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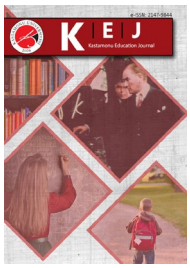

| Research Article / Araştırma Makalesi |

Analyzing of Researches on Gifted in Science Education in Turkey From 2018 to 2020

2018-2020 Yılları Arasında Türkiye'de Özel Yeteneklilerde Fen Bilimleri Eğitimi Alanında Yapılan Çalışmaların İncelenmesi[1]

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Keywords

1. Science education
2. Gifted
3. Content analysis

Anahtar Kelimeler

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Abstract

Purpose: This research aims at analyzing graduate theses and articles made on gifted individual in science education in Turkey through content analysis.

Design/Methodology/Approach: In the research, 16 theses (10 master's and six PhD theses) and 37 articles made between January 2018 and July 2020 were analyzed with content analysis. The studies were accessed from The Council of Higher Education National Thesis Center and Google Academic database.

Findings: In the studies in which content analysis made, current issues were determined as STEM education, curriculum studies, and teaching material development. In most of the studies, qualitative research method was used and "case study" among qualitative research and "survey" among quantitative research models were frequently used. A limited number of experimental researches have shown that learning approaches such as STEM Education, Brain Based Learning, Differentiated Teaching, Argumentation Based Learning, Project Based Learning, Computer Based Learning have positive results on self-regulated learning strategies, attitude towards science, scientific process skills, problem solving skills, creativity and critical thinking skills.

Highlights: It has been concluded that more experimental studies with different variables are needed on science education in gifted. Making studies on entrepreneurial skills, use of technology and different education levels are recommended.

Öz

Çalışmanın amacı: Bu araştırma, Türkiye'de özel yeteneklilerde fen bilimleri eğitimi üzerine yapılan lisansüstü tezlerin ve makalelerin incelenmesi amaçlamaktadır.

Materyal ve Yöntem: Araştırmada, 2018 Ocak ayından 2020 yılı Temmuz ayına kadar yapılmış 16 tez çalışması (10 yüksek lisans ve altı doktora tezi) ve 37 makale içerik analizi ile analiz edilmiştir. Çalışmalara YÖK Ulusal Tez Merkezi ve Google Akademik veri tabanından ulaşılmıştır.

Bulgular: İçerik analizi yapılan çalışmalarda güncel konular; STEM eğitimi, öğretim materyali geliştirme ve müfredat çalışmaları olarak tespit edilmiştir. Yapılan çalışmaların çoğunda nitel araştırma yöntemi kullanılmış ve nitel araştırma türlerinden "durum çalışması", nicel araştırma türlerinden "tarama" modeli sık kullanılan modeller olmuştur. Sınırlı sayıdaki deneysel çalışmalarda; STEM Eğitimi, Beyin Temelli Öğrenme, Farklılaştırılmış Öğretim, Argümantasyon Tabanlı Öğrenme, Proje Tabanlı Öğrenme, Bilgisayar Destekli Öğrenme gibi öğrenme yaklaşımlarının öz düzenleyici öğrenme stratejileri, fene yönelik tutum, bilimsel süreç becerileri, problem çözme becerileri, yaratıcılık ve eleştirel düşünme becerileri üzerinde olumlu sonuçları olduğu görülmüştür.

Önemli Vurgular: Özel yeteneklilerde fen bilimleri eğitimi üzerine farklı değişkenlerle daha fazla deneysel çalışma yapılmasına ihtiyaç olduğu sonucuna ulaşılmıştır. Özel yeteneklilerde girişimcilik becerileri, teknoloji kullanımı ve farklı öğretim seviyeleri ile ilgili çalışmalar yapılması önerilmektedir.

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INTRODUCTION

In today's world, it is essential to raise individuals who can keep up with the 21st century in order to be an advanced society in science and technology (Dönmez & Idin, 2017). The most influential class that will determine the future of a society in international competition is gifted individuals (Alfaqeer & Baioumy, 2019). In this century, it is aimed to raise individuals who can use information in their daily lives, not individuals who memorize information (Kanlı & Emir, 2009). For this reason, countries were asked to pay attention to this category and meet their needs in various fields because gifted individuals play an important role in development and progress by presenting their creative features and abstract ideas (Alfaqeer & Baioumy, 2019). In other words, when looking at gifted individuals, it is seen that they have above-average creativity, ability and task responsibility characteristics (Çepni, Gökdere & Küçük, 2002). In addition, gifted individuals have cognitive abilities such as understanding quickly, learning before their peers, and producing solutions to complex problems (Heller & Hany, 2004). Considering these abilities, it is of great importance to identify gifted individuals and train them in line with the needs of today's societies (Kurnaz & Barışık, 2018; Dönmez & İdin, 2017). However, it is clear that one of the most important problems in the education of gifted students is the inability to provide them with an environment where they can express their talents correctly (Kılıç, 2018). However, gifted individuals need a different education because they have their own characteristics (Kanlı & Emir, 2009). In this context, it is important to systematically develop the talents of gifted individuals within a program so that they can use their talents in the best way (Çepni, Gökdere & Küçük, 2002; Cho & Paik 2006).

In the 21st century, science education has become very important in many aspects (Kanlı & Emir, 2009). In this century, individuals are expected to develop their skills such as problem solving and critical thinking, to be more curious and to develop an attitude based on research and inquiry. Individuals with these skills and attitudes are individuals who are scientifically literate (MEB, 2006). Most gifted individuals have an intense interest in science (Ülger, Uçar & Özgür, 2014; Kunt, 2012). In addition, studies in the field of science increase the curiosity of gifted students and encourage them to do research (Şahin, 2018). In this respect, the special interest of gifted students in science enables them to be seen as the strongest candidates for being a scientist and doing science (Göz, 2019). Therefore, guiding these individuals correctly to pursue a career in science is very important for the progress of today's societies (Kanlı & Emir, 2009).

Although it has been seen that the steps related to the education of gifted individuals in our country have gained momentum recently, it is actually quite late (Kunt, 2012). Today, within the body of Science and Art Centers (BİLSEM), it is ensured that gifted students both continue their education with their peers and develop their skills (Ülger, Uçar, & Özgür, 2014). In addition, structuring learning and teaching environments according to gifted students are only possible thanks to teachers who have a good command of this field (Tüzün & Tüysüz, 2018). In this context, teachers' planning their lessons in line with the characteristics of gifted students will make the process more efficient (Şenol, 2011).

