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An Analysis of the Research Published on the Concept of Activity in Mathematics Education

Merve Sümeyye Gündoğan [1]
Ministry of Education

Ferhat Öztürk [2]
Kırıkkale University

Abstract

The objective of this study is to examine the articles published in Türkiye between 2010 and 2020 on the concept of activity in mathematics education in terms of the year, type, field of study, subject, method, data collecting tool, sampling, and data analysis. The investigation herein was grounded in the application of descriptive content analysis, employing established content analysis methodologies. The sample of the study consists of 64 articles published in DergiPark, which is a part of the Turkish Academic Network and Information Center of the Scientific and Technological Research Council of Türkiye between 2010 and 2020. To collect data in the study, the Study Classification Form was developed regarding the literature, and the data were analyzed by content analysis method. Accordingly, the data were first entered into the Study Classification Form and then into the Microsoft Excel program to obtain frequency and percentage tables. The findings of the study unveiled a discernible decline in the prevalence of research endeavors pertaining to the concept of activity within the domain of mathematics education in Türkiye during recent years. It is believed that the results of this study will provide researchers with new ideas for new studies to be conducted by allowing researchers to see the tendencies of the studies on the concept of activity in mathematics education and the gaps in the relevant literature.

Key Words

Math activity • Descriptive content analysis • Published article

[1] Ministry of Education, Kırıkkale, Türkiye, E-mail: sumeyye.gozuak@gmail.com **ORCID:** 0000-0002-1077-8807
[2] **Correspondance to:** Kırıkkale University, Faculty of Education, Department of Mathematics and Science Education, Kırıkkale, Türkiye, E-mail: ferhatozturk@kku.edu.tr **ORCID:** 0000-0003-2849-8325

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Introduction

It is known that the skills that individuals are expected to put into action have changed today. In the 21st century, with the ever-changing and developing world, it is emphasized that individuals must have different skills to keep up with change and development (Ministry of National Education [MoNE], 2018). In today's education and training process, It is pointed out that they should be equipped for daily life as individuals who have realized the nature of learning, rather than directly receiving and accepting the information conveyed to them. In this regard, the duties, roles, and responsibilities expected of individuals have also changed. Primarily, this change refers to individuals who are decisive in their actions, entrepreneurial, capable of effective communication and empathy, who can produce knowledge and apply it to daily life, who can think critically, solve problems, and thus contribute to the society they live in (MoNE, 2018). In tandem with the revised curricular adjustments engendered by this transformation, the mathematics curriculum has embraced an activity-centric pedagogical approach aimed at fostering active student engagement in the learning process and cultivating the proficiencies delineated within the curriculum's framework. One of the most important features of activity-based teaching is the active participation of students in the learning process.

The primary goal of the renewed education system is to enable individuals to overcome the problems they may face throughout their lives on their own (Korkmaz & Tutak, 2017). According to MoNE (2011), there are some cognitive processes that students should realize in problem-solving-based activities and these processes are as follows:

- They should be capable of building models applicable to the problems they encounter in daily life,
- They should be capable of thinking of new ideas for different problems and be able to apply these ideas,
- They should be capable of using mathematical concepts in problem-solving,
- They should be capable of adapting the strategies they formulate for solving different problems and be able to extend the results of the solution to different problems,
- They should be capable of using mathematics in problems of different subjects.

Students need to approach the solution of problems with different perspectives in this cognitive process. In this respect, the goal of mathematics education is defined as the individual's ability to solve problems that he/she may encounter in daily life and to analyze events while doing so (Korkmaz & Korkmaz, 2017), to associate mathematics with daily life, and to enjoy mathematics instead of being afraid of it (Doruk & Umay, 2011).

Mathematics education and training enable students to broaden their thinking and perspectives. This is associated with understanding and interpreting mathematics. Proper understanding, recognition, and interpretation of mathematics starts with enjoying mathematics. Students may think of mathematics as intimidating and boring (Ocak & Dönmez, 2010). Therefore, mathematics activities should be prioritized to make mathematics more fun and meaningful, and these activities should be used as an important tool in students' mathematics learning (National Council for Teachers of Mathematics [NCTM], 2000). Engaging students in research, associating cause and effect, and making conjectures in mathematics education and training will increase their interest in mathematics. Hence,

these instructional activities are anticipated to serve as catalysts in augmenting students' enthusiasm for the subject of mathematics while concurrently providing essential scaffolding for their cognitive development in this academic discipline. For this reason, students should participate in mathematics activities that integrate multiple sensory organs into the learning process and that are appropriate for their level (Baykul, 2005; Öztürk & Öztürk, 2016; Öztürk & Öztürk, 2020).

The student should be at the forefront of mathematics activities. If the student is given priority, feels that his/her solutions are successful while doing mathematics activities, and receives positive feedback, his/her interest, attitude, and confidence in mathematics will increase. In other words, increased interest in mathematics will positively affect students' success in this field. Furthermore, it is imperative to acknowledge that a student's achievement is contingent not solely upon their comprehension of mathematical concepts but also on their competence in the practical application of mathematical principles, as articulated by Stein et al. (1996). Students need to be more active to develop these capacities (Henningsen & Stein, 1997).

In the light of these descriptions, the wide scope of the concept of activity, the wide range of activity examples in textbooks and curricula, and the lack of a sufficient and clear explanation of activities in both the curriculum and academic studies (Uğurel et al., 2010) underline the importance of this study. In this context, the question "What is the tendency of the research published on the concept of activity in mathematics education in Türkiye?" constitutes the statement of the problem of this study.

Objective of the Study

The objective of this study is to examine the trends of the articles published in Türkiye between 2010 and 2020 on the concept of activity in mathematics education in terms of year, type, field of study, subject, method, data collecting tools, sample, sample size and data analysis method.

Method

Research Design

This study, which was conducted to examine the studies published on the concept of activity in the field of mathematics education in Türkiye, was based on the descriptive content analysis approach from the content analysis methods. The content analysis is a research method based on synthesizing written materials by organizing them by certain criteria based on a systematic review in order to guide future research and disseminate information (Çalık & Sözbilir, 2014; Dinçer, 2018; Fraenkel et al., 2012; Suri & Clarke, 2009). The descriptive content analysis approach, which is one of the content analysis methods, is defined as systematic studies in which the information of the studies conducted in a certain time interval and on a specific subject is evaluated descriptively and tried to be explained mostly with frequency and percentage distributions to determine the general trend in the relevant field (Cohen et al., 2018; Çalık & Sözbilir, 2014; Dinçer, 2018). Given the typically substantial volume of studies subject to scrutiny within the purview of descriptive content analysis, the task of formulating a coherent and comprehensive conclusion predicated on meticulous interpretation and synthesis is inherently intricate, as underscored by Çalık and Sözbilir (2014) and Dinçer (2018).

Research Sample

The articles analyzed as part of this study were accessed through the DergiPark website under the umbrella of the Turkish Academic Network and Information Center (ULAKBIM) of the Scientific and Technological Research Council of Türkiye (TÜBİTAK) with the keywords "activity" and "mathematics activity". Furthermore, in pursuit of an exhaustive coverage of pertinent scholarly literature, a meticulous examination of the bibliographic references appended to the articles was conducted, thereby facilitating the incorporation of recently published studies into the ambit of this research endeavor. A total of 64 articles were accessed in 43 different journals.

Data Collecting Tool

In this study, the Study Classification Form (SCF) based on the "Publication Classification Form" developed by Sozbilir et al. (2012) was used as a data collecting tool. The SCF consists of the following headings: the citation, field, subject, method, data collecting tools, sample, and data analysis method of the study, as well as the related sub-headings. In the SCF, in line with the scope of the research, the relevant sub-analysis headings that are frequently preferred in the studies are directly mentioned, while the heading "others" is used for less preferred sub-analysis headings.

