed related to Instructional Technologies according to Years*

Year	Doctoral		Master's		Total	
	f	%	F	%	f	%
2024	2	11.11	2	4.08	4	5.97
2023	1	5.56	4	8.2	5	7.46
2022	3	16.66	7	14.28	10	14.93
2021	2	11.11	7	14.28	9	13.43
2020	2	11.11	7	14.28	9	13.43
2019	-	-	10	20.4	10	14.93
2018	3	16.66	1	2.04	4	5.97
2017	-	-	1	2.04	1	1.49
2016	2	11.11	2	4.08	4	5.97
2015	2	11.11	2	4.08	4	5.97
2014	1	5.56	5	10.2	6	8.96
2013	-	-	1	2.04	1	1.49
Total	18	100	49	100	67	100

According to Table 1, the number of master's theses is higher than doctoral theses. This may indicate that master's theses can be shorter and easier than doctoral theses and therefore are preferred by students. In 2013 and 2019, only master's theses were written. In 2015, 2016, 2017 and 2024, the number of doctoral and master's theses is the same. In 2022, 7 master's theses and 3 doctoral theses were written, which shows the year with the highest total number of theses compared to other years. It is seen that 2013 is the year with the least number of theses written.

4.2. Findings Related to the Second Sub-Problem

The second sub-problem of the research is "How is the distribution of postgraduate theses in the fields of physics, chemistry, biology and science according to their subject areas between 2013-2024?". The findings obtained from the analyses are given in Table 2.

Table 2. *Subject Distribution of Theses Analyzed related to Instructional Technologies*

Subject Area	Doctoral		Master's		Total	
	f	%	f	%	f	%
Physics	6	33.33	19	38.77	25	37.31
Science	8	44.45	14	28.57	22	32.84
Chemistry	2	11.11	7	14.29	9	13.43
Biology	2	11.11	7	14.29	9	13.43
Physics-Chemistry-Biology	-	-	2	4.08	2	2.99
Total	18	100	49	100	67	100

According to the data in Table 2, it is seen that doctoral studies were carried out in the subject areas of science (f:8, %44.45), secondly Physics (f:6, %33.33), thirdly Chemistry (f:2, %11.11) and Biology (f:2, %11.11). In master's theses, Physics (f:19, 38.77%) was the most common subject area, Science (f:14, 28.57%) was the second, Chemistry (f:7, 14.29%) and Biology (f:7, 14.29%) were the third, and Physics-Chemistry (f:2, 4.08%) was the least common subject area. Looking at the overall total, it is seen that most of the postgraduate theses were conducted in Physics (f:25, 37.31%) and the least in Physics-Chemistry (f:2, 2.99%).

4.3. Findings Related to the Third Sub-Problem

The third sub-problem of the research is "How is the distribution of postgraduate theses in the fields of physics, chemistry, biology and science according to universities between 2013-2024?". The findings obtained from the analyses are given in Table 3.

Table 3. *Distribution of Theses Analyzed related to Instructional Technologies according to Universities*

University	Doctoral		Master's		Total	
	f	%	f	%	f	%
Gazi University	6	33.33	5	10.20	11	16.17
Karadeniz Teknik University	4	22.22	3	6.12	7	10.29
Marmara University	1	5.56	4	8.16	5	7.35
Ondokuz Mayıs University	1	5.56	2	4.08	3	4.40
Firat University	-	-	3	6.12	3	4.40
Aksaray University	1	5.56	-	-	3	4.40
İstanbul University-Cerrahpaşa	-	-	2	4.08	2	2.93
Karamanoğlu Mehmetbey University	-	-	2	4.08	2	2.93
Çanakkale Onsekiz Mart University	-	-	2	4.08	2	2.93
Yıldız Teknik University	1	5.56	1	2.04	2	2.93
Hacettepe University	1	5.56	1	2.04	2	2.93
Kastamonu University	1	5.56	1	2.04	2	2.93
Trabzon University	1	5.56	1	2.04	2	2.93
Amasya University	-	-	1	2.04	1	1.47
Niğde Ömer Halisdemir University	-	-	1	2.04	1	1.47
Giresun University	-	-	1	2.04	1	1.47
Abant İzzet Baysal University	-	-	1	2.04	1	1.47
Mehmet Akif Ersoy University	-	-	1	2.04	1	1.47
Bahçeşehir University	-	-	1	2.04	1	1.47
Kırşehir Ahi Evran University	-	-	1	2.04	1	1.47
Zonguldak Bülent Ecevit University	-	-	1	2.04	1	1.47
Kocaeli University	-	-	1	2.04	1	1.47
Trakya University	-	-	1	2.04	1	1.47
Eskişehir Osmangazi University	-	-	1	2.04	1	1.47
Sinop University	-	-	1	2.04	1	1.47
Uşak University	-	-	1	2.04	1	1.47
Süleyman Demirel University	-	-	1	2.04	1	1.47
Muğla Sıtkı Koçman University	-	-	1	2.04	1	1.47
Kahramanmaraş Sütçü İmam University	-	-	1	2.04	1	1.47
Yozgat Bozok University	-	-	1	2.04	1	1.47
İnönü University	-	-	1	2.04	1	1.47
Bursa Uludağ University	1	5.56	-	-	1	1.47
Balıkesir University	-	-	1	2.04	1	1.47
Atatürk University	1	5.56	1	2.04	1	1.47
Total	18	100	49	100	67	100

When Table 3 is analyzed, it is seen that most of the doctoral (f:6, 33.33%) and master's (f:5, 10.20%) studies related to instructional technologies were conducted at Gazi University. Karadeniz Technical University ranks second for doctoral studies and Marmara University ranks second for master's studies. When we look at the general total value, Gazi University (f:11, 16.17%) and Karadeniz Technical University (f:7, 10.20%) are in the first two places.