In order to provide appropriate and higher quality education to gifted students, they must first be defined correctly (Heller and Hany, 2004). In addition, there should be developed literature in this field in order for gifted individuals to be properly trained, policymakers to make the right decisions, and researchers to determine appropriate methods and techniques (Kırmızı, 2017). When the international literature is examined, it is seen that in the research analyzed studies on gifted from the 1980s to 2017 (Alfaqeer & Baioumy, 2019; Dai, Swanson & Cheng, 2011; Eunice, de Alencar & de Souza, 2018; Hernández-Torrano & Kuzhabekova, 2020; Jolly & Kettler, 2008; Lee & Choi, 2015; Lee ve Kim, 2018; Warne, Lazo, Ramos v Ritter, 2012), meta-synthesis and meta-analysis studies in the field of science education for gifted students are limited. (Kang, 2010; Yoon & Seo, 2016). Kang (2010), as a result of the analysis of the articles published from 1999 to 2009, has been determined that the number of articles has increased since 2005, the studies are mostly conducted with secondary school students, the studies are made on characteristics of the gifted, the curriculum for the gifted and the science education programs, the method is used mostly in research is questionnaires followed by experimental studies. Yoon and Seo (2016) have found to be related that research articles on cognitive characteristics made between 2010-2015 include perceptions, thinking ability, scientific argumentation, science inquiry; researches on social and emotional characteristics also include motivation, creativity, self-efficacy, etc. In this context, it has been observed that the studies conducted in Turkey have also examined the articles and theses prepared on the subjects of "gifted" at different times from 1973 to 2017. (Ayvacı & Bebek, 2019; Coşkun, Dündar & Parlak, 2014; Dönmez & İdin, 2017; Guçin & Oruç, 2015; Kardeş, Akman & Yazıcı, 2018; Koç & Saranlı, 2017; Özenç & Özenç, 2013; Yilmaz,2018). According to these studies; It has been revealed that there has been a decrease in the number of theses and articles on "science education" and "gifted" in recent years (Ayvacı & Bebek, 2019; Dönmez & İdin, 2017), but there has been a significant increase in the number of theses published in recent years on gifted. (Güçin & Oruç, 2015). It has been stated that the number of PhD theses in this field in Turkey is quite limited and more master's theses are made. (Ayvacı & Bebek, 2019; Coşkun, Dündar & Parlak, 2014; Koç & Saranlı, 2017; Özenç & Özenç, 2013). It has been seen that current approach such as argumentation, STEM and research-questioning are not included in the studies (Dönmez & İdin, 2017), the existing situations of master's theses and PhD theses are aimed at the education of gifted (Güçin & Oruç, 2015). Again, it was determined that scale adaptation studies were carried out to identify gifted children (Koç & Saranlı, 2017) and although there were studies to identify gifted children in early childhood, there were no studies on the quality of the education they received (Yılmaz, 2018). In the studies, it has been revealed that the secondary school level is mostly preferred as a sample (Schreglmann, 2016), and BİLSEMs are the centers where studies are carried out on the gifted (Kardeş, Akman & Yazıcı, 2018). It has been observed that quantitative research methods are mostly preferred in studies (Ayvacı & Bebek,

2019; Coşkun, Dündar, & Parlak, 2014; Kardeş, Akman, & Yazıcı, 2018). In addition, it has been revealed that studies in the field of special talents often consist of papers (Güçin & Oruç, 2015).

Although studies on the education of gifted students in Turkey are frequently examined, it is seen that there are limited studies on science education in gifted students (Ayvacı & Bebek, 2019; Dönmez & İdin, 2017). From this point of view, it is important to determine the new trends by examining the researches in the field of education at certain time intervals, in terms of guiding the researchers who will work in these fields (Cohen, Manion & Morrison, 2007). Since there is no current study examining the studies on science education of gifted students in Turkey since 2018, it is thought that this study will contribute to eliminating the deficiency in the literature.

Purpose of the research

The aim of the research is to examine the current postgraduate thesis studies and articles from various aspects within the scope of science education on gifted in Turkey between January 2018 and July 2020, with content analysis.

For this purpose, answers to the following research questions were sought;

1. How is the distribution according to type, years, universities where it is published, titles of advisors, department and type of bibliography on postgraduate theses in science education on gifted students in Turkey?
2. How is the distribution according to journal name, journal type, journal class and publication year on articles prepared in science education on gifted students in Turkey?
3. How is the distribution according to the subject, sample, sample size, research method, data collection tools and data analysis method on studies (articles and postgraduate theses) in science education on gifted students in Turkey?
4. What is the distribution of the results and suggestions obtained from the experimental studies prepared in science education on gifted students in Turkey?

METHOD/MATERIALS

The content analysis method was used in the research. Content analysis is the detailed, systematic examination and interpretation of certain material in order to identify concepts and themes (Berg & Lune, 2015). In content analysis, the researcher sometimes assigns numbers and sometimes words to the material s/he is examining. Thus, it makes its data more understandable with the determined codes (Patton, 2014).

Data Collection

In order to determine the studies to be included in the research, articles and theses published between January 2018 and July 2020 were scanned from the National Thesis Center of the Council of Higher Education and Google Academic databases. The terms "science education, science teaching, special education, education in gifted, BİLSEM" were searched as keywords and related postgraduate theses and articles were listed. Among the 14 postgraduate theses and 35 articles listed, the studies that would be suitable for the subject and purpose of the research were selected by criterion sampling, one of the non-probabilistic (purposive) sampling types.

The criteria determined for the selected studies;

1. Published in Turkey between January 2018 and July 2020,
2. The scope of the study is in the field of science (biology, physics, chemistry and science) teaching
3. In the journals and databases that are open to access,
4. Studies with a clearly stated method are preferred.

In line with the criteria, 16 theses (10 master's and 6 PhD theses) and 37 articles were included in the research. Information about the studies included in the research is given in Appendix-1.

Data collection tools

The studies were analyzed with the "Analysis Form (Appendix-2)", which was prepared by taking the opinion of a science expert. Analysis form; It is based on the "Paper Classification Form" created by Çiltaş, Güler and Sözbilir (2012). The form consists of seven components: the definition of the study, the subject of the study, the methods used in the study, the data collection tools used, sampling and sample sizes, data analysis methods, results and recommendations for experimental studies. This prepared form allowed the researchers to standardize the process and make an evaluation according to the same criteria.

Analysis of Data

The data obtained in the research were analysed in the following seven stages (Creswell, 2013; Merriam, 2015).

1. Preparation and organization of data for analysis: Data analysis was performed using keywords in databases, and 53 studies were reached.
2. Coding the data: The studies included in the research were coded according to predetermined criteria using the "Analysis Form".
3. Establishing the themes: The themes were determined according to the research problems by using the main themes of the study subject, study method, data collection tools, sampling and sample sizes, data analysis methods, results and suggestions for experimental studies.
4. Arrangement of data according to themes and codes: The coding, which was made independently by two different researchers, was arranged by taking the opinions of a science field expert.
5. Arrangement of sub-themes: Sub-themes in the Analysis Form were used and arranged.
6. Interpretation of the data: The data obtained from the studies were interpreted in the light of the studies in the literature.
7. Presentation and visualization of the findings: In order to make the findings more understandable, the findings are presented through tables and graphs.

Validity and Reliability

In order to ensure the validity and reliability of the research; the purpose and research questions were clearly stated, and the data collection method, inclusion and exclusion criteria were explained in detail for the validity of the findings. The studies reached on the subject and the number of those included in the analysis are specified, and their methodology, field, sample, data collection technique and data analysis methods are specified. The process of analyzing the data and establishing common themes is explained in detail (Brantlinger, Jimenez, Klingner, Pugach, & Richardson, 2005).

The process of determining the common themes was made by two researchers who are experts in the field of science education. The reliability percentage of the data (Reliability = Consensus/ (Agreement + Disagreement) x100) was calculated as 78.5%, and the consistency between the coders was tried to be ensured. A reliability percentage above 70% means that the data is reliable (Miles & Huberman, 1994; Yıldırım & Şimşek, 2018). In order to increase the credibility of the research, sections from the findings of the studies examined are also presented.

FINDINGS

Findings related to the sub-problems of the research are given below.

Findings Regarding the First Sub-Problem

The first sub-problem of the study was examined under six themes: the distribution of postgraduate theses in science education for gifted students in Turkey according to the type, years, universities in which they were published, titles of advisors, department and type of bibliography.

Table 1. Distribution of theses by year and type

Year	f	Thesis type	
		Master's (f)	PhD (f)
2018	5	1	4
2019	10	8	2
2020	1	1	-
Total	16	10	6

According to Table 1, it is seen that one of the five theses conducted in 2018 is a master's thesis, four of them are PhD thesis, eight of the 10 theses conducted in 2019 are in the type of master's thesis, two of them are PhD thesis, and in 2020 there is only one master's thesis. It has been determined that the theses prepared on science education for gifted students are mainly master's thesis.

Table 2. Distribution of theses according to the universities published

Univercity	Master's (f)	PhD (f)	Total (f)
Amasya University	-	2	2
Balıkesir University	-	1	1
Boğaziçi University	1	-	1
Erzincan Binali Yıldırım University	1	-	1
Hacettepe University	1	1	2
Kırşehir Ahi Evran University	1	-	1
Kocaeli University	1	-	1
Muğla Sıtkı Koçman University	-	2	2
Necmettin Erbakan University	1	-	1
Pamukkale University	1	-	1
Recep Tayyip Erdoğan University	1	-	1
Sakarya University	1	-	1
Uludağ University	1	-	1

According to Table 2; it is seen that postgraduate thesis studies on science education in gifted have been prepared in 13 universities. Only at Hacettepe University both master's (f=1) and PhD thesis (f=1) were made.