Data Analysis

The content analysis method was used to analyze the data collected from the research. The content analysis, which is used as both a research and data analysis method in the literature (Dinçer, 2018), is described as the systematic coding of quantitative or qualitative data within the framework of certain themes and classifications (Cohen et al., 2018; Fraenkel et al., 2012). The main process in content analysis is to gather studies that are similar to each other under certain notions and themes and interpret them for the reader to understand (Yıldırım & Şimşek, 2006). Accordingly, the articles covered in the research were coded separately using SCF. Both researchers coded the studies in this coding process and the inter-rater reliability was determined as 87% using the formula developed by Miles and Huberman (1994) for reliability calculation. According to Miles and Huberman (1994), a reliability of more than 70% between the researchers indicates that the coding is consistent. After the coding processes of all the studies within the scope of the research were completed, the findings obtained from the SCFs were processed with the Microsoft Excel program and attempted to be described and explained graphically with frequency percentages.

Results

This section delineates and elucidates the outcomes derived from an analysis conducted within the contextual framework encompassing the distribution of articles across distinct temporal periods, fields of study, subject matter, methodological approaches, data collection instruments, sampling procedures, and data analysis methods, pertaining to the discourse surrounding the concept of activity in the realm of mathematics education in Türkiye. These findings are graphically represented utilizing the Microsoft Excel program, presenting frequency percentages for enhanced visual comprehension and analytical insight.

The data obtained for the question *"What is the distribution of the articles published on the concept of activity in mathematics education according to years?"* are given in Figure 1.

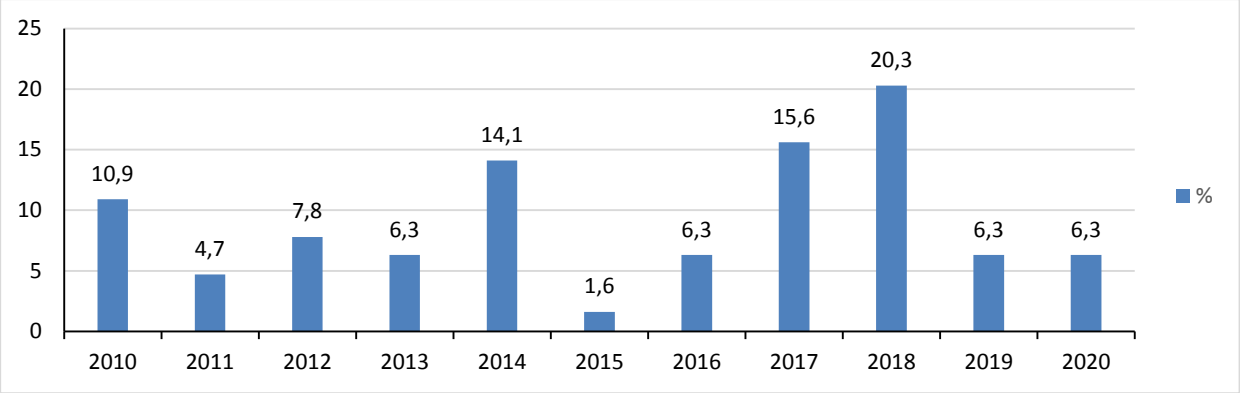

Figure 1. Distribution of the articles published on the concept of activity according to years

When Figure 1 is examined, it is noted that while the number of articles on the concept of activity in mathematics education showed a fluctuating distribution between 2010 and 2015, it started to increase after 2015, but decreased after 2018. Concurrently, it is evident from the analysis that the apex in the volume of articles addressing the concept of activity within the domain of mathematics education occurred in the year 2018, constituting 20.3% of the total corpus, while the nadir was observed in 2015, accounting for a mere 1.6%. Additionally, it is noteworthy that studies published in the years 2013, 2016, 2019, and 2020 manifested an equitable distribution, each contributing 6.3% to the overall dataset.

The data obtained for the question *"What is the distribution of the study subjects of the articles published on the concept of activity in mathematics education?"* are presented in Figure 2.

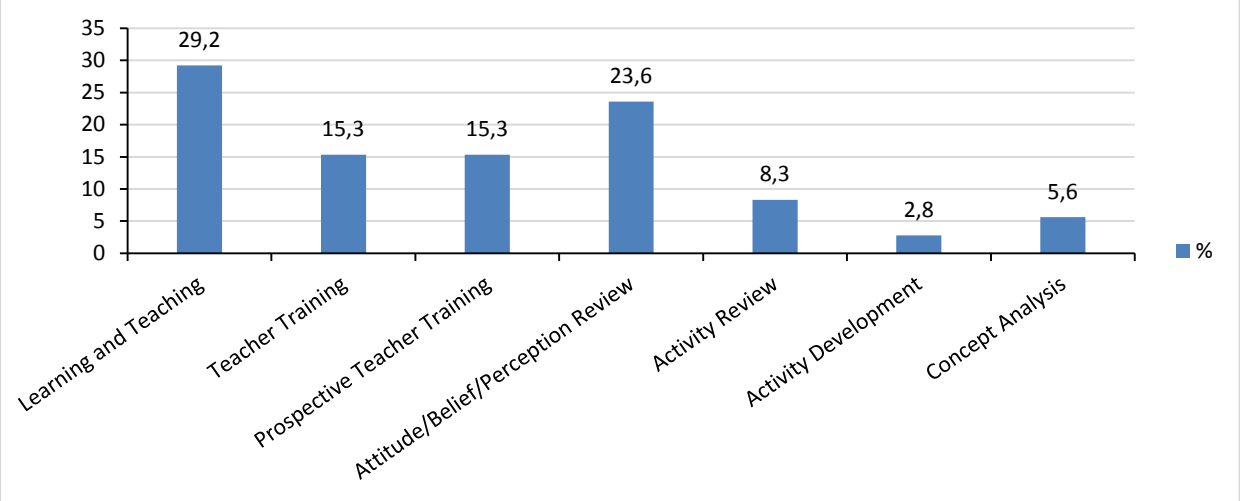

Figure 2. Distribution of the study subjects of the articles published on the concept of activity

When Figure 2 is examined, it is seen that the articles published on the concept of activity in mathematics education between 2010 and 2020 were mostly on learning and teaching with 29.2%, on attitude/belief/perception analysis with 23.6%, on teacher education and pre-service teacher education with 15.3%, on activity analysis with 8.3%, on concept analysis with 5.6% and finally on activity preparation with 2.8%.

The data obtained for the question *"What is the distribution of the field of study of the articles published on the concept of activity in mathematics education?"* are given in Figure 3.

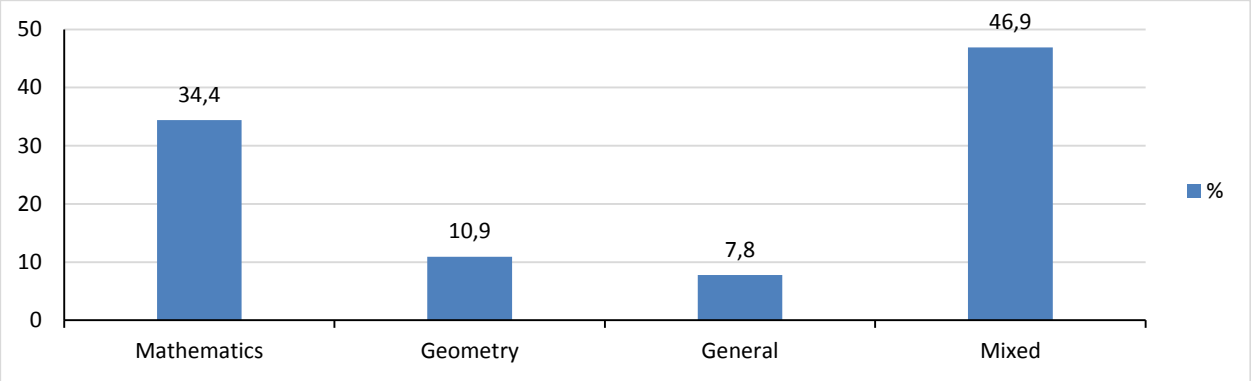

Figure 3. Distribution of the field of study of the articles published on the concept of activity

When Figure 3 is examined, it is seen that a mixed field of mathematics and geometry was the most preferred field of study with a rate of 46.9% in the articles published between 2010 and 2020 on the concept of activity in mathematics education, followed by the field of mathematics with a rate of 34.4%, then geometry with a rate of 10.9%, and finally, an independent general field of study in mathematics and geometry with a rate of 7.8% was the least preferred field of study.

