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Research Article

Thematic Analysis of Postgraduate Theses on Mathematics Literacy in the Field of Mathematics Education in Turkey

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Abstract – The aim of this study is to reveal the characteristics of the postgraduate thesis on the subject of mathematical literacy in Turkey according to various criteria. The criteria examined in line with the purpose of the study; The type and publication year of the postgraduate theses, the university in which it was made, its subject, keywords, sample type and sample numbers, research method and research design, data collection tools, main results and main suggestions were determined. Thematic analysis, one of the qualitative research approaches, was used in the study. The sample of the research consists of 74 postgraduate theses on mathematical literacy in the field of education registered on the official website of the National Theses Center of the Council of Higher Education between 2003-2020. This study differs from other articles and theses on the examination of postgraduate theses on mathematical literacy in terms of the variety of the criteria discussed.

Key words: Mathematical literacy, thematic analysis, mathematics education, postgraduate thesis

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Introduction

The concept of literacy in PISA; is defined as students using their knowledge in daily life, making logical inferences, interpreting problems related to various situations and making inferences from what they have learned to solve (EARGED, 2010). The international student assessment program PISA focuses on the use of learned mathematics in our lives. The part of

PISA that is related to mathematics is called mathematical literacy (Altun et al., 2018). Mathematical Literacy (ML) is defined as one's capacity to use the steps of formulating, applying and interpreting mathematics in various situations we encounter in our lives (Organisation for Economic Co-Operation and Development [OECD], 2016). Real context problems in mathematics are handled according to the competencies, which are the dimensions of constructing (formulating) mathematical problems, solving (executing) mathematical problems with mathematical knowledge, operations and reasoning, and deciding (interpretation/evaluation) that the result is suitable for real life (OECD, 2013). ML has come to the fore as the disconnect between school mathematics and life has increased, and its aim is to integrate knowledge with skill and to enable it to be used (Altun, 2020).

Considering the relationship between ML and school mathematics, it was necessary to examine the ML achievement reported in the Ministry of National Education (MoNE) resources. Our country participated in PISA exams for the first time in 2003. Looking at the success ranking by country in the PISA evaluation, it is seen that Turkey's ML success ranking is in the lower ranks. According to the results of the PISA 2015 application, Turkey ranks 50th among 72 countries with an average score of 420 in terms of mathematics achievement. In 2015, the rate of students in the lower level increased in Turkey, while the ratio of students in the upper level decreased (MoNE, 2016). Turkey ranks 42nd among 79 countries with an average score of 454 in the PISA 2018 survey. The fact that the average mathematics score, which was calculated as 420 in PISA 2015 application, increased to 454 in 2018 is an indication that Turkey has increased its performance (MoNE, 2019). However, although it has increased, it can be said that this ranking is not sufficient.

These results show that studies need to be increased so that mathematics education in Turkey can reach a better point. In particular, identifying and developing problems can be realized with more comprehensive and in-depth studies in mathematics education. Increasing the number of studies examining the tendencies and orientations of theses in the field of mathematics education in the literature is important in terms of directing new studies. In the literature, there are studies to determine the tendencies of postgraduate theses on different subjects in mathematics education in Turkey. Such as; mathematics curriculum (Yenilmez & Sölpük, 2014), model and modeling (Karagöz & Şahin Çakır, 2021; Yıldız & Yenilmez, 2019), problem posing and solving (Geçici & Türnüklü, 2020; Coşkun & Soylu, 2021), experimental design (Er, 2019; Er & Biber, 2020), geogebra (Şimşek & Yaşar, 2019), misconceptions in geometry (Köprücü, 2020), spatial ability (İpekoğlu et al., 2020), math anxiety (Toptaş & Gözel, 2018), computer aided mathematics teaching applications (Tabuk, 2019), mathematics

textbooks (Dede & Arslan, 2019), origami (Kara & Bayraktar Kurt, 2021), literacy in the field of education (Oğuz Hacat & Demir, 2019), mathematics education (Sevencan , 2019; Tereci & Bindak, 2019), realistic mathematics education (Doğan & Kurt, 2019), preschool mathematics education (Yıldız Altan et al., 2021) and primary school mathematics education (Özsoy et al, 2017; Can, 2020) orientations of the postgraduate theses on the subject were examined. Two studies were found in which theses on mathematical literacy were examined. Kanbolat and Balta, (2020) examines the orientation of postgraduate theses on ML in terms of type, year, title of advisor, research approach, sample group, and the university in which it was made. Postgraduate theses on mathematical literacy studied between 2008 and 2019 were examined in terms of the university, years and type, sample characteristics, targeted purposes, methods used and data collection tools by Arı and Demir (2020). In the study, 66 (51 master's and 15 PhD theses) postgraduate theses were discussed.

In terms of Turkey's better ranking in PISA assessments, it is thought that determining the orientations of postgraduate theses on ML in detail will contribute to the literature and guide the researchers who will work in this field. This study differs from other articles and theses (Fırat, 2019; Arı & Demir, 2020; Kanbolat & Balta, 2020; Kozaklı-Ülger et al., 2020) on the examination of studies on ML in terms of the variety of criteria discussed. The current study includes postgraduate theses on ML; types, publication years, universities, subjects, keywords, sample types, number of sample, methods, distribution of methods and research designs by years, data collection tools, results and suggestions.

The aim of this research is to reveal the characteristics of the postgraduate thesis on the subject of ML in Turkey according to various criteria. The criteria determined in line with the purpose of the study are as follows.;

1) Type and publication year of the postgraduate theses,
2) The university where the postgraduate theses was made,
3) The subject of the postgraduate theses,
4) Keywords of the postgraduate theses,
5) The sample type and sample size of the postgraduate theses,
6) Research method and research design of the postgraduate theses,
7) Data collection tools of the postgraduate theses,
8) The main results of the postgraduate theses,
9) The main suggestions of the postgraduate theses.