Table 3. Distribution of theses according to the department published

Univercity	Master's (f)	PhD (f)	Total (f)
Department of Mathematics and Science Education	7	1	8
Department of Primary Education	3	4	7
Department of Basic Education	-	1	1

Looking at Table 3; It is noticed that the most master's thesis (f = 7) was done in the Department of Mathematics and Science Education, and the most PhD thesis (f = 4) was made in the Department of Primary Education. However, it is seen that the most postgraduate thesis (f=8) was done in the Department of Mathematics and Science Education.

Table 4. Distribution of theses according to the Titles of lecturers

Title	Master's (f)	PhD (f)	Total (f)
Professor	1	3	4
Associate professor	9	2	11
PhD Member	-	1	1

According to Table 4; It is understood that postgraduate theses are mostly carried out by faculty members with the title of associate professor (f=11).

Table 5. Distribution of theses by type of bibliography

Research code	Research type	Bibliography type		Total (f)
		National (f)	International (f)	
R13	Master's thesis	57	80	137
R14	PhD thesis	111	128	239
R15	PhD thesis	85	73	158
R16	PhD thesis	87	141	228
R17	PhD thesis	23	505	528
R18	PhD thesis	98	330	428
R19	Master's thesis	44	23	67
R20	Master's thesis	47	9	56
R21	Master's thesis	57	59	116
R22	Master's thesis	93	28	121
R23	Master's thesis	4	97	101
R24	PhD thesis	80	288	368
R25	Master's thesis	45	57	102
R26	Master's thesis	68	24	92
R27	Master's thesis	96	34	130
R28	Master's thesis	49	26	75

According to Table 5; It is seen that the number of bibliography used in PhD theses (R14 (f=239), R16 (f= 228), R17 (f=528), R18 (f=428), R19 (f=328), R24 (f=368)) is higher than those used in master's theses. It is understood that the number of international

bibliography is generally higher in PhD thesis (R14 (f=128), R16 (f=141), R17 (f=505), R18 (f=330), R24 (f=288)) than in master's theses.

Findings Regarding the Second Sub-Problem

In line with the second sub-problem of the research, articles prepared in science education for gifted students in Turkey were examined under four themes: journal name, journal type, journal class and publication year.

Table 6. Distribution of articles by journal name, journal type and class

Journal name	Journal name	Class	f
Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi (EFMED)	National	ULAKBİM	3
Üstün Zekâlılar Eğitimi ve Yaratıcılık Dergisi (ÜZEYAD)	National	Diğer	2
Turkish Journal of Primary Education (TUJPED)	International	Diğer	2
Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi	National	ULAKBİM	2
Milli Eğitim	National	ULAKBİM, Diğer	2
İnönü Üniversitesi Eğitim Fakültesi Dergisi	National	ULAKBİM	2
Bartın Üniversitesi Eğitim Fakültesi Dergisi	National	ULAKBİM	1
Bilim, Eğitim, Sanat ve Teknoloji Dergisi (BEST Dergi)	National	The other	1
Eğitim ve Bilim	International	SSCI	1
Journal of Education in Science, Environment and Health (JESEH)	International	ERIC	1
Eğitimde Nitel Araştırmalar Dergisi- ENAD	International	ULAKBİM	1
Journal of Baltic Science Education	International	SSCI	1
Eğitimde Kuram ve Uygulama	International	EBSCO	1
Eğitim ve Toplum Araştırmaları Dergisi/JRES	National	ULAKBİM	1
Pamukkale Üniversitesi Eğitim Fakültesi Dergisi	National	ULAKBİM	1
Science Education International	International	ERIC	1
Trakya Üniversitesi Eğitim Fakültesi Dergisi	National	ULAKBİM	1
Trakya Üniversitesi Sosyal Bilimler Dergisi	International	EBSCO, ULAKBİM	1
Maarif Mektepleri Uluslararası Eğitim Bilimleri Dergisi	International	The other	1
MANAS Sosyal Araştırmalar Dergisi	National	ULAKBİM	1
Elementary Education Online	International	ULAKBİM, The other	1
TURAN-SAM Uluslararası Bilimsel Hakemli Dergisi	International	ULAKBİM	1
Anemon Muş Alparslan Üniversitesi Sosyal Bilimler Dergisi	National	ULAKBİM	1
International Journal of Science and Research (IJSR)	International	The other	1
Türk Üstün Zekâ ve Eğitim Dergisi	National	ULAKBİM, Diğer	1
Anadolu Öğretmen Dergisi	National	The other	1
Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi	National	ULAKBİM	1
Kastamonu Eğitim Dergisi	National	ULAKBİM	1
Uşak Üniversitesi Eğitim Araştırmaları Dergisi	National	The other	1
YYÜ Eğitim Fakültesi Dergisi	National	ULAKBİM, The other	1

When Table 6 is examined; it is seen that articles published in Necatibey Education Faculty Electronic Science and Mathematics Education Journal (EFMED), Gifted Education and Creativity Journal (UZEYAD), Turkish Journal of Primary Education (TUJPED), Mehmet Akif Ersoy University Education Faculty Journal, National Education and İnönü University Education Faculty Journal are more than other journals.

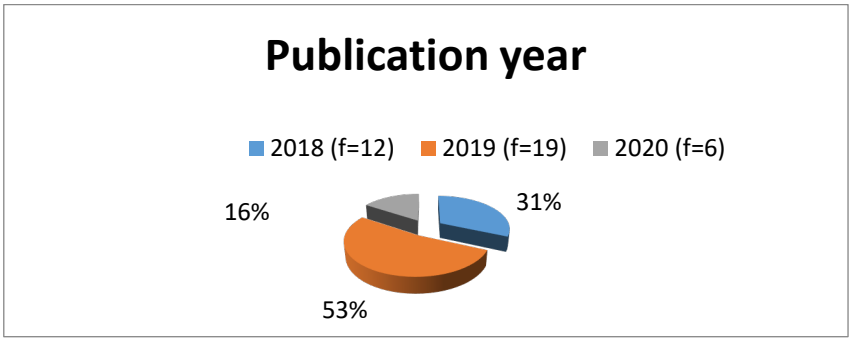

Figure 1. Distribution of articles by years

According to Figure 1, more studies were conducted in 2019 (f=19) than in 2018 (f=12) and 2020 (f=6).

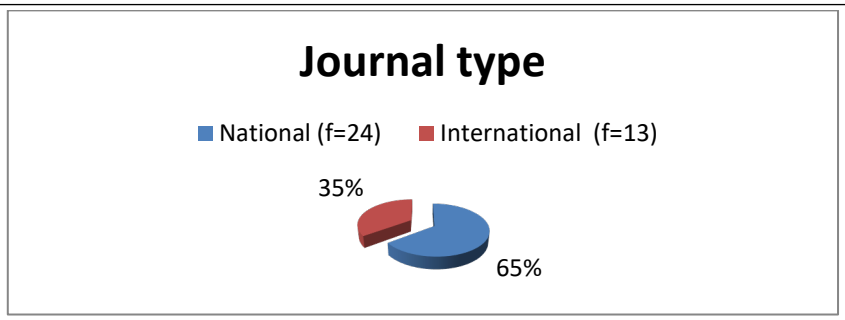

Figure 2. Distribution of articles by journal type

As seen in Figure 2, the number of publications in national journals (f=24) is more than international journals (f=13).