The data obtained for the question *"What is the distribution of the preferred research methods in the articles published on the concept of activity in mathematics education?"* are answered in Figure 4.

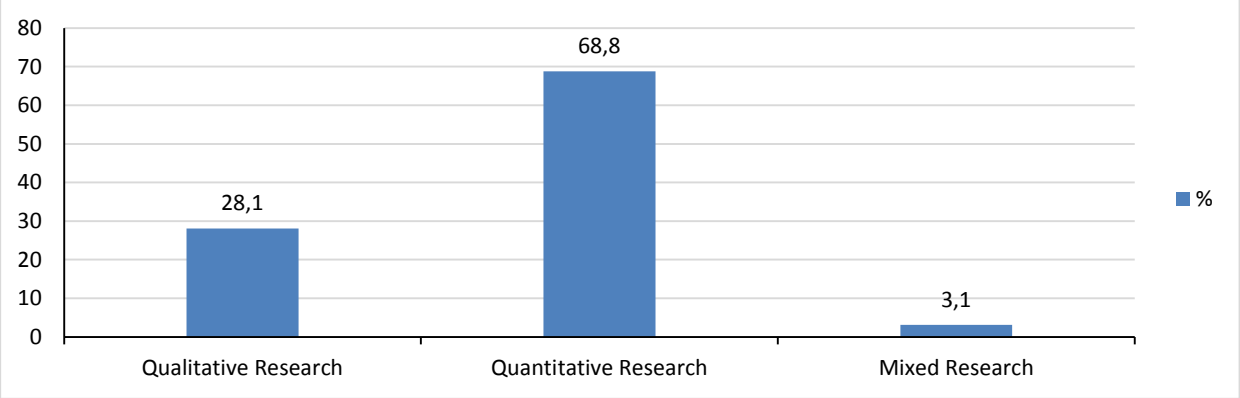

Figure 4. Distribution of the preferred research methods in the articles published on the concept of activity

When Figure 4 is examined, it is seen that the quantitative research method was the most preferred method with a rate of 68.8%, the qualitative research method was preferred with a rate of 28.1% and the mixed research method was the least preferred method with a rate of 3.1% in article studies on the concept of activity in mathematics education.

The data obtained for the question *"What is the overall distribution of the preferred research approaches in the articles published on the concept of activity in mathematics education?"* are presented in Figure 5.

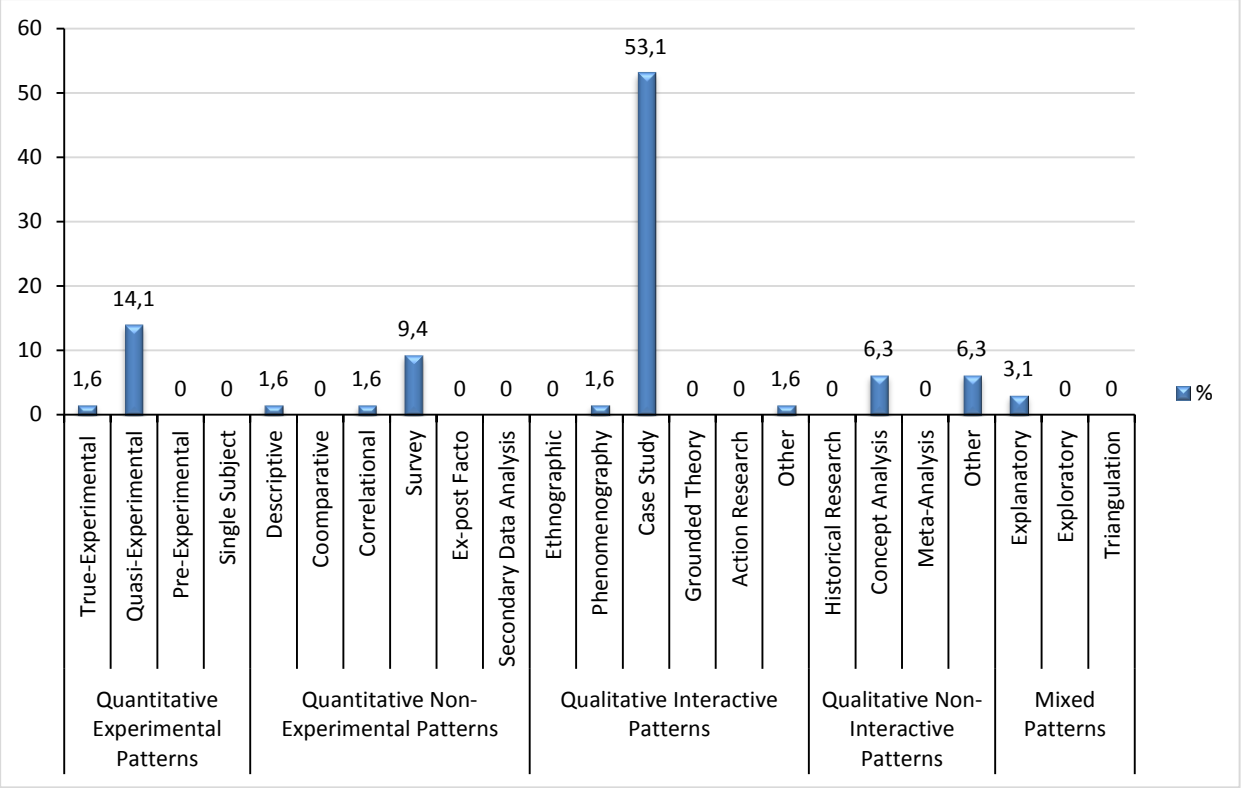

Figure 5. The overall distribution of the preferred research approaches in the articles published on the concept of activity

When Figure 5 is examined, it is seen that among all research approaches in the articles published on the concept of activity in mathematics education between 2010 and 2020, the case study design, which is one of the qualitative research designs, was preferred the most with a rate of 53.1%, followed by the quantitative quasi-experimental design with a rate of 14.1%, the survey design with a rate of 9.4%, and the concept analysis from qualitative research designs and the designs classified as other with a rate of 6.3%. Nonetheless, it is discernible that among the spectrum of mixed research designs, the explanatory paradigm encompassing both quantitative and qualitative facets, constituted a modest proportion, accounting for a mere 3.1% of the total. In contrast, among the quantitative research designs, experimental, descriptive, and correlational designs exhibited relatively diminished utilization, each registering at 1.6%. Similarly, within the domain of qualitative research designs, phenomenological designs, as well as other less frequently employed methodologies, likewise commanded a proportion of 1.6% in the corpus of article studies across the relevant years. Furthermore, it is noted that weak experimental, single-subject, comparative, ex-post facto, and secondary data analysis designs of quantitative research designs, cultural analysis, theory building, action research, historical analysis and meta-analysis designs of qualitative research designs, and exploratory (qualitative-quantitative) and triangulation (quantitative+qualitative) designs of mixed research designs were not preferred at all in these article studies.