Method

Research Design

In the study, qualitative research method was preferred since it was aimed to reveal the characteristics of the postgraduate theses on the subject of ML according to various criteria. Creswell (2012) defines qualitative research as a process of making sense of social life and human problems by questioning them with their own unique methods. In qualitative research, the researcher reads, codes and categorizes the data one by one. This reveals the results of the research based on the codes and categories it has obtained (Merriam, 2009).

In the research, the thematic analysis was carried out within the framework of the qualitative research approach, and the theses were examined and tried to be described within the framework of certain criteria. Thematic analysis includes studies focusing on the same subjects, examining, synthesizing and interpreting within the framework of certain themes or templates. It constitutes a rich source of reference for researchers, practitioners and policy makers in terms of revealing the common and similar aspects of studies that deal with a particular issue from different dimensions (Çalık, et al., 2005; Gül & Sözbilir, 2015).

Data Collection Process

The documents to be included in the research were obtained by the researchers from the database of the National Theses Center of the Council of Higher Education between April 2020 and November 2020. During the search in the database, the terms "mathematical literacy" were used in Turkish and English, including all possible situations, including all situations where the term literacy was written adjacent and separately in Turkish. The theses made in the field of ML and which are open to use are as full text; the theses, which are closed to usage permission, were evaluated by using the summary text. Since the first postgraduate theses on the subject of ML was reached in 2003, the theses prepared from 2003 to the present were discussed. 74 postgraduate theses prepared within the framework of ML between the years 2003-2020 were included in the scope of this study and examined. Of these 74 postgraduate theses, 58 are master's thesis and 16 are PhD thesis.

Data Analysis

Descriptive analysis was used in the analysis of the data obtained in this study. In descriptive analysis, the collected data is explained and interpreted in a systematic and clear way within the framework of predetermined themes. Descriptive analysis takes place in four stages (Yıldırım & Şimşek, 2016). Creating a framework for descriptive analysis, 2. Processing the data according to the thematic framework, 3. Defining the findings, 4. Interpreting the findings.

In this direction, the data of the study were organized under a total of nine themes: "type and publication year of the postgraduate theses, the university, its subject, keywords, sample type and sample size, research method and research design, data collection tools, main results and main suggestions". The documents obtained were evaluated according to the determined criteria. Frequency (f) and percentage (%) values are shown by creating tables in a systematic and clear way. The analysis of the data was completed by interpreting the identified findings.

The data obtained from a total of 74 postgraduate these included in the analysis were analyzed using descriptive analysis and content analysis methods. General information, expressed as general features, was subjected to descriptive analysis, and content features were subjected to content analysis. Descriptive analysis, percentages and frequencies of data; content analysis, on the other hand, involves coding the data first and then combining them under appropriate themes. In the final stage, frequencies and percentages were calculated for each analysis result.

The data obtained from a total of 74 postgraduate thesis included in the analysis were analyzed using descriptive analysis and content analysis methods. While information for general characteristics is given in the form of percentages and frequencies of the data as descriptive analysis; content analysis was used for data that were coded and placed in appropriate themes. Frequencies (f) and percentages (%) for each analysis result are calculated and presented in tables.

Findings and Discussions

In the findings section, theses related to ML; type and publication year, university, the subject of the theses, keywords, sample type and sample size, research method and design, data collection tools, main results and suggestions are listed in tables.

Findings Concerning the Types and Publication Years of Postgraduate Theses

The findings regarding the distribution of the theses examined according to the postgraduate level and years are given in Table 1. When the findings were examined, it was found that the number of studies conducted at the master's level was higher than PhD thesis published on ML.

Table 1. Frequencies of Postgraduate Theses According to Types

Theses Type	**f**	**%**
Master Thesis	58	78,3
PhD Thesis	16	21,7
Total	74	100

When Table 2 is examined, it can be said that postgraduate theses related to ML have been prepared since 2003. In 2004, 2005, 2007 and 2010, there was no theses about ML.

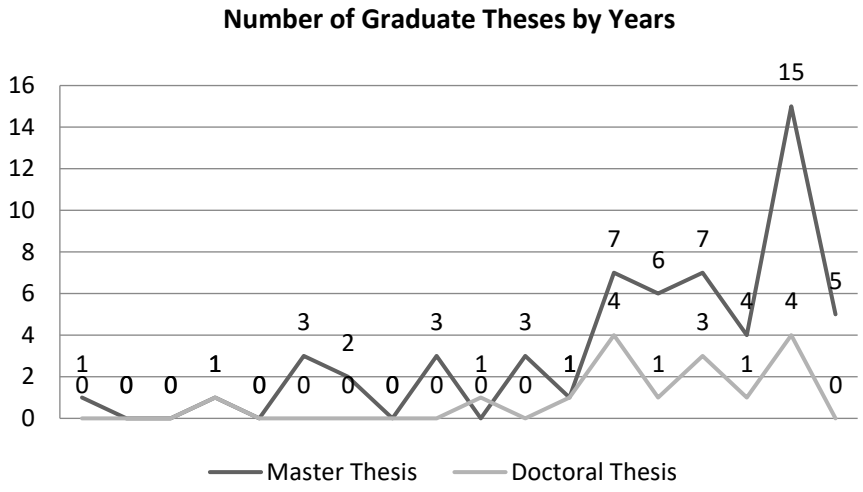
Table 2. Distribution of Postgraduate Theses in Terms of Types by Years

Theses Type	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Master Thesis	1	-	-	1	-	3	2	-	3	-	3	1	7	6	7	4	15	5	58
PhD Thesis	-	-	-	1	-	-	-	-	-	1	-	1	4	1	3	1	4	-	16
Total	1	-	-	2	-	3	2	-	3	1	3	2	11	7	10	5	19	5	74

Except for the years 2004, 2005, 2007, 2010 and 2012, master's thesis on ML was prepared every year. The number of master's theses increased in 2015 and after the following two years showed the same course, there was a decrease in 2018 and in 2019, the number of master's theses on ML reached the highest point. In addition, most of the theses prepared on ML are master's theses.