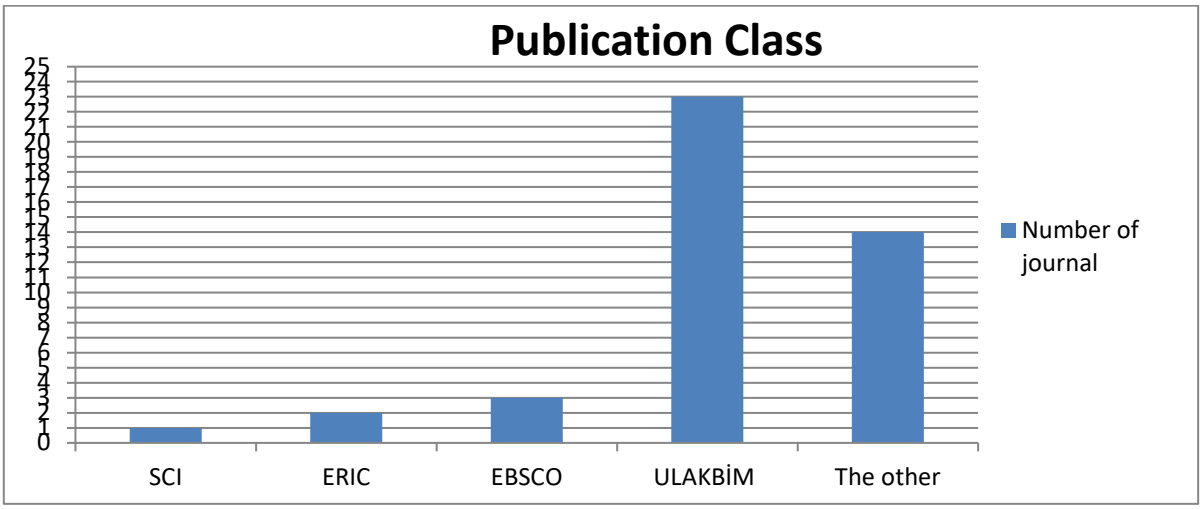

Figure 3. Distribution of articles by publication class

According to Figure 3; the most journals (f=23) are indexed in the ULAKBİM database. While two of the journals are indexed in SSCI, two in ERIC and both in EBSCO, the number of journals indexed in other databases is 14.

Findings Regarding the Third Sub-Problem

The third sub-problem of the study was examined under seven themes namely the distribution of studies (articles and postgraduate theses) in science education for the gifted according to the subject, sample, sample size, research method, data collection tools and data analysis method.

Table 7. Distribution of studies by subject

	Subject	f
Learning Method/ Technique/Strategy	STEM	12
	Differentiated instruction	7
	Project-based learning	4
	Problem-based learning	2
	Argumentation	2
	Computer assisted learning	2
	STEAM	1
	5E	1
	Brain-based learning	1
	İnquiry-based learning	1
	Concept learning	1
	Social learning	1
	EGS (Equality-Requirement-Inquiry) based teaching	1
	Self-learning	1
	Mobile learning	1
	Robotic coding training	1
	Educational game	1
The impact of teaching	Motivation towards science	6
	Creativity	5
	Self-efficacy	4
	Critical thinking skill	3
	Problem solving skill	3
	Self-regulation skill	2
	Academic success in science	2
	STEM attitude	2
	STEM interest	1
	STEM career interest	1
	Opinion on STEM activities	1
	Environmental awareness/sensitivity	1
	Perception of the science-pseudo-science distinction	1
	Self-monitoring-perception of self and task	1
	Perception of socioscientific issues	1
	Perception towards the concept of biology	1
	Attitude towards science	1
	Informal thinking skill	1
	Astronomy success	1
	Attitude towards BİLSEM	1
	Motivation towards BİLSEM	1
	Scientific creativity	1
	Engineering skill	1
	Science process skill	1
	Science self-assessment	1
	Inquiry learning skills	1
	Metacognitive awareness	1
	Unit and symbol knowledge level	1
Opinion	Students' views on BİLSEM biology activities	1
	Students' and teacher views on BİLSEM biology project studies	1
	Student's views on Science-Technology-Society	1
	Student's views on the UYEP curriculum model	1
	Teacher's views on science education given to gifted students	1
	Teacher's views on STEM	1
	Student's views on mobile application	1
	Students' views on problem-based science activities	1
Teaching material study		15
Curriculum studies		14
Scale-test development-translation		5
Concept analysis		4
Comparison of gifted and non-gifted		3
Theoretical article		3
Teacher candidate training		2
Educational problems		1
Teacher training		1

When Table 7 is examined; It is understood that the most used learning method/technique/strategy in studies is STEM (f=12) and the effect of applied teaching on motivation toward science (f=6) has been investigated. Among the studies, it is seen that teaching material (f=15) and curriculum (f=14) studies are more studied than other subject areas.

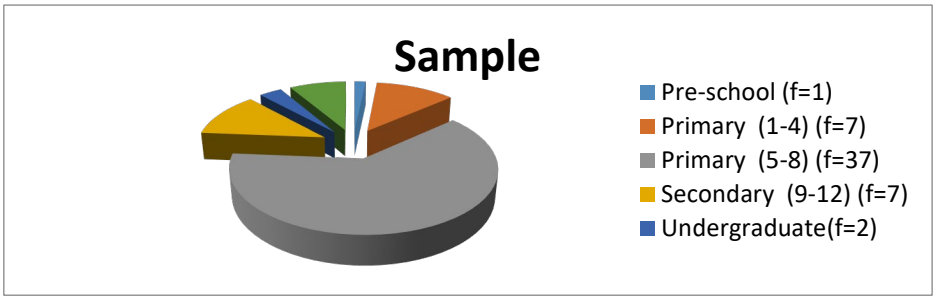

Figure 4. Distribution of studies by sample type

In the studies presented in Figure 4; It is understood that the sample consisted of 7 of them 5-8 grade primary education, 7 of them 1-4 grade primary school students, 7 of them secondary school (9-12) students, 5 of them teachers, 2 of them undergraduate students and only one of them preschool students.

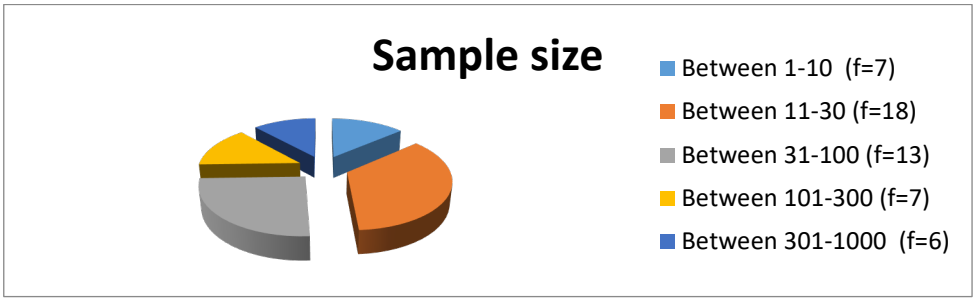

Figure 5. Distribution of studies by sample size

In Figure 5, it is noticed that the most studied sample sizes in the studies are between 11-30 (f=18) and 31-100 (f=13).

Table 8. Distribution of studies according to research method

Research Method	Research Model	f
Quantitative method	Survey	10
	True-experimental	3
	Quasi-experimental	2
	Weak-experimental	1
	Comparative	3
	Correlational	3
Qualitative method	Case study	17
	Phenomenology	4
	Action research	2
	Basic qualitative study	1
Mixed method	Explanatory (Quantitative → Qualitative)	2
	Variation (Quantitative + Qualitative)	5

According to Table 8; it is seen that the qualitative method (f=24) is used more than the quantitative method (f=22) and mixed method (f=7). In addition, İt is understood that the survey model of the quantitative method (f=10) and the case study model of the qualitative method (f=17) are more preferred.