The data obtained for the question *"What is the distribution of the preferred quantitative research designs in the articles published on the concept of activity in mathematics education?"* are presented in Figure 6.

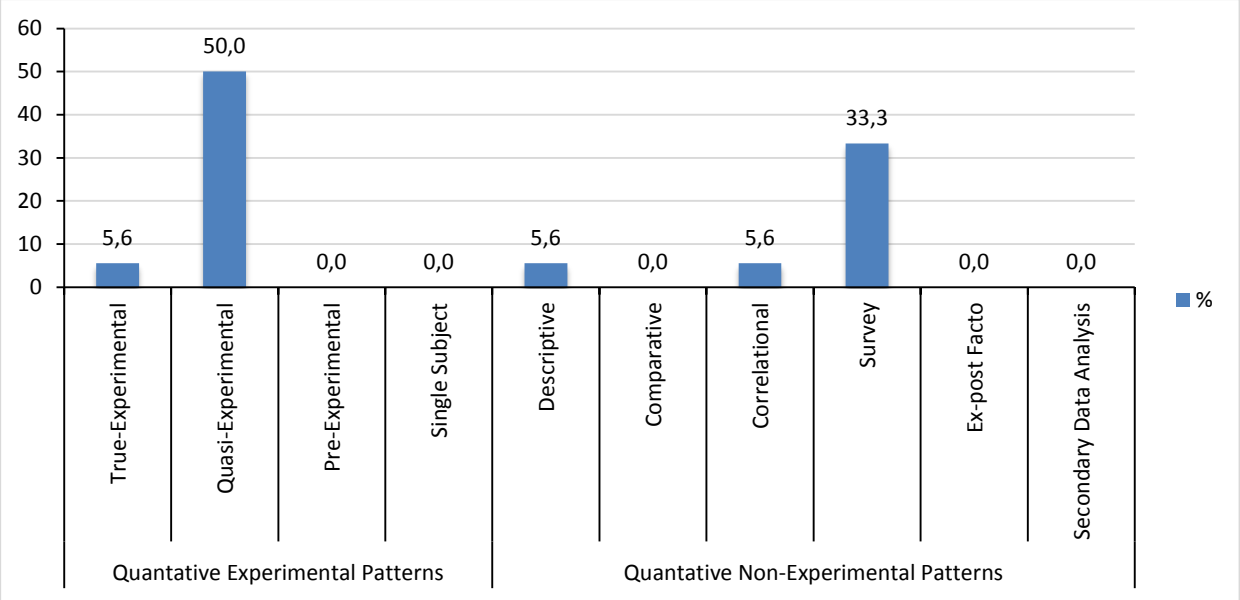

Figure 6. Distribution of the preferred quantitative research designs in the articles published on the concept of activity

When Figure 6 is examined, it is seen that among the quantitative research approaches, experimental designs were preferred the most with a rate of 55.6% total, while non-experimental designs were preferred the least with a rate of 44.5% in total in the article studies published on the concept of activity in mathematics education between 2010 and 2020. Moreover, it is noted that among the quantitative experimental designs, the quasi-experimental design was used more than the experimental design (5.6%) with a rate of 50%, whereas weak experimental and single-subject designs were not used at all. Conversely, Figure 6 reveals that within the realm of quantitative non-experimental designs, the survey design emerged as the favored approach, representing a substantial majority at 33.3%, eclipsing the prevalence of both descriptive (5.6%) and correlational (5.6%) designs. Remarkably, the comparative, ex-post facto, and secondary data analysis designs remained conspicuously absent from the array of methodologies employed, as they were not utilized within the scope of the analyzed article studies.

The data obtained for the question *"What is the distribution of the preferred qualitative research designs in the articles published on the concept of activity in mathematics education?"* are given in Figure 7.

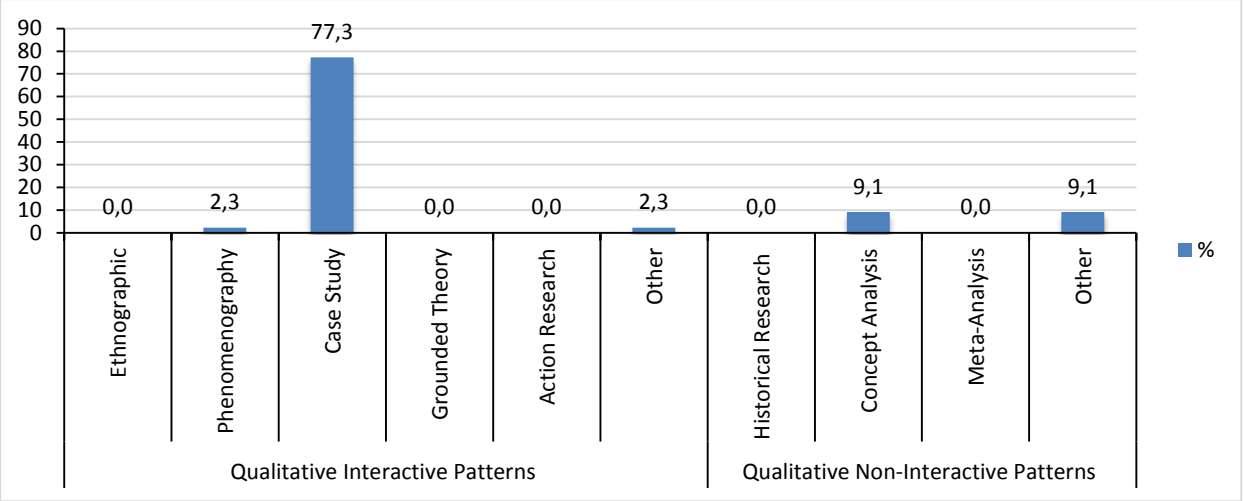

Figure 7. Distribution of the preferred qualitative research designs in the articles published on the concept of activity

When Figure 7 is examined, it is seen that among the qualitative research approaches in the articles published between 2010 and 2020 on the concept of activity in mathematics education, interactive designs were preferred the most with a rate of 81.9% in total, while non-interactive designs were preferred the least with a rate of 18.2% in total. Furthermore, it is noted that the case study design, one of the qualitative interactive designs, was used more than the designs classified as phenomenological (2.3%) and other (teaching experience and design-based) (2.3%) with a rate of 77.3%, whereas cultural analysis, theory building, and action research designs were not used at all. On the other hand, Figure 7 also shows that concept analysis and other (document analysis) designs, which are classified as qualitative non-interactive designs, were less preferred with a rate of 9.1%, and historical and meta-analysis designs were not used at all in the related article studies.

The data obtained for the question *"What is the distribution of the preferred mixed research designs in the articles published on the concept of activity in mathematics education?"* are presented in Figure 8.

