

## An Analysis of the Studies on Self-Efficacy in Mathematics Education in Turkey

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### Abstract

The purpose of the study is to carry out a content analysis of research articles and theses published in Turkey between 2008-2020 on self-efficacy in mathematics education and to determine the trends of the mentioned studies. Document analysis were performed on 205 articles. A study classification form developed by Sozibilir, Kutu and Yasar (2012) was used to analyze the articles included in the study. The form consists of five sections: subject area, research patterns, data collection tools, sampling, and data analysis methods. Results show that self-efficacy studies were mainly quantitative studies and most of them selected middle school students or preservice teachers as sample. Especially qualitative studies suggested to the researchers.

**Keywords:** *Mathematics education, self-efficacy, document analysis*

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### Introduction

As the strength of the constructivist perspectives increased in the cognitive and progressive process, the researchers' interest in the students' thought and belief processes also increased and the focus of the research changed (Schunk, 2012). Socio-cognitive theory revealed the differences between learning and behavior (Zimmerman & Schunk, 2003) and came up with two elements: Self-regulation and self-efficacy. Self-efficacy can be explained conceptually as a person's abilities that are thought to exist for learning or for performing a task. In social cognitive theory, Bandura (1982a, 1982b, 1986, 1997) examines human behavior in the frame of triple reciprocity, individual, behavior, and environment. These interrelated factors are considered as capacities used to organize the behaviors necessary for perceived self-efficacy, learning, or behavior. Studies on the relationship between behavior and self-efficacy (personal factors) showed self-efficacy affects task selection and decision behavior (Schunk, 1991, 2001; Schunk & Pajares, 2002). While students working through tasks, such as working on exercise handouts, completing stages of term papers, they realize they are progressing towards the target behavior. This progress provides development indicators for the students to be convinced that they are doing well and increase their self-efficacy for continuous learning. The social environment may also play a role in the low self-efficacy of students with learning difficulties (Licht & Kistner, 1986). These students may be considered more incompetent by some teachers, and teachers' negative feedback affects the student's self-efficacy (Bryan & Bryan, 1983).

### Literature Review

Academic self-efficacy is a measurement of the students' faith in their competency to do an academic

task in educational settings to gather achievement (Bong & Skaalvik, 2003). One of the most considered academic field for self-efficacy studies is mathematics, and the first studies on self-efficacy were done in mathematics and science, for example, the first common scale used in mathematics self-efficacy belongs to Betz and Hackett (1983).

In social cognitive theory, cognitive modeling has an effect on students' self-efficacy and success while acquiring cognitive skills (Schunk, 1981). Considering the steps of a mathematics teacher who teaches division in the traditional way (Van De Walle et al., 2016), one of the factors affecting students' learning and practice through observation is self-efficacy. Thus, it affects behavior that they think the task is appropriate for their skills or believe they can do the task (if they could, I can do it too). A lot of situations about this kind of motivation can be observed in classes. Motivational effects depend to some extent on self-efficacy (Bandura, 1982b, 1997), and expectations affect self-efficacy. Research shows that specific tasks improve performance and objectives raise self-efficacy (Schunk, 1989a).

Self-efficacy is influenced by the targets set by individuals, feedback on progress to the target (Schunk, 1989b), and outcome expectations (Shell, Murphy & Bruning, 1989). Observational learning is also influenced by the motivation, and it works on putting more goals, self-efficacy, and result expectations (Bandura, 1986, 1997). Cognitive research makes emphasis on attention, repetition, the use of learning strategies, and understanding. This situation helps mathematics education studies in determining the needs of the field, for example, the finding of various relationships among the attitude towards mathematics, self-efficacy, and self-regulation skills. To structure their mind, students should have several options for learning motivation and methods, the time needed for learning, level of the learning, the environment where learning takes place, and social conditions where they are influenced by (Zimmerman, 1994, 1998, 2000).