Table 9. Distribution of studies according to data collection tools

Data collection tools	Tool type	f
Questionnaire	Likert	14
	Open-ended	9
Interview	Semi-structured	24
	Non-structured	1
Observation	Participatory	6
	Non-participatory	8
	Focus group	1
Achievement test	Open-ended	1
	Multiple choice	5
Perception/interest/Attitude/Talent/Personality etc. tests		11
Documents		17

According to the findings obtained from Table 9; It is understood that the most used data collection tools in studies are semi-structured interviews (f=24), documents (f=17) and Likert type questionnaires (f=14).

Table 10. Distribution of studies according to data analysis method

Data analysis method			f
Quantitative analysis	Descriptive	Frequency/percentage table	14
		Mean/standard deviation	19
		Graphical representation	2
	Predictive	t-test	12
		Correlation	3
		Factor analysis	5
		Regression	2
		ANOVA/ANCOVA	6
		Non-parametric	9
		Path analysis	1
Qualitative analysis		Content analysis	25
		Qualitative descriptive analysis	19

According to Table 10; In the analysis of the studies, it is seen that the mean/standard deviation (f=19) and frequency/percentage tables (f=14) are used more in the descriptive analysis, and the t-test (f=12) and non-parametric tests (f=9) are used more in the predictive analysis.

Findings Regarding the Fourth Sub-Problem

In order to determine the distribution of articles and postgraduate theses prepared by using the experimental method in science education for gifted students in Turkey, according to the results and suggestions, two sub-themes, namely conclusions and suggestions, were created.

Table 11. Distribution of studies prepared using experimental method according to the results

Results	f
Positive impact of STEM education	3
Positive increase in self-regulated learning strategies	2
Positive increase in critical thinking skills	2
Positive increase in attitude towards science	2
Positive increase in science process skills	2
Positive increase in problem solving skills	2
Positive increase in creativity	2
Positive increase in motivation towards science learning	2
Positive increase in academic achievement	2
Positive increase in self-confidence	1
Positive increase in scientific creativity	1
Positive increase in epistemological beliefs	1
Positive increase in engineering skills	1
Positive effect of differentiated science activities	1
Increased motivation towards self-regulation	1

Results	f
The positive effect of learning argumentation-based science	1
Positive effect of programming education in visual environments	1
The positive effect of the enriched program	1

When Table 11 is examined; It is seen that the results obtained are positive. It is understood that more experimental studies have been conducted on gifted students' self-regulated learning strategies, attitudes towards science, scientific process skills, problem solving skills, creativity and critical thinking skills, and STEM education.

Table 12. Distribution of studies prepared using experimental method according to recommendations

Recommendations	f
Conducting teacher candidates and teacher trainings	5
Working with different teaching levels	4
Making curriculum studies for gifted	3
Comparing gifted and non-gifted students	3
Ensuring cooperative learning	2
STEM activities and lesson plan preparation	2
Making longitudinal studies on gifted	2
Setting up STEM education centers	1
Establishing a science center for gifted	1
Prepare brain-based differentiated activities	1
Including STEM education in BİLSEM activity books	1
Information sharing with STEM festivals for BİLSEMs	1
Ensuring parent participation in STEM activities	1
Preparing STEM product evaluation tools	1
Planning differentiated events	1
Ensuring school administration-teacher-student communication	1
Ensuring the accessibility of differentiated programs in the digital environment (website, program, etc.)	1
Determining student readiness	1
Development of verbal and nonverbal tests in preschool period	1
Conducting studies in different socioeconomic and sociocultural regions	1

According to the findings in Table 12; In experimental studies, it has been seen that suggestion such as more pre-service teacher and teacher training (f=5), working with different teaching levels (f=4), making curriculum studies for gifted students (f=3), comparing gifted and non-gifted students (f=3), ensuring cooperative learning (f=2), making longitudinal studies in special gifted (f=2), STEM activities and lesson plan preparation (f=2) are made.

DISCUSSION AND CONCLUSION

In order to guide future education programs, teaching methods and techniques for gifted individuals, 16 theses (10 masters and 6 PhD) and 37 articles published between January 2018 and July 2020 in the field of science education were examined in detail. The results of this review were discussed in the light of the literature and suggestions were made.

Theses prepared on science education for gifted students are mostly master's theses and they were prepared in the Department of Mathematics and Science Education. There are many studies supporting this result (Ayvacı & Bebek, 2019; Koç, & Saranlı, 2017; Gülçin & Oruç, 2015; Coşkun, Dündar, & Parlak, 2014; Özenç & Özenç, 2013). As the reasons for this situation; the fact that studies on special talents are new in Turkey (Gülçin & Oruç, 2015), the purpose of master's theses is to specialize more, and the purpose of PhD theses is to contribute to universal knowledge (Ayvacı & Bebek, 2019); entry requirements for doctorate are more difficult than masters, the economic/psychological burden of the doctorate process is higher than the master's process and it requires more time; the scarcity of expert who can do a doctorate in the field of gifted throughout the country (Coşkun, Dündar, & Parlak, 2014; Özenç & Özenç, 2013) can be shown. In addition, the combination of Special Education Teaching Undergraduate Programs (Education Programs for the Visually Impaired, Mentally Impaired, Hearing Impaired and Gifted/Talented) in the 2016-2017 academic year may have an effect on the preparation of theses mostly in the Department of Mathematics and Science Education. Combining the programs has led to problems in lecturers (Filiz, Şahin, Tufan, & Karaahmetoğlu, 2018). For this reason, it may have led to a decrease in the possibility of gifted education graduates studying for many programs to turn to the field of science academically and that the research in this specific field is met by the Department of

Mathematics and Science. Considering the impact of academic studies on education policies, it can be suggested that students and academics should be encouraged to increase the number of PhD theses, which require a more comprehensive study and provide more data than master's theses.

Most of the theses made in 13 universities on science education for gifted students were prepared by faculty members with the title of associate professor. In their study, Dönmez and İdin (2017) concluded that although there are science teaching departments in 70 universities in our country, studies are carried out in very few universities and most of them are consulted by associate professors. Based on this, it is thought that the workload on Associate Professors will be reduced if the theses consultancy were distributed proportionally between Professors, Associate Professors and PhD Faculty Members.

Among the graduate thesis studies, the number of references used in PhD theses is higher than the references used in master's theses. Considering that PhD theses are more comprehensive studies, this is an expected result. In addition, it is seen that the number of international bibliographies used in PhD theses is higher. This result coincides with the results of Coşkun, Dündar, and Parlak (2014), who reported that the number of international bibliographies is higher in PhD theses. This situation may have been caused by the fact that many universities do not require foreign language scores for entry to master's programs according to the postgraduate education and training regulations, and that there is a foreign language score requirement for entry to PhD programs. In order to ensure that the studies conducted throughout Turkey contribute more to the international literature, graduate students can be encouraged to examine the international literature and to use foreign resources in their theses.

More studies were conducted in 2019 and article studies were generally published in national journals. In order to reach the studies in a healthy way, the compatibility between the titles and keywords of the publications related to science education for the gifted can be examined. The most widely used learning method/technique/strategy in studies is STEM education. On the contrary, Dönmez and İdin (2017) reported that they did not find any studies on STEM education in their study. The updating of the science course curriculum by the Ministry of National Education in 2017 may have caused this situation. In the updated program, the "Science and Engineering Applications" field in the knowledge learning area of the science course, and the "Science and Engineering Applications" area in the skill learning area have been added. With these added fields, it is aimed to integrate science with technology, engineering and mathematics (MEB, 2017).

At this point, the new MEB teaching policy may have led researchers to focus mostly on STEM education. Yıldırım and Altun (2015) also reported that STEM education has become a subject that researchers want to work on in the last three years, considering that it brings together various disciplines and provides effective and permanent learning and develops high-level thinking skills in individuals. At this point, since it is a new field of study, more research can be done on STEM education with the gifted. In addition, it has been noticed that in the researches, skill learning areas (scientific process skills, problem solving skills, creativity and critical thinking) are generally studied. The field of "Science and Engineering Applications" in the 2017 curriculum was organized as the "Science, Engineering and Entrepreneurship Applications" field in the 2018 science curriculum (MEB, 2018). Researchers can be advised to study on the entrepreneurship skills of gifted students.