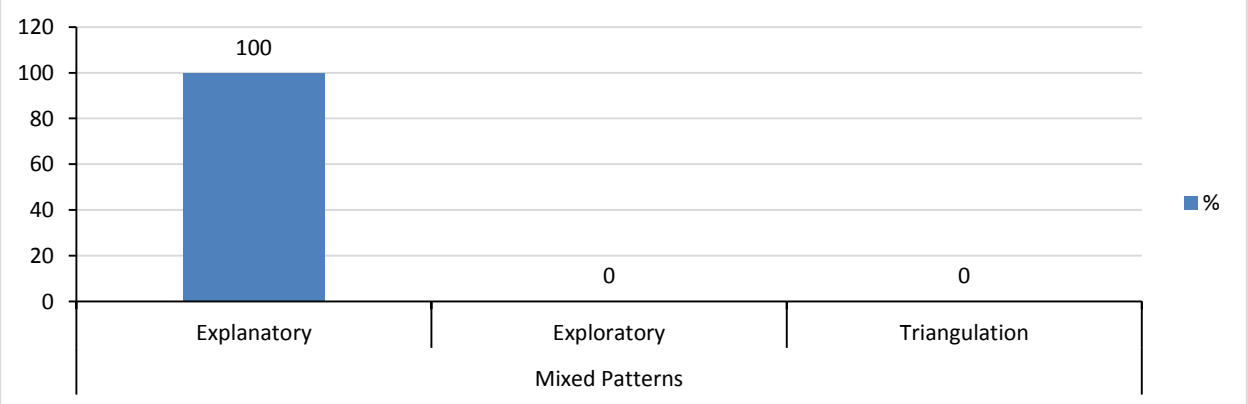

Figure 8. Distribution of the preferred mixed research designs in the articles published on the concept of activity

When Figure 8 is examined, it is seen that the explanatory (quantitative-qualitative) design of mixed research approaches was preferred in all of the article studies published on the concept of activity in mathematics education between 2010 and 2020. On the other hand, it is notable that there were no articles with exploratory (qualitative-quantitative) and triangulation (quantitative+qualitative) designs of the mixed research approaches between the relevant years.

The data obtained for the question *"What is the distribution of data collecting tools used in the articles published on the concept of activity in mathematics education?"* are presented in Figure 9.

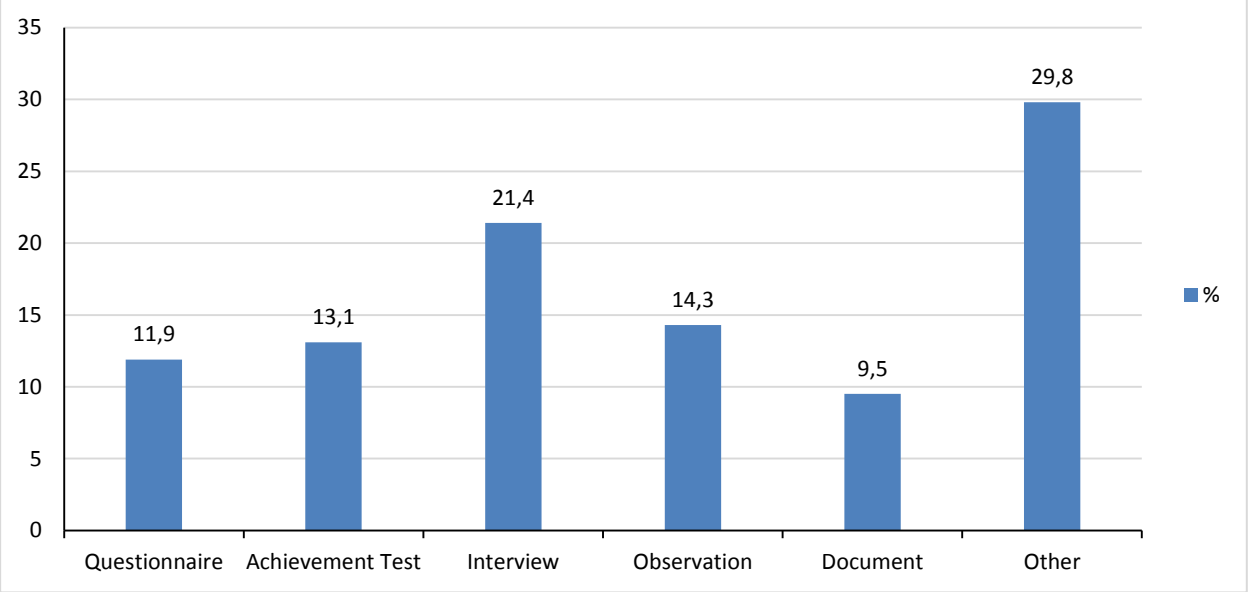

Figure 9. Distribution of data collecting tools used in the articles published on the concept of activity

When Figure 9 is examined, it is seen that interviews were the most used data collecting tool with a rate of 21.4%, followed by observations with a rate of 14.3%, performance tests with a rate of 13.1%, questionnaires with a rate of 11.9% and documents were the least preferred with a rate of 9.5% in the articles published on the concept of activity in mathematics education between 2010 and 2020. In contrast, it is noteworthy that the category denoted as "other" within the classification of data collection instruments, encompassing items such as teacher notes, student journals, activity sheets, reflection sheets, worksheets, evaluation rubrics, as well as studies devoid of explicitly specified data collection tools, exhibited a discernible prevalence, accounting for a significant portion at 29.8% within the context of the analyzed article studies.

The data obtained for the question *"What is the distribution of the number of different data collecting tools used together in the articles published on the concept of activity in mathematics education?"* are given in Figure 10.

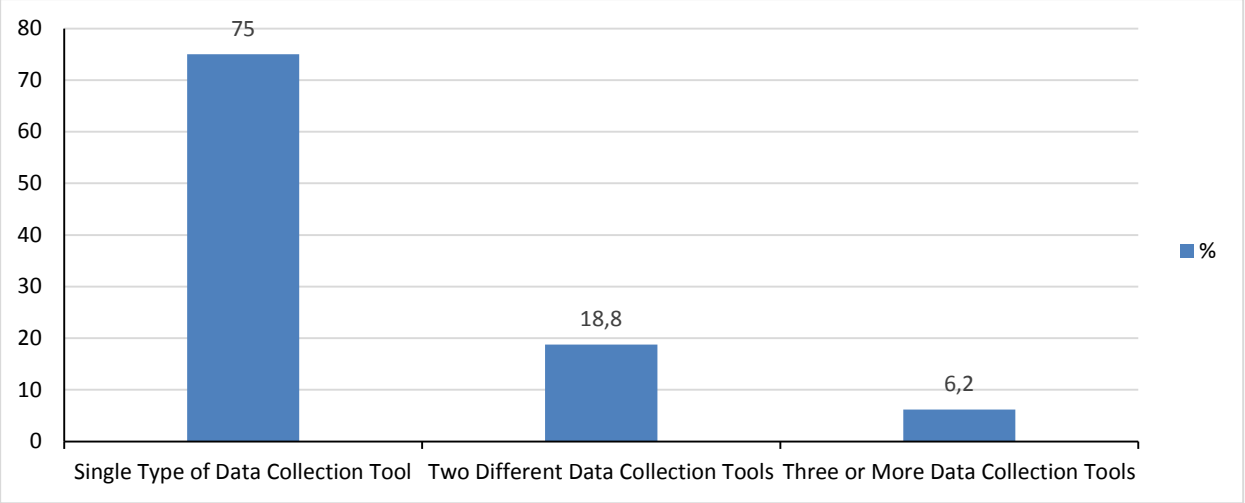

Figure 10. Distribution of the number of different data collecting tools used together in the articles published on the concept of activity

When Figure 10 is examined, it is seen that 75% of the articles published between 2010 and 2020 on the concept of activity in mathematics education used one data collecting tool, 18.8% used two data collecting tools, and 6.2% used three or more data collecting tools.

The data obtained for the question *" What is the distribution of the sample types studied in the articles published on the concept of activity in mathematics education?"* are shown in Figure 11.