4.4. Findings Related to the Fourth Sub-Problem

The fourth sub-problem of the research is "How is the distribution of postgraduate theses in the fields of physics, chemistry, biology and science according to institutes between 2013-2024?". The findings obtained from the analyses are given in Table 4.

Table 4. *Distribution of Theses Analyzed related to Instructional Technologies according to Institutes*

Institute	Doctoral		Master's		Total	
	F	%	f	%	f	%
Education Sciences	13	72.22	25	51.02	38	56.71
Science	2	11.11	17	34.7	19	28.36
Postgraduate Education	3	16.67	7	14.28	10	14.93
Total	18	100	49	100	67	100

When Table 4 is analyzed, it is seen that postgraduate theses were conducted in three different institutes. There were 13 doctoral and 25 master theses in the Institute of Educational Sciences, 2 doctoral and 17 master theses in the Institute of Natural and Applied Sciences, and 3 doctoral and 7 master theses in the Institute of Graduate Studies.

4.5. Findings Related to the Fifth Sub-Problem

The fifth sub-problem of the research is "How is the distribution of postgraduate theses in the fields of physics, chemistry, biology and science according to the research method between 2013-2024?". The findings obtained from the analyses are given in Table 5.

Table 5. *Distribution of Theses Analyzed related to Instructional Technologies according to Research Methods*

Research Methodology	Doctoral		Master's		Total	
	f	%	f	%	f	%
Quantitative	4	22.22	29	59,2	33	49.25
Mixed research	10	55.56	9	18,3	19	28.36
Qualitative	4	22.22	11	22,3	15	22.39
Total	18	100	49	100	67	100

According to Table 5, it is seen that mixed research method (f:10, 55.56%), quantitative (f:4, 22.22%) and qualitative research methods (f:4, 22.22%) were used the most in doctoral studies. In master's theses, quantitative research method was used the most (f:29, 59.2%), qualitative

research method was used the second (f:11, 22.30%) and mixed research method was used the least (f:9, 18.30%). Considering the overall total, it is seen that quantitative research method was used the most (f:33, 49.25%) and qualitative research method was used the least (f:15, 22.39%) in postgraduate theses.

4.6. Findings Related to the Sixth Sub-Problem

The fifth sub-problem of the research was expressed as "How is the distribution of postgraduate theses in the fields of physics, chemistry, biology and science according to research models or designs between 2013-2024?". The findings obtained as a result of the analyses are given in Table 6.

Table 6. *Distribution of Research Designs Used in Theses Analyzed related to Instructional Technologies*

Research Design	Doctoral		Master's		Total	
	f	%	f	%	f	%
Experimental Design	2	11.11	25	51.02	27	40.30
Mixed Design	10	55.55	9	18.37	19	28.36
Case Study	4	22.22	12	24.49	16	23.89
Survey Method	1	5.56	2	4.08	3	4.47
Document Analysis	-	-	1	2.04	1	1.49
Action Research	1	5.56	-	-	1	1.49
Total	18	100	49	100	67	100

According to Table 6, it is seen that mixed research (f:10, 55.56%), case study (f:4, 22.22%), survey (f:1, 5.56%) and action research (f:1, 5.56%) were mostly used in doctoral studies. In master's theses, experimental design (f:25, 51.02%) was used the most, case study (f:12, 24.49%) and document analysis (f:1, 2.04%) was used the least. Looking at the overall total, it is seen that experimental design (f:27, 40.30%), document analysis (f:1, 1.49%) and action research (f:1, 1.49%) were used the most in postgraduate theses.

4.7. Findings Related to the Seventh Sub-Problem

The seventh sub-problem of the research is as follows: "What is the distribution of data collection tools in the postgraduate theses in the fields of physics, chemistry, biology and science between 2013-2024?". The findings obtained from the analyses are given in Table 7.

Table 7. *Distribution of Theses Analyzed related to Instructional Technologies according to Data Collection Tools*

Data Collection Tool	Doctoral		Master's		Total	
	f	%	F	%	f	%
Attitude scale	7	20.59	31	36.47	38	31.93
Semi-structured interview form	11	32.35	22	25.9	33	27.73
Achievement test	8	23.52	23	27.05	31	26.05
Questionnaire	4	11.76	3	3.52	7	5.88
Observation form	2	5.9	2	2.35	4	3.36
Concept test	1	2.94	3	3.52	4	3.36
Document review	1	2.94	1	1.19	2	1.69
Total	34	100	85	100	119	100

When Table 7 is analyzed, it is seen that semi-structured interview form (f:11, 32.35%), achievement test (f:8, 23.52%), document analysis (f:1, 2.94%) and concept test (f:1, 2.94%) were used as data collection tools in doctoral studies. Attitude scale (f:31, 36.47%), achievement test (f:23, 27.05%) and document analysis (f:1, 1.19%) were used as data collection tools in postgraduate studies. Looking at the overall total, it is seen that attitude scale was used the most in postgraduate theses (f:38, 31.93%) and document analysis was used the least (f:2, 1.69%).

4.8. Findings Related to the Eighth Sub-Problem

The eighth sub-problem of the research is "What are the cities where the postgraduate theses in the fields of physics, chemistry, biology and science were conducted between 2013-2024?". The findings obtained from the analysis are given in Table 8.