Regular review of articles published in academic journals is useful to see the current state of mathematics education research and to be aware of future trends (Ulutaş & Ubuz, 2008). Ulutaş and Ubuz (2008) examined 129 studies published in the field of mathematics education. The majority of the studies were experimental studies conducted on primary school students or preservice teachers. These studies were mostly focused on the cognitive dimension, affective dimension, and teaching methods. They also used quantitative methods that administered using scales and surveys. It has been determined that subjects were numbers and geometry in most publications. Çiltaş, Güler, and Sözbilir (2012) investigated articles in the field of mathematics education using content analysis method. For this purpose, a total of 359 studies published in mathematics education have been examined in 32 different journals, 27 of them are national and 5 of them are in the Web of Science SSCI index. As a result of the research, they found there has been a great increase in mathematics education researches since 2002, quantitative researches are preferred, learning studies are at the forefront as a research subject, single data collection tool is used more in the studies, and most of them use of percentage and frequency tables as the data analysis method. İncikabı et al., (2017) conducted a content analysis of the studies which focus on mathematics education between 2009-2014. Findings revealed that the articles were not able to focus on learning areas clearly, most of them were non-experimental studies conducted dominantly on teacher training. In addition to these, it is determined that undergraduate students are preferred as the target audience, achievement tests and interview forms come to the fore as data collection tools. Tuluk and Delibaş (2019) investigated domestic research papers published between 2008-2018 on algebra and algebraic thinking, and it was determined that a large part of the studies were conducted on secondary school students. It was determined that most research was either surveys or case studies, used achievement or skill tests and interviews as the data collection tools, conducted descriptive analysis and content analysis methods. Biber and Er (2020), examined 94 master's degrees and 17 doctorate-level theses in the field of mathematics education in Turkey between 2001 and 2017. Results show that the semi-experimental method was the preferred method and the t-test was the preferred statistical data analysis tool.

When we examine the literature on mathematics and self-efficacy, mathematics self-efficacy studies come from the near past and it is difficult to give precise information about the beginning. When we focus on the Turkey-based work in self-efficacy, the number of studies in mathematics education possess a noticeable increase since 2008. Determining the trends in these studies will provide an opportunity to direct new researches as well as to see a big picture of self-efficacy studies in mathematics education.

Based on the above explanations, the current study aims to investigate self-efficacy research in mathematics education in Turkey between 2008 and 2020. Being in line with the aim, answers to the following research questions were sought.

How is the distribution of the studies on self-efficacy in mathematics education between 2008-2020?  
What is the distribution of mathematics learning areas in the studies on self-efficacy in mathematics education between 2008-2020?

How are methodological specifications of the studies on self-efficacy in mathematics education between 2008-2020?

What objectives are targeted in the studies on self-efficacy in mathematics education between 2008-2020?

### **Methodology**

The current study utilizes the document analysis method that examine printed sources collected for a specific purpose (Yıldırım & Şimşek, 2008). Rummel (1964) and many researchers named this method as “document method”, while Duverger (1973) called it “documentary observation”. Karasar (2007, p. 183) expresses this method as a "systematic review of the existing records or documents as data sources". Document analysis is considered a type of qualitative research. In this respect, the research is designed according to qualitative research methods and techniques.

#### *Determining the Studies to be Analyzed*

Articles and thesis within the scope of this research reached from several databases such as Google Scholar, Ulakbim, ASOS, Turkish Education Index using keywords of Mathematics, self-efficacy, and mathematics self-efficacy". There were rare instances before 2008 such as a thesis in 2002, an article in 2006, and another article in 2007. Hence we have restricted articles and thesis to the 2008-2020 timeframe and found 157 studies from the thesis database. The number of studies in the form of articles was found to be 355. Then we eliminated some of these studies because some articles were produced from masters or doctoral theses. This elimination resulted in 205 distinct studies.

#### *Data Analysis*

The collected data were subjected to content analysis method. The purpose of the method is to gather deeper information about similarities and the differences in the content of collected data (İncikabı, et al., 2017). Organization and interpretation of this data helps us to understand and explain underlying concepts within the frameworks of the study (Yıldırım & Şimşek, 2008).

“Publishing Classification Form” developed by Sözbilir, Kutu and Yaşar (2012) was used to analyze the articles included in the study. The form consists of seven sections as “information about paper, discipline area, subject of the paper, research methods, data collection tools, sample, and data analysis methods” (Sözbilir et al., 2012 p. 373). To determine the trends of the studies in the study, the criterion of “objectives of studies” has been added to the analysis units. Articles were analyzed by researchers according to the mathematical learning areas, method, data collection tools, sample, and data analysis methods.