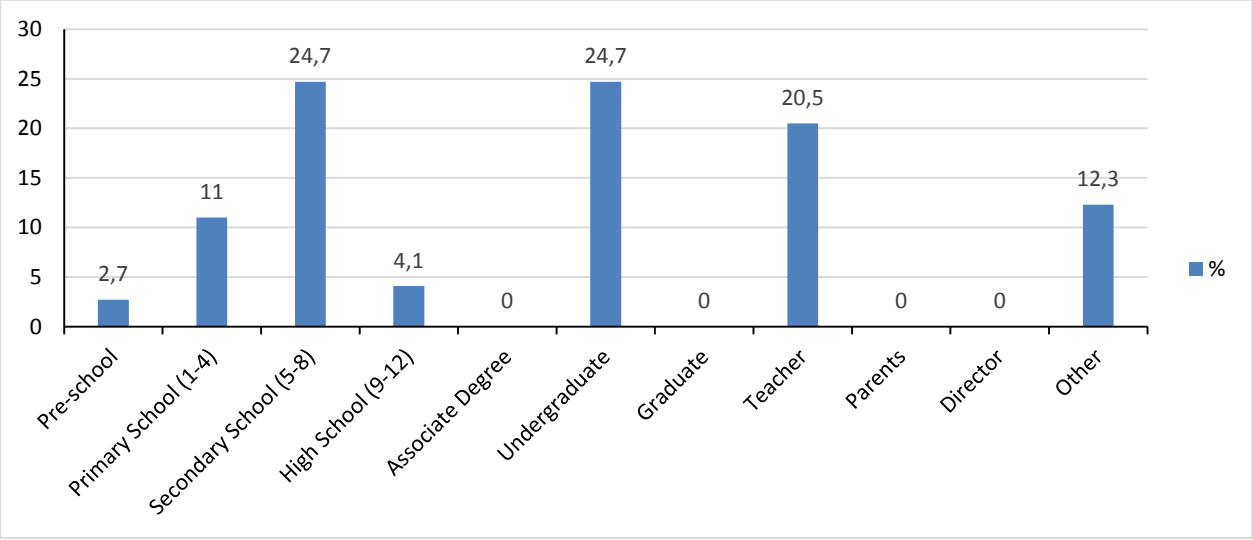

Figure 11. Distribution of the sample types studied in the articles published on the concept of activity

When Figure 11 is examined, it is seen that the articles published between 2010 and 2020 on the concept of activity in mathematics education mostly focused on middle school (5-8) and undergraduate students with a rate of 24.7% and the least on preschool students with a rate of 2.7%. Furthermore, it bears significance to highlight that a

considerable proportion of the published articles, specifically 20.5%, were conducted in collaboration with educators, while 11% were undertaken in the context of primary school students (grades 1-4), and a comparatively smaller fraction, totaling 4.1%, pertained to research involving secondary school students (grades 9-12). On the other hand, it is observed that no articles were conducted with associate and graduate students, parents, and administrators. Finally, Figure 11 shows that the rate of article studies with sample groups classified as other (documents and studies without samples) is 12.3%.

The data obtained for the question *" What is the distribution of the sample sizes of the articles published on the concept of activity in mathematics education?"* are given in Figure 12.

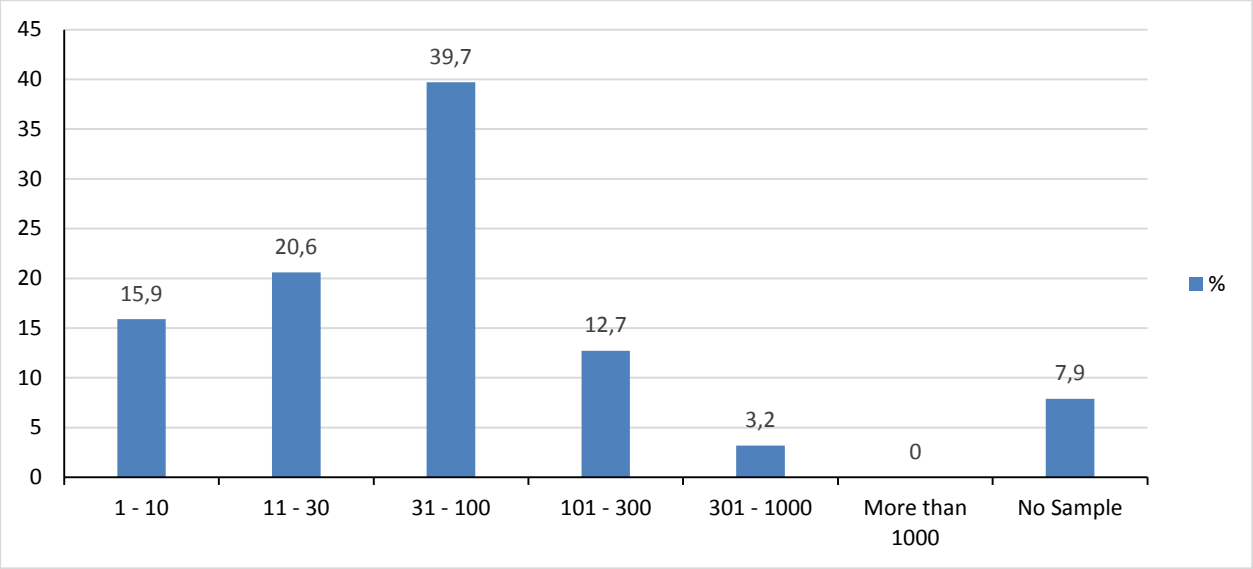

Figure 12. Distribution of the sample sizes of the articles published on the concept of activity

When Figure 12 is examined, it is seen that the articles published between 2010 and 2020 on the concept of activity in mathematics education were studied with a sample size between 31-100 with a rate of 39.7% and 301-1000 with a rate of 3.2%, on the other hand, a sample size between 11-30 with a rate of 20.6%, 1-10 with a rate of 15.9% and 101-300 with a rate of 12.7%. Moreover, it is salient to observe that a discernable portion, specifically 7.9%, of the articles published during the pertinent timeframe did not engage in research involving any specified sample group. Remarkably, within the corpus of analyzed articles, there were no instances of research investigations conducted with sample groups exceeding a magnitude of 1000 individuals.

The data obtained for the question *" What is the distribution of the data analysis methods used in the articles published on the concept of activity in mathematics education?"* are shown in Figure 13.