Among the studies, it was seen that teaching materials and curriculum studies were studied more than other subject areas. Yoon and Seo (2016) also stated that were focused on curriculum studies. Considering that the studies conducted in Turkey on the education of gifted students are new, it is understandable situation that there is an effort to develop materials and present them in a curriculum for teaching students. This result is in parallel with the result of Kardeş, Akman, and Yazıcı (2018) that the scale development and adaptation studies are limited. In this respect, more studies can be conducted to identify and evaluate the gifted.

Postgraduate theses and articles were mostly -studied with 5-8 grade students, with a sample size of 11-30 and 31-100. This result may have been caused by the fact that the science course is taught between the fifth and eighth grade levels in our country and that the researchers have the research in their own classrooms. Schreglmann (2016), Yoon and Seo (2016) also found that similar samples are generally used in studies. Researchers may be advised to conduct studies with different samples. In the studies examined, it was noticed that the studies on the preschool period were quite limited. It is noteworthy that there are few studies on the pre-school period, which is the most active period for the individual physically, emotionally and socially, in which brain development and mental functions are at the highest level. However, the most important period for discovering gifted students and making early interventions is early childhood, and this period also affects their future education (Koç & Saranlı, 2017). Similarly, Yılmaz (2018), Koç, and Saranlı (2017) concluded that studies in early childhood are limited. For this reason, various scientific/applied studies can be conducted to identify and support special talents at an early age. Another result is the limited number of studies with undergraduate students and teachers. Likewise, Özenç, and Özenç (2013) stated that practices are usually done with students and that teachers, parents, etc. emphasized the need to diversify the participants by ensuring their participation.

Quantitative, qualitative and mixed methods were used in the studies. The existence of these three research methods has provided diversity in scientific research methods. While it is the most preferred qualitative method, mixed method studies are very few compared to the others. The fact that the mixed method is less preferred may be due to the fact that this research method is newly adopted in our country or that it requires mastery of both quantitative and qualitative research methods. Although the result obtained is similar to the result of Ayvacı and Bebek (2019), which states that the use of mixed method is limited, it does not match the result that mostly quantitative studies are made. On the other hand, Koç and Saranlı (2017) reported that the studies were mostly carried out with quantitative or mixed-methods. Kardeş, Akman, and Yazıcı (2018), Bolat and Tekin (2017) also reported that more quantitative studies were conducted. The fact that more qualitative methods were used in the studies examined in this research is an important development in terms of understanding the concept of giftedness and increasing the belief in providing rich data for gifted individuals. More qualitative and mixed method studies can be recommended in order to interpret the data in multiple ways for future research.

In the studies, the survey model, which is one of the non-experimental quantitative methods, was preferred. Özenç and Özenç (2013) also determined that the most used research model in studies is the survey model. The advantages of the survey model such as the economy and fast data collection may have been a factor in its preference (Creswell, 2012). It has been observed that experimental quantitative methods are used less frequently in studies, but it contributes to the diversity of designs by making use of full, semi and weak experimental designs. The difficulty in reaching the samples of gifted individuals and the fact that they were educated with different programs may have been caused experimental quantitative methods are less preferred in the research of gifted. In our country, the education of gifted individuals is carried out through various programs only in Gifted Education Programs (ÜYEP), after-school programs in Science and Art Centers (BİLSEM), or in special classes in private schools such as science high schools, conservatories and sports high schools. It is understood that the inadequacy of government policies for gifted students and the absence of a standard program is an obstacle to the enrichment of educational practices (Sak, Ayas, Sezerel, Öpengin, Özdemir, & Gürbüz, 2015). In addition, because of the fact that students studying in these centers, where studies are concentrated, are frequently exposed to an experimental study that they do not volunteer to participate in these studies may also be a reason. At this point, it can be suggested to the program makers that the programs implemented are evaluated and they contribute to creating a study area for the researchers.

In the studies examined, the case study model was preferred more than the qualitative methods. In the case study, which is one of the qualitative research methods, it is aimed to collect comprehensive data by examining a limited system in depth (Creswell, 2012). The fact that the studies are more focused on situation determination is important in terms of understanding how gifted behave in study environments. Dönmez and İdin (2017) also concluded that the theses prepared in the field are experimental and case studies. Since there are more case studies, a meta-analysis can be done by examining the case studies on science education of gifted students.

The most used data collection tools are documents and semi-structured interviews. Semi-structured interview technique, which is the most used technique among interview techniques, is generally preferred more because it does not limit the researcher and offers the freedom for the participants to elaborate their answers more (Cohen et al., 2007). It can be cited as the reason for the frequent use of documents is that they can be obtained at the end of interviews and observations. Again, Likert type questionnaires were mostly used in studies. It can be said that Likert-type measurement tools are frequently preferred in studies because being easy to prepare and apply (Spector, 1992). Dönmez and İdin (2017), Özenç and Özenç (2013) and Kang (2010) also concluded that questionnaires were highly utilized in the studies and emphasized that the use of qualitative measurement tools would provide access to more in-depth information. More experimental studies were conducted on self-regulated learning strategies, attitudes towards science, scientific process skills, problem solving skills, creativity, critical thinking skills of gifted students. It has been understood that learning approaches such as STEM education, Brain-Based Learning, Differentiated Teaching, Argumentation-Based Learning, Project-Based Learning and Computer Based Learning have positive effects on these variables.

More experimental studies have been conducted on self-regulated learning strategies, attitudes towards science, scientific process skills, problem solving skills, creativity, critical thinking skills of gifted students. It has been understood that learning approaches such as STEM education, Brain-Based Learning, Differentiated Teaching, Argumentation-Based Learning, Project-Based Learning and Computer Based Learning have positive effects on these variables. International literature also supports these findings (Kim & Kim, 2018; Kim & Jhun, 2018; Wilson, 2018; Han & Shim, 2019; Morris, Slater, Fitzgerald, Lummis, & van Etten, 2019; Yoon & Seo, 2016). When the international literature is examined, it has been seen that the studies on the use of technology in intelligence games, creative applications, coding and STEM applications among gifted have increased in recent years (Uzunboylu, Ozcinar, Kolotushkin, Kalugina, & Zulfugarzade, 2019). At this point, it can be suggested to focus on using technology in the education of the gifted.

It has been noticed that the experimental studies examined, more pre-service teachers and teacher trainings, curriculum studies for special talents, working with different teaching levels, STEM activities and lesson plan preparation, providing collaborative learning, comparison of gifted and non-gifted students, and longitudinal studies with gifted has been recommended. It is an expected result that being more educational researches in this field considering that there is a need for education programs that are different from normal school programs in order for gifted individuals to be beneficial to society. These results can also be found in the international literature. In the findings obtained by Alfaqeer and Baioumy (2019) via comparing countries in order to determine the needs of gifted students; They drew attention to the necessity of preparing special enrichment programs that meet the needs of the students, develop their talents and skills, reveal their creativity tendencies and enable collaborative study. Eunice, de Alencar, and de Souza (2018) reported that in the studies conducted for gifted students in Brazil, it is recommended to conduct teacher candidates and teacher training, provide school-family communication, and conduct studies on early childhood. He said that when compared to the researches on achievement, discrimination, intelligence and teaching-learning programs for gifted children, research studies on gifted psychological counseling that deal with the psychological and justice development of gifted children are less. With the growth and development of gifted students, he suggested that current selection, identification and program-centered research on cognitive aspects and research on future psycho-emotional development aspects should be done more actively. In line with these suggestions, in parallel with the international literature, it can be suggested that researches involving the families of gifted students in our country (for example, taking part in science festivals together) should be carried out.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Examples of author contribution statements

S.A. and G.Ç.N. conceived of the presented idea. M.Y. developed the theory. S.A. performed the computations. M.Y. and G.Ç.N. verified the analytical methods. M.Y. encouraged S.A. and G.Ç.N. to investigate [a specific aspect] and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

Since the study was not experimentally designed, an "Ethics Committee Report" was not presented.