Table 8. *Distribution of Theses Related to Instructional Technologies according to Cities*

City	Doctoral		Master's		Total	
	f	%	f	%	f	%
İstanbul	3	16.66	9	18.36	12	17.91
Ankara	4	22.22	6	12.24	10	14.93
Trabzon	3	16.66	3	6.12	6	8.96
Samsun	2	11.11	1	2.04	3	4.48
Aksaray	1	5.56	2	4.08	3	4.48
Elâzığ	-	-	2	4.08	2	2.99
Ordu	1	5.56	1	2.04	2	2.99

Table 8 shows the cities in which doctoral and master's theses were conducted. When this table is examined, it is seen that doctoral theses are mostly conducted in Ankara and master's theses are mostly conducted in Istanbul. Looking at the overall total, the provinces of Istanbul and Ankara come to the forefront. In addition, it was determined that Elazığ and Ordu provinces were the cities with the least number of applications in both thesis types.

4.9. Findings Related to the Ninth Sub-Problem

The ninth sub-problem of the research is as follows: "How are the implementation periods of the postgraduate theses in the fields of Physics, Chemistry, Biology and Science in educational institutions between 2013-2024?". The findings obtained as a result of the analysis are given in Table 9.

Table 9. *Implementation Periods of the Theses Analyzed related to Instructional Technologies in Educational Institutions*

Academic Year	Doctoral		Master's		Total	
	f	%	f	%	f	%
2022-2023	2	11.11	2	4.08	4	5.98
2021-2022	5	27.77	6	12.25	11	16.41
2020-2021	1	5.56	9	18.37	10	14.92
2019-2020	-	-	3	6.12	3	4.47
2018-2019	2	11.11	11	22.45	13	19.4
2017-2018	1	5.56	5	10.20	6	8.96
2016-2017	-	-	2	4.08	2	2.99
2015-2016	3	16.66	3	6.12	6	8.96
2014-2015	2	11.11	-	-	2	2.99
2013-2014	1	5.56	4	8.16	5	7.46
2012-2013	-	-	2	4.08	2	2.99
2011-2012	1	5.56	2	4.08	3	4.47
Total	18	100	49	100	67	100

As seen in Table 9, it is seen that doctoral theses were conducted more in the 2021-2022 academic year and master's theses were conducted more in the 2018-2019 academic year. Looking at the overall total, it was revealed that the most studies were conducted in the 2018-2019 academic year, while the least studies were conducted in the 2012-2013, 2016-2017 and 2022-2023 academic years.

4.10. Findings Related to the Tenth Sub-Problem

The tenth sub-problem of the study is "How is the distribution of data analysis in the postgraduate theses in the fields of Physics, Chemistry, Biology and Science between 2013-2024?". The findings obtained from the analyzes are given in Table 10.

Table 10. *Analysis Methods Used in Theses Analyzed related to Instructional Technologies*

Analysis Methods	Doctoral		Master's		Total	
	f	%	f	%	f	%
Content Analysis	7	38.89	12	24.49	19	28.36
Descriptive Analysis	5	27.77	12	24.49	17	25.37
Dependent-Independent T Test	4	22.22	13	26.53	17	25.37
ANOVA	1	5.56	6	12.25	7	10.45
Mann Whitney U Analysis	1	5.56	2	4.08	3	4.48
Wilcoxon Signed Ranks Test	-	-	2	4.08	2	2.99
Chi-Square Analysis	-	-	1	2.04	1	1.49
Kruskal Wallis Test	-	-	1	2.04	1	1.49
Total	18	100	49	100	67	100

When Table 10 is examined, it is seen that in doctoral studies, content analysis (f:7, 38.89%), descriptive analysis (f:5, 27.77%) and ANOVA (f:1, 5.56%) and Mann Whitney U analysis (f:1, 5.56%) were performed the most in doctoral studies. In master's theses, dependent-independent t-test (f:13, 26.53%) was used the most, content and descriptive analysis (f:12, 24.49%) the second most, and Chi-square analysis (f:1, 2.04%) and Kruskal Wallis test (f:1, 2.04%) the least. Overall, it was found that content analysis was used the most in data analysis in postgraduate theses (f:19, 28.36%) and Chi-square analysis (f:1, 1.49%) and Kruskal Wallis test (f:1, 1.49%) were used the least.

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

In this study, which aims to examine the systematic literature of postgraduate theses on instructional technologies in the fields of physics, chemistry, biology and science education between 2013-2024 in our country, a general situation determination and evaluation was made. According to the results of the research, the most theses on this subject were found between 2019-2022. Since 2022, it has been observed that the number of theses on instructional technologies has decreased. The reason for this is thought to be the rapid progress of science and technology in all areas of human life and the reflection of this situation on education and training activities. When the literature is examined, it is seen that the number of graduate theses in the field of education and instructional technologies has also decreased since 2014 (Göktaş, et al., 2012; Tosuntaş, Emirtekin & Süral, 2019).

According to the results of the study, it is seen that master's theses are more than doctoral theses. The reason why master's theses are more than doctoral theses is that master's entrance conditions are easier than doctoral entrance conditions, and the doctoral thesis stage requires more professionalism than master's thesis. This situation can be seen as the reason why the rate

of doing master's degree is higher than the rate of doing doctorate. This result is similar to other studies in the literature (Tosuntaş, Emirtekin & Süral, 2019; Yılmaz & Deniz Çeliker, 2022).