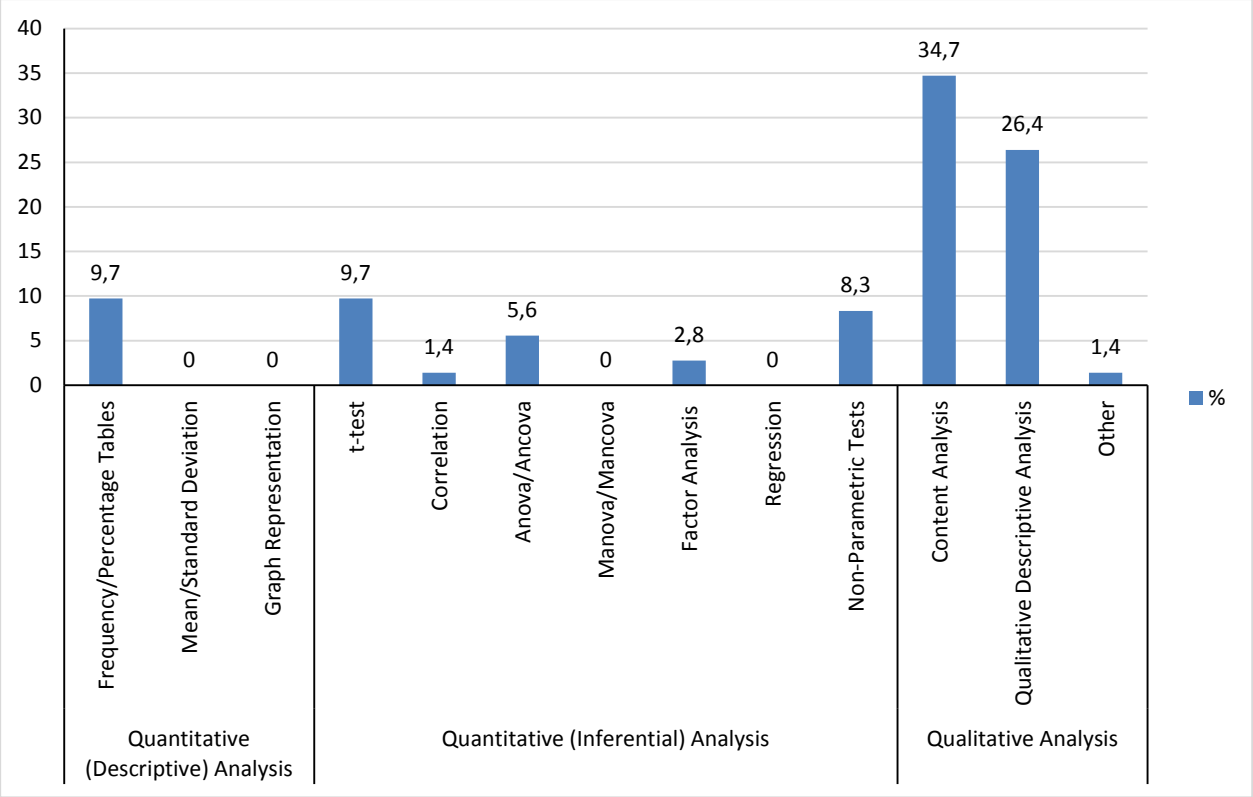

Figure 13. Distribution of the data analysis methods used in the articles published on the concept of activity

When Figure 13 is examined, it is seen that content analysis, one of the qualitative data analysis methods, was used the most with a rate of 34.7%, and correlation analysis, one of the quantitative data analysis methods were used the least with a very small rate of 1.4% among all data analysis methods in the articles published between 2010 and 2020 on the concept of activity in mathematics education. Conversely, it is discerned that within the compendium of published thesis studies, a substantive portion, comprising 26.4%, adopted the qualitative descriptive analysis as the preferred methodology among the spectrum of qualitative data analysis methods. Furthermore, among the quantitative data analysis methods employed, 9.7% of studies harnessed frequency/percentage tables and t-tests, while 8.3% resorted to non-parametric tests. A smaller cohort, constituting 5.6%, opted for Anova/Ancova analysis, and a mere 2.8% implemented factor analysis as their chosen analytical approach. Meanwhile, it is noted that there were no articles in which mean/standard deviation, graphical representation, Manova/Mancova analyses, and regression analyses were used among the quantitative data analysis methods between the relevant years.

The data obtained for the question *" What is the distribution of the number of data analysis methods used in the articles published with the concept of activity in mathematics education?"* are shown in Figure 14.

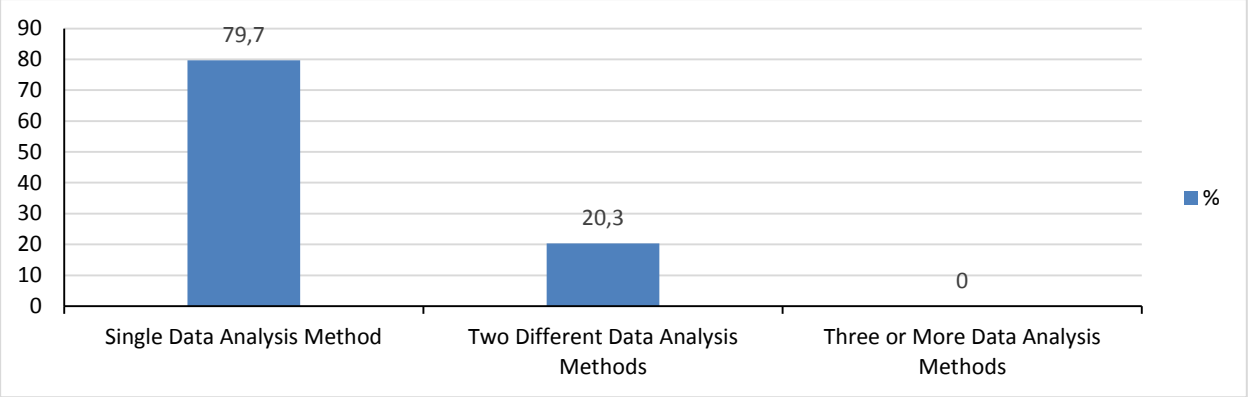

Figure 14. Distribution of the number of data analysis methods used in the articles published with the concept of activity

When Figure 14 is examined, it is seen that 79.7% of the articles published between 2010 and 2020 on the concept of activity in mathematics education used one data analysis method, and 20.3% used two data analysis methods. Nevertheless, it is salient to observe that the articles disseminated during the pertinent time frame refrained from employing a combination of three or more distinct data analysis methodologies in their research endeavors.

The data obtained for the question *" What is the distribution of the data analysis methods used in the articles published on the concept of activity in mathematics education according to years?"* is presented in Figure 15.

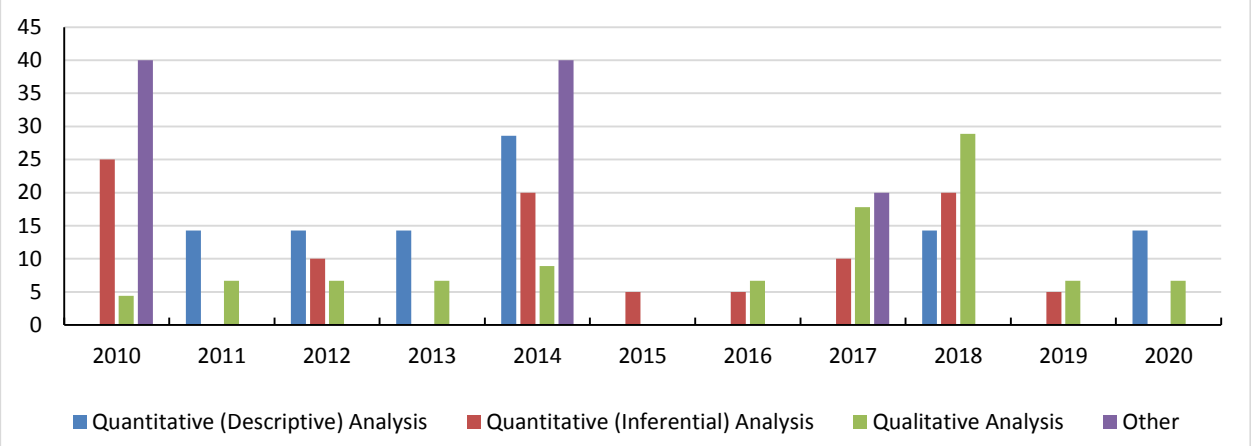

Figure 15. Distribution of the data analysis methods used in the articles published on the concept of activity

When Figure 15 is examined, it is seen that the distribution of the data analysis methods used in the articles published on the concept of activity in mathematics education according to years is irregular in terms of quantitative (predictive), quantitative (descriptive), and qualitative data analysis. Furthermore, it is observed that quantitative (predictive) data analysis methods were most commonly used in 2010, quantitative (descriptive) data analysis methods in 2014, and qualitative data analysis methods in 2018. Furthermore, it is noted that data analysis methods categorized as others were used more in the articles published in 2010 and 2014.

Discussion, Conclusion & Suggestions

This study, conducted to determine the tendencies of the articles published on the concept of activity in mathematics education in Türkiye, examined the related studies between 2010 and 2020 one by one and attempted to offer recommendations based on the results obtained.