There are almost no PhD thesis written between 2003 and 2013 (only one was written in 2006 and 2012). In recent years, it is seen that PhD thesis have been prepared regularly. Until the last month of the research survey, there is no PhD thesis in the field of ML in 2020. Graph 1 shows the distribution of postgraduate theses prepared on ML in terms of their types by years.

Graph 1. Distribution of Theses Prepared Regarding ML by Types by Years



Findings Regarding the Universities where Postgraduate Theses were Made

The frequencies of the universities in which the theses on ML were published are given in Table 3.

Table 3. Distribution of Theses Prepared on ML by Universities

University	Master Theses (f)	PhD Theses (f)	Total
Ankara University	2	3	5
Balikesir University	5	2	7
Bilkent University	4	-	4
Cukurova University	3	-	3
Erzincan University	3	-	3
Eskisehir Anadolu University	-	4	4
Eskisehir Osmangazi University	4	-	4
Firat University	3	-	3
Orta Dogu Teknik University	2	2	4
Uludag University	7	2	9
Total	33	13	46

While showing the distribution of universities, those with a frequency of 3 and above are included in the table. It can be seen from Table 3 that the highest number of PhD theses were made in Eskişehir Anadolu University, and the highest number of master's theses were made in Bursa Uludağ University. Looking at the total column in the table, it is seen that the highest number of postgraduate theses related to ML were made in Uludağ University. Balıkesir University and Ankara University follow it.

Thematic Findings of the Subjects of Postgraduate Theses

The thematic distribution of the subjects of the theses on ML is shown in Table 4. The data in this section are generally the information obtained from the title, problems and sub-problems of the research.

Table 4. Thematic Distribution of the Subjects of the Theses on ML

Theme	f	%
Visual ML	7	6,3
ML Success	8	7,3
ML Education	9	8,2
Factors Affecting ML	15	13,6
Examining Different Subjects with ML	17	15,4
ML Self-Efficacy	10	9,0
ML Attitude	5	4,6
ML and Computer Communication Technologies	3	2,8
ML and Mathematical Modeling	3	2,8
ML and PISA	25	22,7
ML and Problem Solving	8	7,3
Total	110	100

According to Table 4, the themes most focused on by the subjects of ML theses are "Mathematics Literacy and PISA" and " Examining Different Subjects with ML". It is seen that the other themes on which the subjects of the prepared theses are most focused on are "Factors Affecting ML" and “ML Self-Efficacy”. In addition to these, there are 7 different themes identified in the subjects of theses written on ML.

Findings on Keywords of Postgraduate Theses

The keywords of the theses were considered important in terms of the emergence of the concepts associated with ML. Their thematic distribution is shown in Table 5.

Table 5. Distribution of Theses Prepared on ML by Keywords

Keywords	f	%
Thinking Styles-Paths	3	2,5
Visual ML	5	4,1
Mathematics Achievement	3	2,5
Mathematics Education	10	8,3
Mathematics Literacy	48	39,7
Mathematical Literacy	4	3,3
Mathematical Modeling	3	2,5
Motivation	3	2,5
Literacy	6	4,9
Self-Efficacy Perception	4	3,3
PISA	23	19,0
PISA 2012	5	4,1
Problem Solving	4	3,3
Total	121	100

While the frequency of use of keywords is shown, those with a frequency of 3 and above are included in the table. Looking at the table, the keywords of "Mathematics Literacy" is included in more than half of the ML theses. The second keywords in terms of frequency of use was “PISA”. The third place is the concept of “Mathematics Education”.

Findings Regarding the Sample Type and Sample Size of Postgraduate Theses

The distribution of theses related to ML included in the research according to sample types is presented in Table 6.

Table 6. Distribution of Theses Prepared on ML by Sample types

Sample Types		Master Theses (f)	PhD Theses (f)	Total
Primary student	Primary School-4	1	-	1
Middle school student	Middle School-6	5	-	5
	Middle School-7	6	-	6
	Middle School-8	9	3	12
	Middle School	2	1	4
High school student		4	2	6
Undergraduate student	Pre-service primary school mathematics teacher	3	-	3
	Pre-service mathematics teacher	-	1	1
	Pre-service classroom teachers	2	-	2
	Other	2	2	4
Teachers		-	1	1
PISA Participants		15	5	20
Other	Adult	2	-	2
	No Sample	6	1	7
	Teacher + Student	1	-	-
Total		58	16	74

When Table 6 is examined, it is seen that researches on ML are conducted according to different sample groups. The researches were mostly carried out with middle school students. This is followed by research with PISA participants and undergraduate students. It is noteworthy that very few studies have been conducted with primary school students, adults and teachers. The distribution of the theses prepared on ML according to the sample size is shown in Table 7.

Table 7. Distribution of Theses Prepared on ML by Sample Size

Sample Size	Master Theses (f)	PhD Theses (f)	Total
Sample size not specified	5	4	9
No Sample	6	1	7
1-40	9	4	12
41-100	9	1	10
101-200	5	-	5
201-500	11	4	15
500 and over	13	2	7
Total	58	16	74

It was seen that most of the master's theses prepared according to Table 7 were carried out with sample groups of more than 500. In addition, the sample size was not specified and studies without a sample were also conducted. In doctoral dissertations, on the other hand, it was mostly studied with sample groups between 1 and 40, between 201 and 500, and with sample groups whose sample size was not specified.

Findings Concerning the Research Method and Design of Postgraduate Theses

The distributions of the theses on ML according to the research method are given in Table 8 under four title.