The other result obtained from this research is that doctoral theses are mostly related to science subjects and master's theses are mostly related to physics subjects. In total, it was found that there were the highest number of technology-supported theses on physics subjects, followed by theses on science subjects. This may be because physics and science concepts are mostly abstract, and teachers prefer to use instructional technologies to concretize abstract concepts. Instructional technologies contribute to the learning environment, especially in the concretization of abstract structures (Tuncel et al., 2011). In addition, since physics subjects are generally more common in the course subjects, the researchers may have conducted more research on these subjects and prepared graduate theses. Similarly, Yılmaz and Deniz Çeliker (2022) examined the postgraduate thesis studies written within the scope of technology-based science education and found that there were more theses related to the force and motion unit among physics subjects.

In the study, it was determined that these theses between 2013 and 2024 were mostly conducted at Gazi University. On the basis of cities, it was revealed that doctoral theses were mostly conducted in Ankara and master's theses were mostly conducted in Istanbul. Looking at the overall total, the provinces of Istanbul and Ankara come to the forefront again. In the literature, Erdoğan and Çağıltay (2009) found that the highest number of postgraduate theses in the field of ITET (Instructional Technology Education Thesis) were conducted at METU (Middle East Technical University), Akça Üstündağ (2013) found that the highest number of master's theses of ITET departments were conducted at Gazi University between 2002-2007, and Töngel et al. (2020) found that the highest number of theses in the field of instructional technologies were conducted at Ankara University between 2013-2018.

In the study, it is seen that graduate theses in both thesis types (doctorate-master's degree) were conducted in three different institutes (institutes of science, social sciences and educational sciences). Most theses were prepared in the Institute of Educational Sciences. The reason for this is that the departments related to field education are mostly the departments of Educational Sciences Institutes. However, in our country, it is also seen that departments such as physics, chemistry, biology and science education are also included in the departments of the Institutes of Science, albeit to a lesser extent. In the literature, Tosuntaş, Emirtekin and Süral (2019) examined the theses on instructional technologies between 2013 and 2019 and similarly found that these theses were prepared mostly in the institute of educational sciences and secondly in the institutes of science.

In the research, it was determined that mixed research method was used the most in doctoral studies between 2013-2024, followed by quantitative and qualitative research methods. In master's studies, quantitative research method was used the most, qualitative research method was used the second and mixed research method was used the least. In general, it is seen that

quantitative research method is used the most and qualitative research method is used the least in graduate theses. The reason for this can be considered as the fact that analyses of qualitative research take longer and require more professionalism than analyses of quantitative research. For this reason, quantitative analyses may be avoided in master's theses. This result is similar to the results of Şimşek et al. (2008) between 1996-2006, Tosuntaş, Emirtekin and Süral (2019) between 2013-2018, Töngel et al. (2020) between 2013-2018, Akça Üstündağ (2013) between 2002-2007. The reason why quantitative research methods are preferred more may be that graduate students do not have sufficient knowledge and experience about research and qualitative analysis methods. The fact that qualitative analyses are more time-consuming than quantitative analyses can also be shown as a reason for not being preferred.

In the research, it was determined that mixed research was used mostly in doctoral studies and experimental design was used mostly in master's studies. Looking at the overall total, it was determined that the experimental design was mostly used in postgraduate theses. In terms of research design, Şimşek et al. (2008) and Akça Üstündağ (2013) stated that experimental design was mostly used in their examinations, while Töngel et al. (2020) and Tosuntaş, Emirtekin and Süral (2019) stated that survey research was mostly used. The use of mixed research in doctoral dissertations between 2013-2024 shows that researchers tend to obtain richer and more in-depth information by supporting quantitative data with qualitative data.

In the research, it is seen that semi-structured interview form is used mostly in doctoral studies and attitude scale is used mostly in master's studies. Looking at the overall total, it was determined that the attitude scale was used the most in postgraduate theses. When the literature was examined, it was determined that researchers mostly used questionnaires (Göktaş et al., 2012), scales (Tosuntaş, Emirtekin & Süral, 2019) and tests (Şimşek et al., 2008) as data collection tools. Since quantitative research methods are used more, it is expected that quantitative data collection tools will be used more.

In the study, it was concluded that content analysis was used most in doctoral studies, dependent-independent t-test was used most in master's theses, and content analysis was used most in data analysis in graduate theses. It is a normal result that content analysis is used more in doctoral theses because mixed methods are used the most, and quantitative analysis methods are used more in master's theses because quantitative research methods are used more in master's theses. These results are similar to previous studies (Şimşek et al., 2009; Tosuntaş, Emirtekin & Süral, 2019).

In the light of these results, the following suggestions can be made:

- Since technology is among the necessities of our age, it is recommended that studies on instructional technologies should be conducted not only in science and physics disciplines but also in other science fields such as biology and chemistry.
- Teachers can participate in more in-service trainings so that they can easily adapt instructional technologies to their lessons.
- Technical equipment for instructional technologies should be checked and deficiencies should be completed so that teachers can use them in their lessons.