First of all, information about the volume, number, authors of the article, and the publication language was entered as preliminary data. Then, the subject and method of the article, the data collection tools used in the article, and the methods used to analyze the data were determined. However, at these stages, it was seen that some articles lacked explanatory information, especially in the method of the research, data collection tools, and data analysis methods. In this case, the method of the article, the data collection tool type, and the data analysis methods were analyzed and coded by researchers. In the articles in which such information was renamed, the consensus of the researchers was paid attention.

During the analysis of the data, the researchers worked independently and analyzed the articles following the previously created criteria. The coding agreement between researchers is 93% according to Miles and Huberman's (1994) formula. The items causing the dispute were discussed again and a consensus was reached on the appropriate code.

### **Findings**

Table 1 presents the distribution of the self-efficacy studies in mathematics education according to the years of publication.

Table 1. Distribution of self-efficacy studies in mathematics between 2008 and 2020

Year	n	%
2008	5	2,4
2009	5	2,4
2010	13	6,3
2011	11	5,4
2012	17	8,3
2013	16	7,8
2014	16	7,8
2015	22	10,7
2016	18	8,8
2017	19	9,3
2018	23	11,2
2019	22	10,7
2020	18	8,8

From Table 1, an increase in the number of the studies is noticeable. Moreover, self-efficacy studies in mathematics education have reached their top rate in 2018 and kept their popularity in 2019 and 2020. The distribution of the content domains of the self-efficacy studies in mathematics education in Turkey is given in Table 2.

Table 2. Distribution of the content domains of the self-efficacy studies

Content Domain	n	%
General	116	56,6
Algebra	48	23,4
Geometry and Measurement	27	13,2
Numbers and Operations	8	3,9
Probability and Statistics	5	2,4
Trigonometry	1	0,5
Total	205	100,0

According to Table 2, 23% of the studies were in algebra content domain and 13% of studies were in geometry and measurement content domain. Numbers content domain included in 4%, probability and statistics content domain included in 2%, and trigonometry content domain included in 0.5% of these studies. More than half of the studies (57%) are related to mathematics in general but cannot be included in a specific content domain. Self-efficacy in content domains such as probability and statistics, and trigonometry were explored by very few researchers. The research methods used in the self-efficacy studies in mathematics education are given in Table 3.

Table 3. The distribution of research methodologies used in self-efficacy studies

Methodology	n
Experimental	35 (%17,1)
Explanatory	1
Comparative	1
Correlational	1
Experimental	3
Survey	2
Single Subject	1
Semi Experimental	24
Weak Experimental	2
None-Experimental	157 (%76,6)
Descriptive	24
Comparative	5
Correlational	47
Survey	80
Historically Analysis	1
Case Study	1 (%0,5)
Mixed	12 (%5,9)

As shown in Table 3, the studies were mostly non-experimental (76.6%) while the case study approach was preferred the least with a percentage of 0.5. Survey studies were the most preferred research design among the studies in Turkey focusing on self-efficacy in mathematics education. Experimental studies (17.1%) were in the second place among the research methodologies preferred in the math self-efficacy studies. Among the experimental studies, semi-experimental design was the most preferred one. Correlational design has also been paid attention to in math self-efficacy studies in Turkey. Approaches for quantitative analysis of the data obtained from self-efficacy studies in Turkey are provided in Table 4.

Table 4. Approaches for data analysis in the studies on self-efficacy in mathematics education between 2008-2020

Data Analysis Type	Analysis Made by	n
Quantitative Data Analysis	Difference in Means (parametric tests)	105
	Factor analysis	30
	Frequency/percentage Tables	5
	Content Analysis	2
	Correlation	16
	Non- parametric tests	23
	Mean/standard deviation	4
	Regression	21
	Qualitative Data Analysis	
	Content Analysis	2
	Qualitative descriptive analysis	5

Most studies utilized quantitative data analysis approaches (n=197) while only eight studies utilized qualitative data analysis. Studies, which utilized quantitative analysis, mostly preferred T-tests, ANOVA and similar parametric test for statistical difference in means. Factor analysis, regression, correlation and non-parametric test were also carried out in the studies of self-efficacy in mathematics education. Qualitative data analysis, on the other hand, in the form of descriptive analysis (n=5) and content analysis (n=3) utilized only in 8 studies

The data collection tools of the targeted studies were provided in Table 5.