Table 8. Distribution of Theses Prepared on ML by Research Methods

Research Methods	Master Theses (f)	PhD Theses (f)	Total
Quantitative Research Method	23	6	29
Qualitative Research Method	13	6	19
Mixed Research Method	21	4	25
Nested Patterns from Mixed Method Studies	1	-	1
Total	58	16	74

ML theses were conducted using the "quantitative research method" at most. It is the "Mixed Research Method" following the "quantitative research method" as frequency. It is seen that the difference between "quantitative research method" and "mixed research method" is very small compared to the number of postgraduate theses. Looking at the table specifically for master's theses, it is seen that "quantitative research method" is used the most. In the master's theses, there is one theses in which the "nested mixed method" is used, which is not included in the quantitative, qualitative and mixed research method. Looking at the doctoral theses, it is seen that quantitative and qualitative research methods are equal in number (6 each).

The distribution of research methods of theses by years is given in Table 9.

Table 9. Distribution of Research Methods of Theses on by Years

Research Methods	2003	2006	2008	2009	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Quantitative Research Method	1	2	2	1	2	1	1	-	5	2	5	1	4	2	29
Qualitative Research Method	-	-	1	1	-	-	-	1	2	2	2	2	5	3	19
Mixed Research Method	-	-	-	-	1	-	2	1	4	3	3	1	10	-	25
Nested Patterns from Mixed Method Studies	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Total	1	2	3	2	3	1	3	2	11	7	10	5	19	5	74

Looking at Table 9, it is seen that the "quantitative research method" has been used since 2003. However, since there is no significant difference in the frequency of use compared to

years, there is a stability. “qualitative research method” has been used since 2008. While the frequency of use of the method is in the same line, an increase is observed in the frequency of use in 2019. “mixed research method” was used for the first time in 2011 in ML postgraduate theses. It is seen that the "mixed research method" has started to be used in ML theses mostly in recent years. The frequency of use of the "mixed research method" increased significantly in 2019.

The distribution of theses on ML according to the research design is given in Table 10.

Table 10. Distribution of Theses Prepared on ML by Research Design

Research Design	Master Theses (f)	PhD Theses (f)	Total
Descriptive Design	1	-	1
Descriptive Research	3	-	3
Descriptive Content Analysis	1	-	1
Descriptive Survey Model	1	-	1
Experimental Design	7	1	8
Document Analysis	4	-	4
Case Study	4	-	4
Action Research Design	2	-	2
Nested Mixed Design	1	1	2
Relational Research Model	2	-	2
Relational Survey Model	9	4	13
Causal Comparative Research	2	-	2
Descriptive Design of the Mixed Method	2	-	2
Exploratory Case Study Design	-	1	1
(Predictive) Correlational Research	3	1	4
Causal Comparative Research Design	1	-	1
Teaching Experiment Design	-	3	3
Segmentation Model	1	-	1
Survey Design	8	3	11
Semi-Experimental Design	4	1	5
Horizontal And Vertical Comparison Design	-	1	1
Unspecified	2	-	2
Total	58	16	74

ML theses were conducted using the “relational survey model” at most. This situation was the same in both master's theses and doctoral theses. The pattern, which ranks second in terms of frequency of use according to the research pattern in master's theses, is the "survey desing". In the third place is the "experimental design". The frequency difference between the patterns in these first three rows is very small (1 frequency difference). Survey design and teaching experiment design share the second place in doctoral theses.

The distribution of the research patterns of the theses on ML by years is given in Table 11.

Table 11. Distribution of research design of theses prepared on ML by years

Research Design	2003	2006	2008	2009	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
Descriptive Design	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Descriptive Research	-	-	-	-	-	-	1	-	1	1	-	-	-	-	3
Descriptive Content Analysis	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Descriptive Survey Model	-	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Experimental Design	-	1	-	-	-	-	-	1	1	-	2	1	2	-	8
Document Analysis	-	-	-	-	-	-	-	-	-	-	-	-	2	2	4
Case Study	-	-	1	-	-	-	-	-	-	-	-	1	2	-	4
Action Research Design	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Nested Mixed Design	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2
Relational Research Model	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2
Relational Survey Model	1	1	-	-	-	-	2	1	2	1	1	-	4	-	13
Causal Comparative Research	-	-	-	1	-	-	-	-	-	-	1	-	-	-	2
Descriptive Design of the Mixed Method	-	-	-	-	1	-	-	-	-	1	-	-	-	-	2
Exploratory Case Study Design	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
(Predictive) Correlational Research	-	-	-	-	1	-	-	-	1	-	-	-	1	1	4
Causal Comparative Research Design	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Teaching Experiment Design	-	-	-	-	-	-	-	-	-	1	1	-	1	-	3
Segmentation Model	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Survey Design	-	-	2	1	-	1	-	-	3	-	2	-	1	1	11
Semi-Experimental Design	-	-	-	-	-	-	-	-	2	1	-	-	2		5
Horizontal And Vertical Comparison Design	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1

Looking at the distribution of research designs by years, it is seen that the "Relational Survey Model" has been used since the first year when ML theses were written. It is seen that the oldest method used in ML postgraduate theses after the "Relational Survey Model" is the "Experimental Design". If we look at the table from the most recent date, two of the five postgraduate theses written in 2020 were prepared with the "Document Analysis" pattern. Four of the 19 postgraduate theses written in 2019 were prepared using the "Relational Survey Model".

Findings Regarding Data Collection Tools of Postgraduate Theses

The distribution of theses prepared on ML according to data collection tools is shown in Table 12.

Table 12. Distribution of Theses Prepared on ML by Data Collection Tools

Data collection tools	Master Theses (f)	PhD Theses (f)	Total
Questionnaire	9	3	12
Inventory	3	-	3
Scale	16	3	19
Test	30	7	37
Form	15	1	16
Document	4	4	8
Interview (Interview) Form or Interviews	10	5	15
PISA Questions - Data	6	2	8
Total	93	25	118

When Table 12 is examined, it is seen that many different data collection tools are used in theses prepared on ML. Considering the data collection tools used, data was collected mostly with the test technique. Also; scales, forms and interviews are other frequently used data collection tools. Considering all data collection tools, data was collected with the least inventory.

Findings Concerning the Results of Postgraduate Theses

The distribution of the results of the theses on ML is given in Table 13 under five theme.