6. ABOUT THE AUTHORS

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Appendix

Appendix-1: Graduate Theses Examined in the Study

Thesis number	Author	Year	Thesis name	Thesis type
328898	A. Kaman	2013	Öğrenciler tarafından hazırlanan video filmlerin fen ve teknoloji dersi öğretiminde başarıya etkisi (<i>The impact of video films prepared by the students' achievement on science and technology course teaching</i>)	Master
360680	S. O. Esen	2014	Teknoloji destekli beyin temelli öğrenmenin öğrencilerin akademik başarıları, hatırlatma düzeyleri ve üstbilişsel farkındalık (<i>The effect of technology supported brain-based learning on students' academic achievement, retention level and metacognitive awareness</i>)	Master
381084	A. Şimşek	2014	Fizik öğretmen adaylarının teknolojik pedagojik alan bilgileri gelişiminin incelenmesi (<i>Examination of development of technological pedagogical content knowledge of pre-service physics teachers</i>)	Ph.D.
372281	Y. Emrem	2014	Astronomi ve Uzay Bilimleri dersi gökküresi konusunun akıllı tahta ile uygulamalarının öğrencilerin görsel düşüncelerindeki gelişime etkisi (<i>Astronomy and Space Scientist course subject in the celestial sphere, applications with the smart board of the effects of students's visual thinking</i>)	Master
363087	N. Ergün	2014	Fen bilgisi öğretmen ve öğretmen adaylarının "ışığın kırılması" konusundaki teknolojik pedagojik alan bilgilerinin ve sınıf içi uygulamalarının belirlenmesi (<i>Examining pre- and in-service science teachers' technological pedagogical content knowledge and classroom teaching practices in the topic of "refraction of light"</i>)	Master
382061	A. Kılınç	2014	Robotik teknolojisinin 7. sınıf ışık ünitesi öğretiminde kullanımı (<i>The using of robotic technology in teaching of light unit 7th grade</i>)	Master
356693	D. Yılmaz	2014	Teknolojik pedagojik alan bilgisinin belirlenmesi: Çoklu durum çalışması (<i>Determining technological pedagogical content knowledge: Multiple case study</i>)	Master
381101	T. Kolaylı	2015	Teknoloji destekli bilimsel araştırma (TEDBA) modelinin uygulanabilirliği: Çevre kimyası seçmeli dersi örneği (<i>Applicability of technology embedded scientific inquiry (TESI) model: A case of environmental chemistry elective course</i>)	Master
407731	A. Kumaş	2015	Fizik öğretiminde REACT öğretim stratejisine dayalı olarak geliştirilen yenilikçi teknoloji destekli zenginleştirilmiş öğretmen rehber materyallerinin değerlendirilmesi (<i>The evaluation of innovative, technology supported, enriched teacher guide materials developed according to REACT instructional strategy of teaching physics</i>)	Ph.D.
419312	E. Gökler	2015	Madde ve ısı ünitesinde tam öğrenme modelinin tamamlayıcı yaklaşımına göre geliştirilen teknoloji destekli materyalin öğrenci üzerindeki etkinliğinin araştırılması	Master

Dilara ÜNLÜ, Ayşe Gül ÇİRKİNOĞLU ŞEKERCİOĞLU & Hasene Esra YILDIRIR
Systematic Literature Review of Graduate Thesis on Instructional Technologies in the Fields of Physics,
Chemistry, Biology and Science Education

			<i>(Research on the efficacy of technology - supported material developed for the substance and heat unit on students in the complementary approach of complete learning model)</i>	
407694	E. Kaya	2015	Güneş sistemi ve ötesi: Uzay Bilmecesi' ünitesi için bilişsel yük kuramı ilkelerine göre geliştirilen teknoloji destekli rehber materyallerin etkililiğinin belirlenmesi <i>(Determining the effectiveness of technology supported guided materials based on cognitive load theory principles related to 'solar system and beyond: Space Puzzle' unit)</i>	Ph.D.
450174	N. Gülçiçek	2016	Fen bilgisi öğretmen adaylarının elektrostatik konusundaki teknolojik pedagojik alan bilgileri <i>(The pre-service science teachers' technological pedagogical content knowledge about electrostatic)</i>	Ph.D.
423072	F. Dereli	2016	6. sınıf dünya ve evren konu alanına uyarlanmış bilimin doğası kazanımlarının akıllı tahta etkinlikleri ile öğretimi <i>(Teaching the acquisition of the nature of science which has been adapted to the fields of 6th grade earth and universe with the activities of smart board)</i>	Master
454560	N.B. Karagöz	2016	Öğrencilerin fen bilimleri dersi deneylerini animasyonlaştırmasının akademik başarı, tutum ve motivasyonlarına etkisi <i>(The effect of animating science lesson experiments of students on their academic success, attitude and motivation)</i>	Master
472022	M.H. Başak	2016	Fen bilimleri öğretmenlerinin teknoloji entegrasyonunu geliştirmeye yönelik hizmet içi eğitim kursunun hazırlanması ve etkililiğinin değerlendirilmesi: Fatih Projesi örneği <i>(Preparation of teacher professional development training course programme for science teachers' technology integration development and the evaluation of its efficiency: Sample of Fatih Project study)</i>	Ph.D.
477068	Y. Bolu	2017	6.sınıf öğrencilerinin bilimsel sorgulama, yaratıcılık, fen başarısı ve tutumlarına modellemeye dayalı fen öğretiminin etkisi <i>(The effect of model-based learning on views about scientific inquiry, creativity, academic achievement & attitude of 6th grade students)</i>	Master
533523	H. Karabulut	2018	Teknoloji destekli otantik öğrenme aktivitelerinin öğrencilerin fen öğrenmelerine, fene yönelik tutumlarına ve bilgilerinin kalıcılığına etkisi <i>(The effect of technology supported authentic learning activities on students' science achievement, retention of learning and attitude towards science)</i>	Ph.D.
492301	E.A. Peker	2018	5. sınıf "Canlılar dünyasını gezelim ve tanıyalım" ünitesinin klasik eğitsel oyunlar ve teknoloji destekli eğitsel oyunlarla öğretiminin değerlendirilmesi <i>(Evaluation of teaching the unit of 'Let's travel and learn about the living world' for 5th grades with classic educational games and educational games supported with technology)</i>	Ph.D.
490680	O. Oymak	2018	Fizik eğitiminde laboratuvar destekli öğretim ile teknoloji destekli öğretimin öğrencilerin akademik başarılarına ve fizik dersine yönelik tutumlarına etkisinin incelenmesi <i>(Comparison of students' learning and attitude in technology supported and laboratory-based environments)</i>	Master
515720	G. KayaYatar	2018	Fen bilimleri öğretmen adaylarının teknolojik pedagojik alan bilgilerini etkileyen faktörlerin incelenmesi	Ph.D.