*Table 5. Distribution of data collection tools in studies on self-efficacy in mathematics education between 2008-2020*

Data Collection Tools	n	%
Perception / interest / attitude / etc, testing	134	62,6
Survey	44	20,6
Achievement test	30	14,0
Interview	6	2,8

When the table is examined, the majority of the studies utilized perception / interest / attitude / talent / personality tests as the means of data collection (62.6%). Moreover, surveys (20.6%) and achievement tests (14%) are also among the highly preferred data collection tools. However, interviews (4%) were chosen very few as a data collection tool.

In Table 6, the findings of the analysis of the participants and sample sizes are given.

*Table 6. Participants and sample size distribution of the studies*

Participants	Sample size						Total
	1-10	11-30	31-100	101-300	301-1000	1000+	
Early childhood students					1		1 (0,5%)
Primary school students		2	1	6	3	1	13 (6,3%)
Middle school students	1	3	15	17	26	8	70 (34,1%)
High school students		1	9	4	12		26 (12,7%)
Pre-service teachers	2		13	37	14		66 (32,2%)
Teachers		1	4	13	5		23 (11,2%)
Graduate students			1	3			4 (2,0%)
Other				2			2 (1,0%)
Total	3 (1,5%)	7 (3,4%)	43 (21,0%)	82 (40,0%)	61 (29,8%)	9 (4,4%)	205 (100%)

It is evident from Table 6 that participants for the studies were mostly included middle school or undergraduate students while there were only a few studies in which graduate students and kindergarten students are used as samples. The scarcity of studies in primary education is also remarkable.

Table 6 also indicates that studies most of the time utilized a sample size in the range of 101-300. Moreover, the studies with small samples (less than 10 participants) or very large samples (more than 1000 participants) were rarely employed in the math related self-efficacy studies in Turkey.

The objectives of the studies conducted between 2008-2020 on self-efficacy in mathematics education were provided in Table 7.

Table 7. Analysis of the distribution of objectives of the studies on self-efficacy in mathematics education

Study works on	Year												Total	
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019		2020
Scale development	1			1	1		1		1			5	2	12
Perceived self – efficacy beliefs	2	3	5	6	8	10	8	12	10	4	9	12	5	94
Content knowledge			1			1	1	1	2	2	2	1	3	14
Mathematical skills			3		1	6	1	3	5		3	3		25
Teaching	1	1		5	6	3	2	6	3	2	4	5	2	40
Technological	1	2	1	1	1		4	2				3		15
Factors affecting self-efficacy	2	2	6	4	5	2	4	10	6	5	13	1	9	69
Factors related with self-efficacy			2		3	4	3		1	10	1	4	5	33

According to Table 7, studies mostly aimed to investigate perceived self-efficacy beliefs (n=94). Among the self-efficacy beliefs, a tendency of the investigation was observed towards math teaching efficacy beliefs. Moreover, other preferred objectives of the mathematics self-efficacy studies in Turkey included the factors affecting self-efficacy (n=69). The objectives of the studies also investigated the factors related to self-efficacy (n=33) or aimed scale development (n=12). Moreover, it is revealed from the table that the focus of research on mathematics self-efficacy varies by year. As an example for this situation, while factors related to self-efficacy were the focus of studies in 2017, studies in 2018 focused on factors affecting self-efficacy, and 2019 studies focused on the perceived self-efficacy beliefs.

### Discussion

In this research, studies on mathematics self-efficacy in Turkey have been analyzed by all accounts of certain variables. Self-efficacy is the scope or strength of one's belief in the ability to complete their tasks and achieve goals. Psychologists have examined self-efficacy from various perspectives and have paid attention to various ways in the development of self-efficacy, self-efficacy dynamics, and deficiency in many different environments. It has been observed that the studies on Self-Efficacy between 2008-2020 have increased since 2010.

is expected that there will be studies in the content domain of statistics, measurement, and data. However, there are also studies in which self-efficacy is an independent variable and its effects on a determined dependent variable are examined. It can be expected that studies will increase in mathematics content domains.