Table 13. Distribution of Theses Prepared on ML by Results

Theme	Category	f	%
Factors Increasing ML Success	-Technology -Mathematics Literacy Education -Curriculum Arrangement -Valuing Mathematics -Developing a Positive Attitude -Mathematical Modeling Training -Using Mathematical Tools	19	19,8
Variables Affecting ML	-Demographic features -School Type -Classroom Management -Active Participation -Belief in Self-Efficacy -Geographical Location -Teacher-Student Relationship -Study Habits	48	50,0
Behaviors Observed in the ML Process	-Difficulties Encountered -Observed Process Skills -Observed Misconceptions	6	6,2
Determining ML Achievement Level	-Using Measuring Tools -Observing Mathematical Process Skills -Using Special Statistical Methods -Using Special Measuring Tools	23	24,0
Total		96	100

A thesis is not included in only one theme. More than one theme can be found as a result of a thesis. Looking at the table, it is seen that the results under the theme of "variables affecting ml" are found in more than half of the ML theses. In addition, the results related to "determination of ml achievement level" and "factors that increase ml success" are also given a lot. In the theme of "behaviors observed in the ML process", relatively few frequencies are seen compared to other themes.

Findings Concerning the Suggestions of Postgraduate Theses

The distributions of the theses on ML regarding their suggestions are given in Table 14 under five thematic title.

Table 14. Distribution of Theses Prepared on ML by Suggestions

Theme	Category	f	%
Academic Suggestions	-Examination of Mathematical Processes -Examination of Mathematical Literacy Levels -Working with Different Samples -Using Different Measuring Tools -Comparing Mathematics Literacy by Countries -Comparing Mathematics Literacy Among School Types	63	43,1
Suggestions for Students	-Solving ML Problems -ML Education -Using Technology	15	10,3
Suggestions for Teachers	-ML Education -Self Assessment	20	13,7
Suggestions for the Teaching Process	-Variables Influencing ML -Adult Education -Material Enrichment -Enriching Teaching Methods and Techniques	22	15,1
Suggestions for the Curriculum	-Increasing the Mathematics Applications Lesson -Updating Textbooks	26	17,8
Total		146	100

A theses is not included in only one theme. More than one theme can be found in a theses proposal. Looking at the table, it is seen that ML theses have the most "Academic Suggestions" while making suggestions. The second group of suggestions in terms of frequency among the suggestions addressed by ML theses is "suggestions for the curriculum". There is very little (two frequencies) difference in frequency between "suggestions for teachers" and "suggestions for teaching process". In almost the same number of theses, suggestions were made for the teacher and the teaching process. “suggestions for students” are the least in number.

Conclusions and Suggestions

The aim of this study was to examine the postgraduate theses conducted in Turkey on mathematical literacy, which is heavily included in the education system of countries with PISA exams, according to the determined variables, and to provide researchers with an idea for new studies. In line with the purpose of the study, 74 postgraduate theses on ML conducted between 2003 and 2020 were examined. It was determined that 58 of the postgraduate theses examined in the research were master's and 16 of them were PhD theses. Since the number of master's programs in education in Turkey is higher than doctoral programs, it is an expected result that there are more master's theses. Sevencan (2019), in his study examining postgraduate theses in

the field of mathematics education in Turkey between the years 2000-2016, stated that approximately 80% of 1276 theses consisted of master's theses. Similarly, Tereci and Bindak (2019), in their study examining postgraduate theses in the field of mathematics education in Turkey between 2010 and 2017, revealed that approximately 81% of 602 theses were master's theses. The result that 78% of the postgraduate theses in the field of ML are at the master's level, is in line with these results.

Distribution of postgraduate theses on ML by years showed that most of the theses published between 2003-2020 were made after 2015. Similarly, Şahin and Başgül (2020), in their study in which they examined a total of 109 postgraduate theses conducted between 2003-2018 in order to reveal the trends of the postgraduate theses related to the PISA exam in Turkey, found that the most thesis related to PISA was made in 2015, and that the most of the theses conducted on mathematical literacy.

It is seen that there are 10 universities in Turkey that produce three or more postgraduate theses on ML. It is seen that the highest number of doctoral theses were made in Eskişehir Anadolu University, and the highest number of master's theses were made in Uludağ University. When looking at the postgraduate theses related to ML without separating them based on their types, it is seen that they are mostly prepared in Uludağ University, followed by Balıkesir University and Ankara University. It has been determined that most of the postgraduate theses in the field of mathematics education between 2010-2017 and in the field of primary school mathematics education between 2005-2016 in Turkey were made in Gazi University (Tereci & Bindak (2019); Özsoy et al., 2017). When we look at the studies that consider the frequency of postgraduate thesis on university basis as a sub-problem, two studies that mention the frequency of doing three or more theses are included here. In the first study, Doğan and Kurt (2019) examined theses on realistic mathematics education, in three of 26 different universities; the second is Toptaş and Gözel's (2018) studies on mathematics anxiety, and four out of 29 different universities are in the scope of a subject. The fact that the number of studies in ten different universities is three or more can be considered as an indication that this subject is seriously considered in terms of graduate education.

When we look at the keywords of the postgraduate theses on ML, it is seen that the concept of "mathematical literacy" is used most frequently. This is followed by the keywords "PISA" and "mathematics education"; It is noteworthy that the keywords of "thinking styles-paths", "mathematics success", "mathematical modeling" and "motivation" are few in number. It is a predictable result that the keywords of “mathematical literacy” is used in all theses

focusing on ML. In addition, it was seen that the theses that were carried out using PISA data and that included "PISA" in their keywords mostly used PISA 2012 data.

Most of the postgraduate theses on mathematics literacy in the field of mathematics education in Turkey were conducted on middle school students. The following sample type is PISA participants and undergraduate students. When the postgraduate theses on ML are examined according to the sample size; It has been seen that the number of studies conducted with more than 500 participants in master's theses is high. It is thought that the frequent use of PISA data in theses has an effect on the number of studies conducted with more than 500 participants. The sample size of the studies show sufficient diversity.