Dilara ÜNLÜ, Ayşe Gül ÇİRKİNOĞLU ŞEKERCİOĞLU & Hasene Esra YILDIRIR
Systematic Literature Review of Graduate Thesis on Instructional Technologies in the Fields of Physics,
Chemistry, Biology and Science Education

			<i>(Investigation of factors influencing on technological pedagogical content knowledge of pre-service science teachers)</i>	
579524	E. Başçı	2019	Teknoloji ile zenginleştirilmiş astronomi dersinin öğrencilerin kavramsal anlamalarına, ilgi ve tutumlarına etkisi <i>(The effect of technology-enriched astronomy course on students' conceptual understanding, interests and attitudes)</i>	Master
558604	M. Öksüz	2019	"Maddenin tanecikli yapısı" ünitesine yönelik zenginleştirilmiş öğretim materyalinin etkililiğinin tespiti <i>(Investigation the effectiveness of enriched teaching material on 'The particulate nature of matter')</i>	Master
553061	T.A. Akarca	2019	Fen bilgisi öğretmen adaylarına "Su" temasının LEGO robotik uygulamaları ile öğretiminin çeşitli değişkenler açısından incelenmesi <i>(Examination of teaching the theme 'Water' to pre-service science teachers with LEGO robotics applications based on different variables)</i>	Master
617256	K. Akbaba	2019	Fen öğretiminde web 2.0 uygulamalarının öğrencilerin fen bilimleri dersine ve teknoloji kullanımına yönelik tutumlarına etkisi <i>(The effect of web 2.0 applications in science teaching on students' attitudes towards science and technology use)</i>	Master
584262	Ö.Ö. Köse	2019	Teknoloji destekli argümantasyon uygulamalarının 7. sınıf öğrencilerinin akademik başarılarına, kavramsal anlamalarına ve tutumlarına etkisi: Kuvvet ve enerji <i>(The effect of technology assisted argumentation on the 7th grade achievement, conceptual understanding and attitude: Force and energy)</i>	Master
546014	M. Özer	2019	Teknoloji destekli araştırma-sorgulamaya dayalı fen öğretiminin etkililiğinin değerlendirilmesi: Işık ve ses örneği <i>(Evaluation of effect of technology supported inquiry-based science teaching: Light and sound example)</i>	Master
571283	İ. Dilek	2019	Fen bilgisi öğretmen adaylarının teknolojik pedagojik alan bilgisi gelişiminde mikro öğretimin etkisi <i>(The effect of micro teaching on preservice science teachers' technological pedagogical content knowledge development)</i>	Master
567681	F. Karataş	2019	Teknolojik uygulamalarla destekli çevre eğitiminin ortaokul 7. sınıf öğrencilerinin çevreye yönelik tutum, davranış ve başarılarına etkisi <i>(The effect of environment education supported by technological applications on environmental attitudes, behaviors and success of 7th grade secondary school students)</i>	Master
608979	Ş. Çallı	2019	Mobil uygulama destekli öğretimin 5. sınıf öğrencilerinin akademik başarı, tutum, motivasyon ve katılımlarına etkisi: Elektrik konusu <i>(The effect of mobile-assisted instruction on 5th grade students' achievement, attitude, motivation and engagement: Electric subject)</i>	Master
593849	H. Bilgin	2019	Fen bilimleri öğretmenlerinin fen bilimleri dersi için geliştirilmiş bir android tabanlı mobil uygulamaya yönelik görüşlerinin incelenmesi <i>(An examination of science teachers' opinions towards to android based mobil application for science courses)</i>	Master
660170	B. Elbir	2020	Robotik çalışmalarının STEM uygulaması olarak ortaokul fen laboratuvar uygulamalarına entegrasyonu	Ph.D.