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APPENDIX-1. Information on the studies included in the research

	Authors and Publication Year	Publication Type	Publication Name
R1	Kılıç (2018)	Article	"Üstün Yetenekli Çocukların Fen Eğitiminde Bilim Deney Merkezlerinin Rolü"
R2	Ayaydın, Ün, Acar Şeşen, Usta Gezer ve Camcı Erdoğan (2018)	Article	"Özel Yetenekli Öğrencilerin Çevre Farkındalık ve Duyarlılıkları: "Bilim ve Sanat Kâşifleri Doğada""
R3	Akbaş ve Çetin (2018)	Article	"Üstün Yetenekli Öğrencilerin Çeşitli Sosyobilimsel Konulara İlişkin Argümantasyon Kalitesinin ve İnformal Düşünme Becerisinin İncelenmesi"
R4	Erdoğan (2018)	Article	"Üstün/Özel Yeteneklilerde Atomun Yapısı Konusunun Öğretiminde Bütüncül Yaklaşımla Program Farklılaştırma"
R5	Açıkgül Fırat ve Köksal (2018)	Article	"Özel Yetenekli Öğrencilere Yönelik Fen Bilimlerine Özgü Uzamsal Akıl Yürütme Becerisi Testinin Geliştirilmesi"
R6	Kurnaz ve Şentürk Barışık (2018)	Article	"Üstün Zekâlı Öğrencilerin Fen Bilimlerinde Motivasyonel İnançları ve Yaratıcı Düşünme Becerileri Arasındaki İlişkilerin İncelenmesi"
R7	Özarslan ve Çetin (2018)	Article	"Gifted And Talented Students' Views About Biology Activities İn A Science And Art Center"
R8	Özçelik ve Akgündüz (2018)	Article	"Üstün/Özel Yetenekli Öğrencilerle Yapılan Okul Dışı STEM Eğitiminin Değerlendirilmesi"
R9	Saraçoğlu, Şengül Yıldırım ve Bektaş (2018)	Article	"Üstün Yetenekli Öğrenciler ile Normal Gelişim Gösteren Öğrencilerin Fen Öz-Yeterliklerinin Sınıf Düzeyine Göre İncelenmesi"
R10	Şahin (2018)	Article	"Argümantasyon Tabanlı Bilim Öğrenme Yaklaşımının Üstün Yetenekli Öğrencilerin Fen Bilimleri Derslerindeki Akademik Başarılarına Etkisi"
R11	Şahin ve Kabasakal (2018)	Article	"STEM Eğitim Yaklaşımında Dinamik Matematik Programlarının (Geogebra) Kullanımına Yönelik Öğrenci Görüşlerinin İncelenmesi"

	Authors and Publication Year	Publication Type	Publication Name
R12	Tüzün ve Tüysüz (2018)	Article	"Özel Yetenekli Bireylerin Öğretmenleri İçin STEAM Eğitimi"
R13	Akpınar (2018)	Master's Thesıs	"Üstün Yetenekli ve Zekâlı öğrencilerde Stem Eğitiminin Öz düzenleme, Fen'e Yönelik Motivasyonları ve Epistemolojik İnançlarına Etkisinin İncelenmesi"
R14	Ayverdi (2018)	PhD Thesis	"Özel Yetenekli Öğrencilerin Fen Eğitiminde Teknoloji, Mühendislik, Matematiğin Kullanımı: Fetemm Yaklaşımı"
R15	Kaymakçı (2018)	PhD Thesis	"Ortaokul Bilsem Öğrencilerine Yönelik Fen Eğilimi Öz-Değerlendirme Ölçeği'nin Geliştirilmesi ve BİLSEM Öğrencilerinin Fen Öğrenmeye Yönelik Motivasyonlarının Belirlenmesi"
R16	Kutlu Abu (2018)	PhD Thesis	"Üstün Yetenekli Öğrencilerin Kaynaştırılmasına Yönelik Farklılaştırılmış Fen Etkinliklerinin Değerlendirilmesi"
R17	Şen (2018)	PhD Thesis	"Mühendislik Tasarımı Odaklı Bütünleşik STEM Etkinliklerinde Üstün Zekâlı ve Yetenekli Öğrencilerin Kullandığı Beceriler"
R18	Akkanat (2019)	PhD Thesis	"Bilim ve Sanat Merkezlerine Devam Eden Öğrencilerin Fen Yeteneklerini Okul İklim ve Akademik Katılımın Yordaması Üzerine Bir Model Çalışması"
R19	Barış (2019)	Master's Thesis	"Bilsem'de Görev Yapan Fen Bilimleri ve Matematik Öğretmenlerinin STEM Eğitim Uygulamalarının Araştırılması"
R20	Dağlı (2019)	Master's Thesis	"Üstün Yetenekli Öğrencilere Verilen Fen Eğitimine Yönelik Fen Bilimleri Öğretmenlerinin Görüşleri"
R21	Eker (2019)	Master's Thesıs	"Bilim Sanat Merkezlerinde Görev Yapan Öğretmenlerin Bilim, Teknoloji, Mühendislik ve Matematik Eğitimi Algıları"
R22	Göz (2019)	Master's Thesis	"Özel Yetenekli Öğrencilerin Fen-Teknoloji-Toplum Hakkındaki Görüşleri"
R23	Koçoğlu (2019)	Master's Thesis	"Investigation Of Self-Regulated Learning (Srl) Strategies Used By Gifted Students While Learnıng Science"
R24	Okulu (2019)	PhD Thesis	"Stem Eğitimi Kapsamında Astronomi Etkinliklerinin Geliştirilmesi ve Değerlendirilmesi"
R25	Taktat Ateş (2019)	Master's Thesis	"Özel Eğitim Öğretmenlerinin Fen Bilimlerine Yönelik Öz Yeterlik İnançları"
R26	Seren (2019)	Master's Thesis	"Üstün Yetenekli Öğrencilerle STEM Etkinliklerinin Tasarlanması ve STEM Etkinliklerinde 3 Boyutlu Teknolojilerin Kullanılması"
R27	Yurtkulu (2019)	Master's Thesis	"Özel Yetenekli Öğrenciler ve Akranlarının Görsel Okuryazarlık Düzeyleri ve Fen Dersindeki Görselliğe İlişkin Görüşleri"
R28	Elmas (2020)	Master's Thesis	"Üstün Yetenekliler Eğitim Programları Müfredat Modeli Kullanılarak Zenginleştirilen ve Hızlandırılan "Madde ve Doğası" Konu Alanı ile İlgili Öğrenci Görüşleri: Bursa PÜYED Örneği"
R29	Alkan (2019)	Article	"Özel Yetenekli Öğrencilerin Programlama Dili Öğretiminde Kodu Game Lab Yazılımının Problem Çözme Becerileri Düzeyine Etkisi"
R30	Barış ve Ecevit (2019)	Article	"Özel Yetenekli Öğrencilerin Eğitiminde STEM Uygulamaları"
R31	Bildiren ve Kargın (2019)	Article	"The Effects Of Project Based Approach İn Early Intervention Program On The Problem Solving Ability Of Gifted Children"
R32	Camci Erdogan (2019)	Article	"How Do Prospective Elementary And Gifted Education Teachers Perceive Scientists And Distinguish Science From Pseudoscience?"
R33	Can ve İnel Ekici (2019)	Article	"Üstün ve Özel Yetenekli Öğrencilerin Probleme Dayalı Fen Etkinliklerine İlişkin Görüşlerinin Değerlendirilmesi"
R34	Dolu ve Ürek (2019)	Article	"Kimyasal Değişim Temalı Etkinliklerin Özel Yetenekli Öğrencilerin Kimyasal Değişim-Işık İlişkisini Kavramsal Anlama Düzeylerine Etkisinin İncelenmesi"
R35	İkikat (2019)	Article	"Zenginleştirilmiş Fen Bilimleri Dersi ile Çocuklarda Yaratıcılık Geliştirme"
R36	Karahan ve Ünal (2019)	Article	"Üstün Yetenekli Öğrencilerin Çevre Dostu STEM Projeleri Tasarımı"
R37	Mutlu ve Nacaroğlu (2019)	Article	"Examination Of Perceptions Of Gıfted Students About Climate Change And Global Warmıng"
R38	Nacaroğlu ve Arslan (2019a)	Article	"Bilim ve Sanat Merkezlerinde Yürütülen Proje Çalışmalarına İlişkin Öğrenci Görüşlerinin Değerlendirilmesi"
R39	Nacaroğlu ve Arslan (2019b)	Article	"Özel Yetenekli Öğrencilerin Fen Bilimleri ve Matematik Derslerinde Kullanılan Sembol ve Birimlere Yönelik Bilgi Düzeylerinin İncelenmesi"
R40	Nacaroğlu ve Bektaş (2019)	Article	"Fen Bilimleri Dersindeki Madde ve Değişim Ünitesine Yönelik Geçerli ve Güvenilir Başarı Testi Geliştirme: BİLSEM Örneği"