In a research process, the experimental method is generally preferred to measure variables and reveal cause-effect relationships depending on these variables. Experimental method is used in studies to collect quantitative data to examine the effect of a newly developed material or a new approach on student achievement in educational research (Çepni, 2018; Büyüköztürk et al., 2018). In full experimental research, an unnatural research environment is created and one or more control groups are selected to represent one or more experimental groups. The most important point in the selection of the groups is that the student distribution is done randomly. The main reason for this is to eliminate the problems that may arise from outside during the formation of the groups (Fraenkel & Wallen, 2006). Even though full experimental research is best form of experimental research, when we look at the findings, full experimental method was preferred only in three studies. This situation can be explained by feasibility of randomization, and it is impractical to randomly assign students to experimental and control groups in schools where students already clustered when they start to schools (Taber, 2019).

In cases where it is not possible to randomly assign subjects to experimental and control groups, semi-experimental method is preferred (Cohen, Manion, & Morrison, 2000). Since education in Turkey is

controlled by a central education ministry, it is almost impossible to implement full experimental research and researchers cannot create classes through random assignment, therefore previously created classes in schools are used as experimental and control groups in educational research (Gürbüz & Şahin, 2014). In the findings of this study, semi-experimental methods were preferred by 24 studies. Single-subject research is a semi-experimental type of research in which findings related to only one subject are obtained and interpreted (Büyüköztürk et al., 2018). In the evaluated studies, the number of single-subject studies is only one.

Qualitative research can be defined as a research method that gives importance to the process rather than the result, provides detailed and in-depth research (Bogdan & Biklen, 2007; Patton, 2002), and uses data collection tools such as interviews, observation, and document analysis. In a study to identify general trends in mathematics education dissertations, Tereci and Bindak (2019) found the most preferred method is qualitative research (38%) among dissertations, and the number of quantitative (32%) and mixed (30%) studies were near to qualitative studies. This situation contradicts with our findings where majority of the studies in self-efficacy were quantitative. This can be explained by the nature of how self-efficacy is measured or observed. As discussed by Williams and Rhodes (2016), self-efficacy measure requires participants' own rating for their confidence level for a particular ability instead of participants' explanation. These ratings mostly represented by percentage levels. Since a self-efficacy measurement is reported by a number which is continuous in nature, most mathematics education researchers investigated to find its relationship with other constructs that represented by number in a particular range. These kind of investigations usually resulted in correlational studies or experimental studies which are the branches of quantitative studies.

In the study, the most frequently used methods of data analysis were the predictive techniques such as t-test, ANOVA, and non-parametric tests in qualitative studies, while content analysis and descriptive analysis were frequently used techniques on qualitative data. The findings are parallel to Saracaloğlu et al. (2014).

There are also studies where self-efficacy is an independent variable and its effect on a determined dependent variable is examined. Teachers' knowledge level, students' mathematics achievement, attitude towards mathematics, problem-solving, and similar constructs have been related to self-efficacy. In this context, it is seen that self-efficacy is an element that can be associated with many individual and educational variables. Studies related to self-efficacy are increasing in teacher education programs, along with the fields of teaching specific mathematics content.

Our review showed that one third of the studies work on middle school students while another one third of the self-efficacy studies work on preservice teachers. Ratio of the studies, which work on preservice teachers, are close to the national ratio for educational studies. Göktaş et al. (2012) found that 26% of the educational studies worked on undergraduate students while 11% of the studies worked on middle school students. Ratio of the middle school students were much higher in self-efficacy related studies in mathematics education. This ratio can be explainable by the structure of the Education Faculties in Turkey. Currently there are 13 programs for teaching high school mathematics (CHE, 2021a) while there are 76 programs in state universities and 9 programs in private universities for teaching middle school mathematics (CHE, 2021b). This numbers suggest that most of the mathematics educators work in primary school mathematics education departments. Therefore, it is a very natural result that most studies work on either preservice teachers or middle school students.

Examining the subjects of the studies showed that most studies chose mathematics as whole discipline as content domain. These studies generally tried to understand the relationship between mathematics self-efficacy and other constructs or how mathematics self-efficacy differed according to variables that separate sample in to independent groups. Algebra and geometry were also popular contents in the studies while probability, statistics and trigonometry was chosen by a small number of studies. This situation is also can be explainable by the dominance of mathematics education programs for middle school students and distribution of content in middle school mathematics curriculum. A recent analysis showed that the least offered content domain was probability and statistics while trigonometry was not offered to middle school students (Biber & Tuna, 2017)