When we look at the research methods of postgraduate theses on ML, it is seen that the most widely used method is the quantitative research method, followed by the mixed research method. It has been observed that the "quantitative research method" has been preferred since 2003. “mixed research method” was used for the first time in 2011 in ML postgraduate theses. It is seen that the "mixed research method" has started to be used in ML theses mostly in recent years.

The most commonly used research design in postgraduate theses on ML is the "relational survey model". It is seen that "survey design" and "experimental design" follow this in master's theses. It is seen that "survey design and teaching experiment design" are used in doctoral theses. Özsoy et al. (2017) found that the most commonly used research design is the survey design in their studies where they examined the research tendencies of postgraduate theses in the field of primary school mathematics education. Karagöz and Şahin Çakır (2021), on the other hand, in their study in which they examined model and modeling theses conducted in Turkey, concluded that quasi-experimental design was mostly used as a research model in theses.

When the postgraduate theses on ML are examined within the scope of data collection tools, it is seen that the test technique is used the most. After the test technique, scale, form and interviews were preferred; it is seen that the inventory is used at least. Similarly, Coşkun and Soylu (2021) found that tests were mostly used as a data collection tool in postgraduate theses on problem solving in the field of mathematics education in Turkey. In addition, Geçici and Türnüklü (2020) concluded that the most data was collected through interviews in theses on problem posing in Turkey.

While the findings related to the results of the ML theses mostly focused on the variables affecting ML, the level of success and the factors that increase success, it was seen that there was few data on the behaviors observed in the ML process. It is thought that the reason for this

may be the difficulty of interpreting and criticizing human behaviors. For the theses planned to be made on ML, studies that include the observation of the behaviors in the process may be preferred.

When the results are evaluated in general, middle school students are the most preferred sample type in postgraduate theses on mathematics education in the field of mathematics education in Turkey. The need for mathematically literate teachers to raise mathematically literate individuals, it can be recommended to increase the number of studies with teachers as a sample type in studies to be conducted in the field of ML.

It is seen that the highest number of PhD theses were made at Eskişehir Anadolu University, and the most number of master's theses were made at Bursa Uludağ University, therefore, considering the number of universities in our country, studies at the doctoral level on this subject are limited to some universities. It can be suggested that studies on this subject be extended to other universities as well. In the research, it was revealed that more master's thesis on the subject was made. In this direction, doctoral thesis supervisors can encourage their postgraduate students to work on ML.

It has been observed that almost half of the suggestions in the theses are academic suggestions. The least number of suggestions are those that are directly related to the student. Although the most frequently studied group as the study group is middle school students, the fact that the least suggestion is directly in the student theme can be considered as an indication that studies focusing on the process should be increased. Considering the importance of mathematical literacy for students, it is important to develop suggestions for students in studies that are thought to be carried out.

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Türkiye'de Matematik Eğitimi Alanında Yapılmış Matematik Okuryazarlığı İle İlgili Lisansüstü Tezlerin Tematik Analizi

Özet:

Bu çalışmanın amacı, Türkiye'de matematik okuryazarlığı konusunda yapılan lisansüstü tezlerin özelliklerini çeşitli ölçütlere göre ortaya koymaktır. Araştırmanın amacı doğrultusunda incelenen kriterler; lisansüstü tezin türü ve yayın yılı, yapıldığı üniversite, konusu, anahtar kavramları, örneklem türü ve örneklem sayısı, araştırma yöntemi ve araştırma deseni, veri toplama araçları, ana sonuçlar ve temel önerileri olarak belirlenmiştir. Araştırmada nitel araştırma yaklaşımlarından biri olan tematik analiz kullanılmıştır. Araştırmanın örneklemini Yükseköğretim Kurulu Ulusal Tez Merkezi resmi internet sitesinde kayıtlı 2003-2020 yılları arasında gerçekleşen eğitim alanında matematik okuryazarlığı ile ilgili 74 lisansüstü tez oluşturmaktadır. Bu çalışma, ele alınan kriterlerin niteliği ve çeşitliliği açısından matematik okuryazarlığı ile ilgili lisansüstü tezlerin incelenmesine ilişkin diğer makale ve tezlerden farklılık göstermektedir.

Anahtar kelimeler: Matematik okuryazarlığı, tematik analizi, matematik eğitimi, lisansüstü tez

Geniş Özet

Giriş

Matematik okuryazarlığı, kişinin matematiği hayatımızda karşılaştığımız çeşitli durumlarda formüle etme, uygulama ve yorumlama basamaklarını kullanma kapasitesi olarak tanımlanır (Organisation for Economic Co-Operation and Development [OECD], 2016). Matematik Okuryazarlığı (MO) okul matematiği ile yaşam arasındaki kopukluğun artması üzerine gündeme gelmiş olup amacı, bilgiyi beceri ile bütünleştirmek sureti ile işe koşmak ve kullanılmasını sağlamaktır (Altun, 2020). Matematik okuryazarlığının okul matematiği ile olan ilişkisi göz önüne alındığında MEB kaynaklarında raporlanan matematik okuryazarlığı başarısının irdelenmesine gerek duyulmuştur. PISA 2015 uygulaması sonuçlarına göre Türkiye matematik başarısı bakımından 420 ortalama puan ile 72 ülke arasından 50. sırada yer almaktadır. 2015'de Türkiye'de alt düzeyde yer alan öğrenci oranı artmış, üst düzeyde yer alan öğrenci oranı ise azalmıştır (MEB, 2019). Türkiye, PISA 2018 araştırmasında 454 ortalama puan ile 79 ülke arasından 42.sırada yer almaktadır. PISA 2015 uygulamasında 420 olarak hesaplanan ortalama matematik puanının 2018 yılında 454'e çıkması Türkiye'nin performansını artırdığının bir göstergesidir. (MEB, 2016). Ancak her ne kadar artmış olsa da bu sıralamanın yeterli olmadığı söylenebilir.