<i>(Integration of robotics studies as STEM into secondary school science laboratory practices)</i>				
619555	E. Demir	2020	5. sınıf fen bilimleri dersi insan ve çevre ünitesinde ters yüz sınıf uygulamalarının çevre bilincine etkisinin incelenmesi <i>(Analyzing of effects of flipped classroom practices on environmental consciousness in the fifth-grade sciences lesson human and environment unit)</i>	Master
651267	H. Yanış Kelleci	2020	Eğitsel robotik uygulamalarına dayalı STEM eğitimi kapsamında öğretmen adaylarının eğitsel robotik TPAB öz-yeterlik inançlarının bilimsel yaratıcılık ve bilgi işlemsel düşünme becerilerinin incelenmesi <i>(An investigation of pre-service teachers' educational robotics TPACK self-efficacy belief, scientific creativity and computational thinking skills in the scope of educational robotics-based STEM education)</i>	Ph.D.
634134	E. Şahin	2020	Dijital destekli işbirlikli öğrenci takımları başarı bölümleri yönteminin fen bilimleri dersinin akademik başarısına etkisi <i>(The effect of digitally assisted cooperative student groups success part tactic to the academic success of science class)</i>	Master
611774	M. Öztanrıkulu	2020	Fen bilgisi derslerinde kullanılan web tabanlı materyallerin kullanım amaçları ve etkinliğinin incelenmesi <i>(Exploring the effectiveness and the purposes of web-based materials used in science classes)</i>	Master
626831	İ. Yıldırım	2020	7. sınıf ışığın madde ile etkileşimi ünitesinde web 2.0 araçlarının kullanılmasının öğrencilerin akademik başarılarına, teknoloji ile kendi kendine öğrenme düzeylerine ve fene yönelik tutumlarına etkisinin incelenmesi <i>(An investigation of effect of the use of web 2.0 tools on students' academic achievement, levels of self-directed learning with technology and attitudes towards science in the interaction of light and matter unit in 7th grade)</i>	Master
646441	H. Yıldırım	2020	Öğretmen adaylarının fen, teknoloji, mühendislik, matematik (FeTeMM) entegrasyonuna yönelik özyeterlik algılarının incelenmesi <i>(An investigation of pre-service teachers' self-efficacy perceptions for science, technology, engineering and mathematics (STEM) integration)</i>	Master
651565	B. Şafak	2020	Eğitim teknolojisi araçlarıyla desteklenen çevre eğitiminin fen bilimleri öğretmen adaylarının çevre okuryazarlığına etkisinin incelenmesi <i>(An analysis of the effect of environmental education supported by educational technology tools on environmental literacy of science teacher candidates)</i>	Master
635597	H. Türk	2020	Fen eğitiminde yenilikçi teknoloji uygulamaları: Dijital hologram örneği <i>(Innovative technology applications in science education: Digital holography)</i>	Master
681049	I.Z. Yaşar	2021	Maddenin tanecikli yapısının teknoloji destekli işbirlikli öğretiminin makroskopik-altmikroskopik geçişleri sağlamaya ve bazı değişkenlere etkisi <i>(The effect of teaching particular structure of matter via technology supported cooperative learning on translating across macroscopic-submicroscopic levels, and some variables)</i>	Ph.D.

Dilara ÜNLÜ, Ayşe Gül ÇİRKİNOĞLU ŞEKERCİOĞLU & Hasene Esra YILDIRIR
Systematic Literature Review of Graduate Thesis on Instructional Technologies in the Fields of Physics,
Chemistry, Biology and Science Education

701166	İ. Aydın	2021	Fen bilimleri dersine yönelik teknoloji destekli interaktif öğretim etkinliklerinin öğrenci başarısına etkisi (<i>The effect of technology-assisted interactive teaching activities on science achievement</i>)	Master
673446	S. Özkan	2021	8. sınıf asit ve baz konusuna yönelik teknoloji destekli rehber materyal geliştirilmesi ve etkililiğinin araştırılması (<i>Developing technology supported guidance material for 8th grade acid and base subject and investigation of its effectiveness</i>)	Master
705813	M.Gönülkırım az	2021	Fotosentez ve hücre solunum konusunun teknoloji destekli tahmin-gözlem-açıklama tekniği ile öğretiminin ortaokul öğrencilerinin başarısına etkisi (<i>The effect of teaching photosynthesis and cellular respiration with technology supported prediction-observation-explanation technique on the success of secondary school students</i>)	Master
703159	H. Aydın	2021	Animasyon destekli örnek olaya dayalı tasarlanan fen öğrenme ortamının akademik başarı ve motivasyona etkisi (<i>The effect of the animation-supported case-based science learning environment on achievement and motivation</i>)	Master
659381	M.Çalışkan	2021	Vücudumuzdaki sistemler ünitesinde dinamik görsel kullanımının 6. sınıf öğrencilerinin akademik başarılarına etkisi (<i>The effect of dynamic visual usage on the academic achievement of 6th grade students in the systems unit in our body</i>)	Master
681010	Ş. Şahingöz	2021	Fen bilimleri öğretmenlerinin ölçme ve değerlendirmeye yönelik öz yeterlik inançlarının incelenmesi üzerine bir araştırma (<i>A study on examination of science teachers' self-efficacy beliefs towards measurement and evaluation</i>)	Master
698603	Ö. Kırbaş	2021	Fen bilgisi öğretmenlerinin web 2.0 araçları kullanımlarının incelenmesi (<i>Investigation of science teachers' use of web 2.0 tools</i>)	Master
744166	M.Karyağdı	2022	Fen bilgisi öğretmen adaylarının oluşturdukları teknoloji destekli kavramsal değişim etkinliklerinin değerlendirilmesi (<i>Evaluation of technology supported conceptual change activities created by pre-service science teacher</i>)	Master
766431	H. Çakır	2022	Teknoloji destekli otantik çevrim içi öğrenme ortamlarının biyoloji laboratuvar dersi kapsamında incelenmesi (<i>Examination of technology supported authentic online learning environments in the context of biology laboratory course</i>)	Ph.D.
754402	E.M. Güven	2022	Fen bilimleri öğretmenlerinin teknolojik pedagojik alan bilgileri gelişimlerinin incelenmesi (<i>Examining development of technological pedagogical content knowledge of science teachers</i>)	Ph.D.
727528	S. İkinci	2022	Modern fizik öğretiminde argümantasyona dayalı sorgulama: Bir durum çalışması (<i>Argument based inquiry in modern physics teaching: A case study</i>)	Ph.D.
714541	N. Topçuoğlu	2022	Kimya eğitiminde atom ve molekül yapılarının öğretiminde üç boyutlu tasarım uygulamaları (<i>Three-dimensional design applications in teaching atom and molecular structures in chemistry education</i>)	Ph.D.
768749	F.T.Tekin	2022	Teknolojinin ve robotik kodlamanın hayat bilgisi ve fen bilimleri derslerinde uygulanması: Bir karma desen araştırması	Master