In the studies examined in the study, it is seen that scale or questionnaires that make up the data set are frequently used as data collection tool. Saban (2009) stated in his research that education researchers mostly used surveys, scales, and inventories, however documents, observations and interviews are rarely used methods for data collection in studies related to multiple intelligence. Another general review conducted by Göktaş et al. (2012), named "Trends in Educational Research in Turkey: A Content Analysis", confirmed the findings of this research that most used data collection tools are



surveys and questionnaires for interest/ attitude/ personality/ abilities. The scales not only facilitate the measurement process, but also determine the quality of the results obtained. Scientific development is based on measurement, and measurements made with sensitive measurement tools increase this development. Data in the cognitive domain becomes stronger with data in the affective domain. Cross validations in this field are valuable as an effort to contribute to mathematics education with the power it takes from psychological research.

When there is a suitable scale for the purposes of the study, which is validated on intended sample, researchers use this scale to collect data. However sometimes there is no appropriate scale that fits the purpose of the study or intended sample. Thus researchers try to develop a tailored scale for their purpose. In this aspect, mathematics-related self-efficacy scale development and implementation are discussed in various contexts in Turkey. These are mostly in the form of self-efficacy perception of pre-service mathematics teachers and in-service teachers. In addition, it emerges in subjects such as developing a self-efficacy scale of middle school and high school students in mathematics fields (Aksu, 2008; Aslan & Işıkşal-Bostan, 2016; Aydın, Delice & Kardeş, 2011; Günhan & Başer 2007; Işıkşal & Aşkar, 2003; Karataş, & Aslan-Tutak, 2017; Kılıç & İncikabı, 2013; Koyuncu, Güzeller & Akyüz, 2017; Mumcu, 2019; Özgen & Bayram, 2018; Saraç & Tutak-Aslan, 2013; Sevimli & Aydın, 2017; Şan, 2013; Tataroğlu, 2009; Umay, 2001; Ünay, 2012; Yurt & Sünbül, 2014;).

### **Conclusion**

The present study investigated self-efficacy related studies in mathematics education in Turkey. Analysis showed that self-efficacy studies in mathematics education drastically increased from 5 to 22 between 2008 and 2015. After 2015, number of self-efficacy studies decreased a few and increased a few, and stayed in range of 18 to 23. These self-efficacy studies are generally interested in mathematics as a whole discipline. Most of them were non-experimental studies, and tried to explain the relationship between self-efficacy and other psychological constructs. Most of the studies relied on statistical analysis for finding mean differences between groups. Relation between mathematics self-efficacy and mathematics achievement investigated by small numbers of studies. Typical sample size was between 100 and 300 while typical groups of interest were either middle school students of pre-service teachers. Although a few number of studies tried to develop a self-efficacy related scales, most of the studies were interested in perceived self-efficacy beliefs and factors affecting self-efficacy.

### **Recommendations**

Previous research confirms that Self-efficacy beliefs and attitudes about mathematics are predictor variables for mathematics achievement (Randhawa, Beamer and Lundgerb's, 1993) and teacher self-efficacy has impact on students' mathematics achievement and attitudes toward mathematics (Küçükalioglu & Tuluk, 2020). Therefore, more experimental research is needed to find ways for increasing both teachers' and students' self-efficacy, and more qualitative research is needed to understand how teachers' self-efficacy is influenced.

Experimental studies on self-efficacy can be increased according to mathematics content domain in mathematics success, motivation, transferring, and other areas.

Experimental studies on large samples may help us to understand the efficiency of the methods that proposed to increase self-efficacy. However, studies that only have quantitative aspect do not help us to understand why or how a particular method is effective for increasing self-efficacy. Therefore we need more qualitative or mixed method studies to understand the nature of self-efficacy. One way to deeply examine the nature of self-efficacy is single subject studies.

Regression analysis is one of the correlational data analysis techniques that reveals how much of the change in the dependent variable explained by the independent variables. Structural equation modeling studies also a part of correlational studies which can help us to test causal relationships between variables in mathematics education studies. Therefore, we need more mathematics education studies, which utilize structural equation modeling, to reveal causal relationship between variables related to self-efficacy.

### **Limitations**

This study investigated self-efficacy studies in Turkey, and these studies were limited to academic studies indexed by Google Scholar, Ulakbim, ASOS, and Turkish Education Index. Search keywords were only in Turkish and English languages and other languages were beyond the authors language skills.

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