Türkiye'nin PISA değerlendirmelerinde daha iyi bir sıralamaya sahip olması açısından matematik okuryazarlığı ile ilgili yapılan lisansüstü tezlerin yönelimlerinin ayrıntılı olarak belirlenmesinin literatüre katkıda bulunacağı ve bu alanda çalışacak olan araştırmacılara yol göstereceği düşünülmektedir. Bu araştırmanın amacı Türkiye'de matematik okuryazarlığı konusu üzerine yapılan lisansüstü tez çalışmalarının çeşitli kriterlere göre özelliklerini ortaya koymaktır. Araştırmada matematik okuryazarlığını konu edinen lisansüstü tezlerinde, çalışmanın amacı doğrultusunda incelenen kriterler;

1) Lisansüstü tezin türü ve yayın yılı,
2) Lisansüstü tezin yapıldığı üniversite,
3) Lisansüstü tezin konusu,
4) Lisansüstü tezin anahtar kavramları,
5) Lisansüstü tezin örneklem türü ve örneklem sayısı,
6) Lisansüstü tezin araştırma yöntemi ve araştırma deseni,
7) Lisansüstü tezin veri toplama araçları,
8) Lisansüstü tezin başlıca sonuçları,
9) Lisansüstü tezin başlıca önerileri olarak belirlenmiştir.

Yöntem

Çalışmada matematik okuryazarlığı konusu üzerine yapılan lisansüstü tez çalışmalarının çeşitli kriterlere göre özelliklerini ortaya koymak amaçlandığından nitel araştırma yöntemi tercih edilmiştir. Araştırmada nitel araştırma yaklaşımı çerçevesinde tematik analiz yapılarak tezler incelenmiş ve belirli kriterler çerçevesinde betimlenmeye çalışılmıştır.

Araştırmaya dahil edilecek dokümanlar, araştırmacılar tarafından Nisan 2020 – Kasım 2020 tarihleri arasında Yükseköğretim Kurulu Başkanlığı Ulusal Tez Merkezi resmî sitesinin veri tabanından elde edilmiştir. Veri tabanında yapılan tarama esnasında *"matematik okuryazarlığı", "matematik okuryazarliği", "matematik okuryazarlık", "matematiksel okuryazarlık", "matematik okur yazarlığı", "matematik okur yazarlık", "matematik okur-yazarlık", "matematik okur-yazarlığı"* terimleri kullanılmıştır. Ulaşılan dokümanların tamamı çalışmaya dâhil edilmiştir. Matematik okuryazarlığı konusuna ilişkin ilk lisansüstü tez çalışmasına 2003 yılında ulaşılması sebebiyle 2003 yılından günümüze kadar hazırlanan tezler ele alınmıştır. 2003-2020 yılları arasında matematik okuryazarlığı konusu çerçevesinde hazırlanan 74 lisansüstü tez bu çalışma kapsamına dahil edilerek incelenmiştir. Bu 74 lisansüstü tezinin 58 tanesi yüksek lisans ve 16 tanesi doktora tezidir.

Analize dâhil edilen toplam 74 lisansüstü tezden elde edilen veriler, betimsel analiz ve içerik analizi yöntemi kullanılarak analiz edilmiştir. Genel özellikler için bilgiler verilerin yüzdeleri ve frekansları şeklinde betimsel analiz olarak verilirken; kodlanarak uygun temalara yerleştirilen veriler için ise içerik analizi kullanılmıştır. Her bir analiz sonucuna yönelik frekanslar (*f*) ve yüzdeler (%) hesaplanarak tablolar eşliğinde sunulmuştur.

Bulgular

Elde edilen bulgular incelendiğinde matematik okuryazarlığı ile ilgili yayımlanan 74 tezden yüksek lisans düzeyinde yapılan çalışmalarının sayıca daha fazla olduğu bulunmuştur. 2004, 2005, 2007, 2010 ve 2012 yılları haricinde her yıl matematik okuryazarlığı ile ilgili yüksek lisans tezi hazırlanmıştır. Yüksek lisans tezlerinin 2015 yılında sayıca fazlalaştığı takip eden iki yıl aynı seyri gösterdikten sonra 2018 yılında bir düşüş yaşayıp 2019 yılına gelindiğinde ise matematik okuryazarlığı ile ilgili hazırlanan yüksek lisans tezleri sayıca en üst noktaya ulaşmıştır. 2003-2013 yılları arasında yazılmış doktora tezi neredeyse hiç yoktur (2006 ve 2012 yılında birer tane doktora tezi yazılmıştır). Son yıllarda ise düzenli olarak doktora tezlerinin de hazırlandığı görülmektedir. Araştırma taramasının yapıldığı son aya kadar 2020 yılında da MO alanında bir doktora tezi çalışması yoktur.

Doktora tezlerinin sayıca en fazla Eskişehir Anadolu Üniversitesi'nde, yüksek lisans tezlerinin sayıca en fazla Bursa Uludağ Üniversitesi'nde yapıldığı görülmektedir. Genel olarak

bakıldığında MO ile ilgili lisansüstü tezlerin sayıca en fazla Uludağ Üniversitesi'nde yapıldığı görülmektedir. Sayıca ikinci sırada yer alan Balıkesir Üniversitesi'nde yapılan tezlerdir.

Matematik okuryazarlığı tezlerinin konularının en çok odaklandığı temalar, "matematik okuryazarlığı ve PISA" ve "matematik okuryazarlığı ile farklı konuların incelenmesi" şeklindedir. Hazırlanan tezlerin konularının en çok odaklandığı diğer temanın ise "matematik okuryazarlığını etkileyen faktörler" olduğu görülmektedir.

"Matematik Okuryazarlığı" anahtar kavramı MO tezlerinin sayıca yarısından fazlasında yer almaktadır. Kullanılma sıklığı bakımından ikinci sırada yer alan anahtar kavram "PISA" olmuştur. Üçüncü sırada "Matematik Eğitimi" kavramı yer almaktadır.