The study results show that the number of published articles increased steadily after 2015 (Figure 1) and this increase can be attributed to the centralization of the activity-based teaching approach in the updated curricula. Also, it can be said that the studies published on the concept of activity in mathematics education have tended to decrease in recent years. It is found that most of the articles published on the concept of activity in mathematics education in Türkiye are about learning and teaching (Figure 2). It is believed that increasing the number of studies conducted with teachers and future teachers, which will provide guidance for the implementation of activities in the teaching process, and the results of these studies will contribute significantly to the elimination of deficiencies in practice. As a matter of fact, there are many studies in the literature indicating that teachers and pre-service teachers have difficulties in activity preparation and implementation processes (Duru & Korkmaz, 2010; Özgen & Alkan, 2011; Öztürk, 2016; Uğurel et al., 2010). It is concluded that in the article studies related to the concept of activity (Figure 3), mixed studies in which mathematics and geometry are included together are preferred the most. Again, it has been observed that the number of articles published in the field of mathematics is considerably higher than the number of articles published in the field of geometry. The higher number of studies in the field of mathematics compared to the field of geometry in the articles published on the concept of activity indicates that the literature gaps in the field of geometry are quite high. Çiltaş et al. (2012) emphasized that there are few studies on geometry in mathematics education. In contrast, İlhan (2011) stated that there are quite a lot of thesis studies in the field of geometry. These findings suggest a need for future studies on the concept of activity to encompass a greater emphasis on geometry.

In the articles published in mathematics education in Türkiye (Figure 4), it is observed that quantitative research was preferred the most, whereas qualitative research was preferred as a secondary approach. Selçuk et al. (2014) found that the quantitative research methods were the most commonly preferred in their study. Again, Çiltaş et al. (2012) stated that quantitative research methods were used more in the examined article studies. On the other hand, mixed studies (Creswell, 2003), in which qualitative and quantitative study data are addressed in a single study and different data sources are transformed into each other and verified, were rarely used in article studies. Ulutaş and Ubuz (2008) stated that there are few mixed studies in Türkiye. It is also believed that increasing the number of studies using mixed research methods in the studies to be conducted on the concept of activity in mathematics education will enrich the research on this subject in terms of methodology. Moreover, it has been observed that qualitative interactive designs were mostly preferred in article studies related to the concept of activity (Figure 5). It was also determined in Akkuş and Darendeli's (2020) study that qualitative research was more frequent. However, it is determined that mixed research designs were used the least in the published article studies.

In the articles published in Türkiye on the concept of activity in mathematics education, the quasi-experimental design, one of the quantitative experimental design, was preferred the most (Figure 6). It is also observed that survey design was the most preferred among quantitative non-experimental designs in published article studies. Yaşar and

Papatğa (2015) concluded that experimental studies were more preferred in the studies conducted. Meanwhile, in the articles published on the concept of activity, the case study was the most preferred qualitative interactive design (Figure 7). This aligns with the findings of Yıldız and Yenilmez (2019). Baki et al. (2011) stated in their study that experimental studies were especially preferred in theses, but qualitative studies, primarily case studies, began to gain prominence as the belief that the mathematics teaching and learning process cannot be solely explained by numbers or symbols grew. It has been determined that the explanatory (quantitative-qualitative) mixed design was the most favored among mixed research designs in the articles published on the concept of activity (Figure 8). However, it has been observed that exploratory (qualitative-quantitative) and triangulation (quantitative+qualitative) mixed designs were not preferred in article studies. It is considered that the use of research designs (experimental, weak experimental, single-subject, comparative, correlational, ex-post facto, secondary data analysis, cultural analysis, phenomenology, theory building, historical analysis, concept analysis, meta-analysis, mixed designs, etc.) that are less preferred or not preferred at all in the article studies examined within the scope of the research will contribute to revealing different dimensions of the research topic related to the studies to be conducted on the concept of activity.

It is determined that the interview was the most commonly used data collecting tool in the articles published on the concept of activity (Figure 9). İncikabı et al. (2017) stated that the interview data collecting tool was mostly used in qualitative research on mathematics education. Conversely, documents were the least preferred as a data collecting tool. When the number of data collecting tools used in the articles published on the concept of activity in mathematics education was examined (Figure 10), it was found that only one data collecting tool was preferred. Thus, researchers are recommended to include more than one data collection tool in their studies to achieve higher-quality results and increase the reliability of the study data.

It has been determined that the published article studies (Figure 11) were mostly conducted with secondary school (5-8) and undergraduate students. In this regard, Albayrak (2017) emphasized that working with undergraduate students is more preferred due to the difficulty of obtaining the necessary study permits from authorities for studies involving the secondary school group. İncikabı et al. (2017) stated that the most frequently studied group was secondary school students, as compared to the studies conducted with preschool, primary and secondary school students. It is observed that graduate education programs are not preferred as the sample group in the article studies on the concept of activity in mathematics education. Given this situation, it is recommended that future mathematics educators conduct studies with graduate students as they are the source of science. Meanwhile, no studies have been found to be conducted with associate degree students, parents, and administrators in the articles published on the concept of activity. Nevertheless, the belief that conducting studies with administrators and parents would be beneficial for mathematics teaching has been emphasized in many studies (Çiltaş et al., 2012; Selçuk et al., 2014). It has been determined that most of the articles published in Türkiye on the concept of activity in mathematics education were conducted with a sample group between 31-100 people (Figure 12). This is similar to many studies (Tatar & Tatar, 2006; Ulutaş & Ubuz, 2008; Çiltaş et al., 2012). However, Erdoğmuş (2009) emphasized in his study that experimental studies are mostly preferred among quantitative methods in theses, and in this case, the sample should be large in order to collect more data in less time. Considering this, it is recommended to increase the sample size to obtain more data and more reliable results.

It is observed that content analysis and qualitative descriptive analysis, among the qualitative analysis methods, were predominantly used in the article studies published on the concept of activity (Figure 13). Yıldız and Yenilmez (2019) mentioned that they employed content analysis and qualitative descriptive analysis as data analysis methods in their study, which aligns with the findings of this research. It is suggested that researchers consider evaluating different statistical analysis methods in conjunction with qualitative analysis methods. In the articles published on the concept of activity in mathematics education in Türkiye (Figure 14), it has been determined that the single data analysis method was the most commonly used. Albayrak (2017) observed that the single data analysis method was more preferred in published articles, while three or more data analysis methods were more preferred in theses. However, it has been noted that three or more data analysis methods were not used at all in the article studies. Meanwhile, it has been determined that the qualitative data analysis method was used the most in 2018 (Figure 15) in article studies published on the concept of activity. Similarly, Tatar et al. (2013) observed that there were more quantitative and qualitative studies in their review.

It is believed that the results of this study are valuable in terms of showing the study tendencies related to the concept of activity in mathematics education and thus will be useful in guiding future studies. In this regard, this study is expected to provide ideas to researchers who will conduct studies on the concept of activity in mathematics education. On the other hand, it is expected that the use of the content analysis method in the study will contribute to the studies to be conducted with this method in different fields of study.

It should be noted that this research only covers the studies accessed through DergiPark. Following the same reasoning, it can be said that examining articles published in different databases and in different years in future studies will provide a more comprehensive result in demonstrating the development and diversification of studies on the concept of activity in mathematics education in Türkiye. Furthermore, it is of great importance to conduct such studies at regular intervals to assess the state of research on the concept of activity in mathematics education in Türkiye as a whole.

Ethic

According to the decision of Kırıkkale University Social and Human Sciences Research Ethics Committee, dated 21/12/2021 and numbered 64945, this study received ethical approval.

Author Contributions

This study was produced from the master thesis prepared by the first author, under the supervision of the second author.

Conflict of Interest

The authors declare that they have no conflict of interest.

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