Dilara ÜNLÜ, Ayşe Gül ÇİRKİNOĞLU ŞEKERCİOĞLU & Hasene Esra YILDIRIR
Systematic Literature Review of Graduate Thesis on Instructional Technologies in the Fields of Physics,
Chemistry, Biology and Science Education

<i>(Application of technology and robotic coding in life and science courses: A mixed pattern research)</i>				
709903	E.B.Bilginer	2022	Fen bilimleri öğretmen adaylarının yavaş geçişli animasyon tekniği ile dolaşım sistemi konusunda zihinsel model gelişiminin incelenmesi <i>(Investigation of mental model development of pre-service science teachers on the circulation system with slow transfer animation technique)</i>	Master
735953	P.Dölek	2022	Covid-19 sürecinde fen bilimleri öğretmenlerinin uzaktan eğitime yönelik tutum ve görüşlerinin incelenmesi (Elazığ ili örneği) <i>(Investigation of attributes and opinions of science teachers on distance education in the Covid-19 process (Elazığ province))</i>	Master
738534	C.Aksu	2022	Kimya öğretmen adaylarının titrasyonlar konusunda zihinsel modellerinin belirlenmesi <i>(Determination of mental models of chemistry teacher candidates on titrations)</i>	Master
722870	M. Pıçakçı	2022	Sınıf öğretmenlerinin teknopedagojik eğitim yeterlikleri ile fen teknoloji mühendislik matematik (FETEMM) farkındalık, öz yeterlik ve endişelerinin incelenmesi <i>(Examination of classroom teachers' tecnopedagogical educational qualifications and science technology engineering mathematics (STEM) awareness, self-efficacy and concerns)</i>	Master
734093	S. Adıgüzel	2022	Dijital hologram kullanımının 4. sınıf fen öğretiminde akademik başarı ve tutuma etkisi <i>(The effect of the use of digital hologram on academic success and attitude in 4th grade science teaching)</i>	Master
837327	R. Çakır	2023	Teknoloji destekli fen öğretimi: Tutum, başarı, motivasyon ve öğrenci görüşleri <i>(Technology supported science teaching: Attitude, achievement, motivation and student views)</i>	Master
830408	E. Öztürk	2023	Teknoloji destekli öğretimin ortaokul öğrencilerinin Fen Bilimleri dersi akademik başarılarına ve fen konularına yönelik ilgilerine etkisi <i>(The effect of technology supported education on the academic achievement of middle school students in science lessons and their interest in science topics)</i>	Master
810527	S. Yılmaz	2023	Teknoloji destekli laboratuvar uygulamalarının farklı değişkenler açısından incelenmesi <i>(Examination of technology-supported laboratory applications in terms of different variables)</i>	Master
801467	A. Bayır	2023	Türkiye'de teknoloji destekli fen öğretimi konulu çalışmaların betimsel içerik analizi <i>(Descriptive content analysis of technology supported science teaching studies in Turkey)</i>	Master
809915	G. Alp	2023	Fen bilimleri dersinde dijital teknolojiler ile zenginleştirilmiş öğretim materyallerinin öğrencilerin bilgisayarca düşünme becerilerine ve kavram geliştirme süreçlerine etkileri <i>(The effects of instructional materials enriched with digital technologies on students' computer thinking skills and concept development processes in science lessons)</i>	Ph.D.
846750	R. Yenigün	2024	Teknoloji destekli argümantasyon yönteminin ortaokul öğrencilerinin vücudumuzdaki sistemler ünitesindeki akademik başarılarına, yaratıcılıklarına ve argümantasyon becerilerine	Master

			etkisi (<i>The effect of technology-supported argumentation method on secondary school students' academic success, creativity and argumentation skills in the systems unit in our body</i>)	
849674	A. Üldeş	2024	Üç boyutlu teknoloji destekli STEM etkinliklerinin dezavantajlı kız öğrencilerin STEM kariyer ilgileri ve tutumlarına etkisi (<i>The effect of three-dimensional technology supported STEM activities on disadvantaged female students' STEM career interests and attitudes</i>)	Ph.D.
847851	D.K. Gözeller	2024	Teknoloji destekli bilimin doğası etkinliklerinin öğretmen adaylarının bilimin doğasına yönelik görüşlerine ve web tabanlı öğretime yönelik tutumlarına etkisinin incelenmesi (<i>The examination of the effects of technology supported nature of science activities on prospective teachers views on the nature of science and a towards web-based instruction</i>)	Master
849643	M.D. Balçın	2024	Fen, mühendislik ve girişimcilik temelli etkinliklerin ortaokul öğrencilerinin mühendisliğin doğası anlayışları, girişimcilik becerileri, kariyer ve yetenek gelişimi öz-yeterliklerine etkisi (<i>The effect of science, engineering and entrepreneurship-based activities on secondary school students' understanding of the nature of engineering, entrepreneurship skills, career and talent development of self-efficacy</i>)	Ph.D.

*Master Thesis: Master, Doctoral Dissertation: Ph.D.