MO ile ilgili farklı örneklem gruplarına göre araştırmalar yapıldığı görülmüştür. Yapılan araştırmalar en çok ortaokul (5-8) öğrencileri ile yürütülmüştür. Bunu PISA katılımcıları ve lisans öğrencileri ile yapılan araştırmalar takip etmektedir. Yetişkinler ve öğretmenler ile çok az sayıda çalışma yapılmış olması dikkat çekmektedir. Yüksek lisans tezlerinin büyük bir kısmının 500 üstü örneklem gruplarıyla, doktora tezlerinin ise çoğunlukla 1-40, 201-500 kişi sayısına sahip örneklem gruplarıyla yürütüldüğü tespit edilmiştir.

MO tezleri en fazla "nicel araştırma yöntemi" kullanılarak yürütülmüştür. Frekans sıklığı olarak "nicel araştırma yöntemi"ni takip eden "karma araştırma yöntemi"dir. MO tezlerinde en fazla kullanılan araştırma deseni ise "İlişkisel Tarama Modeli" olmuştur.

MO ile ilgili hazırlanan tezlerde birçok farklı veri toplama aracından yararlanıldığı görülmektedir. Yararlanılan veri toplama araçlarına bakıldığında en çok test tekniği ile veri toplanmıştır.

MO ile ilgili hazırlanan tezlerin yarısından fazlasında, elde edilen sonuçların "MO'yu etkileyen değişkenler" teması altında bulunduğu görülmektedir. Bununla beraber "MO başarı seviyesi belirleme" ve "MO başarısını arttıran faktörler" ile ilgili sonuçlara da fazlaca yer verilmiştir. MO tezlerinin en fazla "akademik öneriler" de bulunduğu görülmüştür. MO tezlerinin ele aldığı önerilerde sıklık bakımından ikinci sırada bulunan öneri grubu "öğretim programı için öneriler"dir.

Sonuç ve Tartışma

Araştırmada incelenen 74 lisansüstü tezin 58 tanesinin yüksek lisans 16 tanesinin doktora tezi olduğu tespit edilmiştir. Türkiye de eğitim alanında yüksek lisans programlarının doktora programlarına göre sayıca fazla olmasından dolayı yüksek lisans tezlerinin daha fazla olması beklenen bir sonuçtur. Bu doğrultuda doktora tez danışmanları tez öğrencilerini MO ile ilgili çalışma yapmaları konusunda teşvik edebilir.

Türkiye'de matematik eğitimi alanında yapılmış matematik okuryazarlığı ile ilgili lisansüstü tezlerin yıllara göre dağılımına bakıldığında 2003-2020 yılları arasında yayınlanmış olan tezlerin büyük bir kısmının 2015 yılı sonrasında yapıldığı görülmektedir. Uluslararası düzeyde uygulanan PISA değerlendirmelerinin okul matematiği ile yaşam arasındaki boşlukla ilgili farkındalığının artırmasına ve ülke eğitim sistemlerinin yeniden düzenlenmesinde dikkate alınmasına (Kozaklı Ülger ve ark., 2020) rağmen 2015 yılı ve sonrasında düzenli bir artış söz konusu değildir.

Doktora tezlerinin sayıca en fazla Eskişehir Anadolu Üniversitesi'nde, yüksek lisans tezlerinin sayıca en fazla Bursa Uludağ Üniversitesi'nde yapıldığı, dolayısıyla ülkemizdeki üniversite sayısı göz önüne alındığında bu konuyla ilgili çalışmaların bazı üniversitelerle sınırlı kaldığı görülmektedir. Bu konuyla ilgili çalışmaların diğer üniversitelere yaygınlaştırılması önerilebilir.

Türkiye'de matematik eğitimi alanında yapılmış matematik okuryazarlığı ile ilgili lisansüstü tezlerin anahtar kavramlarına bakıldığında "matematik okuryazarlığı" kavramının en sık kullanıldığı görülmektedir ve bu tahmin edilebilir bir sonuçtur.

Türkiye'de matematik eğitimi alanında yapılmış matematik okuryazarlığı ile ilgili lisansüstü tezlerin büyük çoğunluğu ilköğretim öğrencileri üzerinde yürütülmüştür. Bunu takip eden örneklem türü ise PISA katılımcıları ve lisans öğrencileridir. Lisans öğrencileri araştırmacılar için kolay ulaşılabilir bir çalışma grubudur (Kozaklı Ülger ve ark., 2020). Matematik okuryazarı bireylerin yetişmesi için matematik okuryazarı öğretmenlere olan ihtiyaç göz önünde tutulduğunda, MO alanında yapılacak olan çalışmalarda örneklem türü olarak öğretmenlerle çalışılması önerilebilir.

MO tezlerinin sonuçlarına ilişkin bulgular daha çok MO'yu etkileyen değişkenlere, başarı düzeyine ve başarıyı artıran faktörlere odaklanırken MO sürecinde gözlenen davranışlara ilişkin çok az veri olduğu görülmüştür. Bunun nedeninin insan davranışlarını yorumlamanın ve eleştirmenin zorluğu olabileceği düşünülmektedir. MO üzerine yapılması planlanan tezler için süreçteki davranışların gözlemlenmesini içeren çalışmalar tercih edilebilir.

Tezlerde yer alan önerilerin neredeyse yarısının akademik öneriler olduğu gözlemlenmiştir. En az sayıda öneri, doğrudan öğrenciyle ilgili olanlardır. Çalışma grubu olarak en sık çalışılan grup ortaokul öğrencileri olsa da en az önerinin doğrudan öğrenci temasında olması sürece odaklanan çalışmaların artırılması gerektiğinin bir göstergesi olarak değerlendirilebilir. Matematik okuryazarlığının öğrenciler için önemi göz önüne alındığında yapılması düşünülen çalışmalarda öğrencilere öneriler geliştirilmesi önemlidir.