	Authors and Publication Year	Publication Type	Publication Name
R41	Özarslan (2019a)	Article	"Üstün Zekâlı ve Yetenekli Olan ve Üstün Zekâlı ve Yetenekli Olmayan Öğrencilerin Biyolojiye İlişkin Algılarının Karşılaştırılması: Metaforik Çalışma"
R42	Özarslan (2019b)	Article	"Özel Yetenekli Öğrencilerin ve Biyoloji Danışman Öğretmenlerinin BILSEM Biyoloji Proje Çalışmaları Hakkındaki Görüşleri"
R43	Özdemir ve Gürlen (2019)	Article	"Üstün Yetenekli Öğrencilere Yönelik Zenginleştirilmiş Fen Bilimleri Öğretim Programına İlişkin Eylem Araştırması"
R44	Subaşı ve Özay Köse (2019)	Article	"Üstün Yetenekli Öğrencilere Bağışıklık Sistemi Konusunun Öğretiminde Egs Tabanlı Öğretim Yönergesinin Etkisi"
R45	Tiryaki, Çakıroğlu ve Yaman (2019)	Article	"The Effects Of The Program Including Differentiated Stem Applications Based On The Parallel Curriculum Model On The Critical Thinking Skills, Creativity And Attitudes Of Gifted And Talented Students"
R46	Yaman ve Emir (2019)	Article	"Beyin Temelli Öğretiminin Özel Yetenekli Öğrencilerin Yaratıcılıklarına ve Eleştirel Düşünmelerine Etkisi"
R47	Yıldırım ve Saraçoğlu (2019)	Article	"Normal Gelişim Gösteren ve Üstün Yetenekli Ortaokul Öğrencilerinin Fen Bilimleri Öz yeterlikleri ve Öz yeterliklerine Cinsiyetin Etkisi"
R48	Ayverdi ve Öz Aydın (2019)	Article	"Özel Yetenekli Öğrencilerin Eğitiminde Fetemm"
R49	Bircan ve Köksal (2020)	Article	"Özel Yetenekli Öğrencilerin Stem Tutumlarının ve STEM Kariyer İlgilerinin İncelenmesi"
R50	Karataş ve Solak (2020)	Article	"Böcekleri Takım Düzeyinde Teşhise Yönelik Geliştirilen Mobil Uygulamanın Özel Yetenekli Öğrenciler Açısından Etkililiğinin Değerlendirilmesi"
R51	Kılıçkıran, Korkmaz ve Çakır (2020)	Article	"Robotik Kodlama Eğitiminin Üstün Yetenekli Öğrencilere Katkısı"
R52	Kutlu Abu ve Gökdere (2020)	Article	"Üstün Yeteneklilere Yönelik Farklılaştırılmış Fen Öğretim Modülü Hakkında Sınıf Öğretmeni Adaylarının Kavramsal Algıları ve Değerlendirmeleri"
R53	Yılmaz, Üçüncü ve Arık (2020)	Article	"Özel Yetenekli Öğrencilerde Habitat Parçalanmasına Yönelik Farkındalık Oluşturma: Müzikli Sandalye Oyunu"

APPENDIX-2. Analysis Form

WORK IDENTITY	
Author/s (with titles)	
	Turkish Foreign Mixed
Journal	**Name:**
	Keywords:
	Year: **Volume:** **Issue:** **Page:**
	Type: National International
	Publication language: Turkish English Other
	Class: SCI/SSCI ERIC-BEI-EI-EAI ULAKBİM SBVT Other Classless
	References: National (number: .....) International (number: .....)
Thesis	**Name:**
	Master's PhD
	Year: **University:** **Department:**
	Key Words:
	References: National (number: .....) International (number: .....)
Issue	

WORK IDENTITY		
1. Learning method/ technique/ strategy Brain Based Learning Problem-Based Learning Inquiry-Based Learning Web-Based Learning Social Learning STEM 5E Differentiated Learning Method comparison **Other: .....**	**2. The Effect of Teaching** **a. Success (name: .....)** **b. Attitude (name: .....)** **c. Motivation (name: .....)** **d. Interest (name: .....)** **e. Perception (name: .....)** **f. Skill (name: .....)** Self-regulation/ Self-efficacy Creativity Epistemological belief Critical Thinking Skill Scientific Process Skills Mental Risk Taking Inquiry Learning Skill **Other: .....**	**3. Teacher training** Teacher candidate training In-service training teacher opinion Teacher self-efficacy **Other: .....** **4. Education/training issues** **5. Studying teaching material** **6. Comparison of gifted and non-gifted** **7. Scale-Test Development-Translation** **8. Research method studies** **9. Curriculum studies** **10. Concept analysis** **11. Other: .....**

METHOD				
QUANTITATIVE		**QUALITATIVE**		**MİXED**
Experimental	**Non-experimental**	**Interactive**	**Non-interactive**	Explanatory (Quantitative → Qualitative) Explorer (Qualitative → Qualitative) Variation (Quantitative + Quantitative)
True-experimental Quasi-experimental Weak experimental Single subject	Descriptive Comparative Correlational Survey Secondary data analysis	Culture analysis Phenomenology Case Study Theory building Critical studies	Historical analysis Concept analysis Compilation Meta-analysis Other	

DATA COLLECTION TOOLS		SAMPLE	
Name:		**Sample**	**Sample Size**
1. Questionnaire: Open-ended Likert Other **2. Achievement test:** Open-ended Elective Other **3. Perception/interest/Attitude/Talent/Personality etc. tests** **4. Interview:** Structured Semi-structured Unstructured Focus group **5. Observation:** Participant Non-participant **6. Alternative evaluation studies (**Diagnostic test, Concept map, Portfolio etc.) **7. Documents** **8. Other**		**1.**Pre-school **2.** Primary education (1-4) **3.** Primary education (5-8) **4.** Secondary education (9-12) **5.** Undergraduate **6.** Graduate **7.** Teacher **8.** Managers **9.** Parents **10.** Other	1. Between 1-10 2. Between 11-30 3. Between 31-100 4. Between 101-300 5. Between 301-1000 6. More than 1000

DATA ANALYSIS METHOD		
QUANTITATIVE DATA ANALYSIS QUALITATIVE DATA ANALYSIS		**QUALITATIVE DATA ANALYSIS**
Descriptive	**(Inferential)**	**Qualitative analysis**
Frequency/percentage table Mean/standard deviation Graphical representation Other.....	t-test Correlation ANOVA/ANCOVA MANOVA/MANCOVA Factor analysis Regression Non-parametric Other.....	Content analysis Qualitative descriptive analysis Other .....

CONCLUSIONS IN EXPERIMENTAL STUDIES	
Conclusion:	Positive: ..... Ineffective: ..... Negative: .....
Suggestion:	