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# Examination of the Contribution of Data Learning Field to the General Objectives of the Mathematics Teaching Program

Semra Ertem[1]

*Dokuz Eylül University*

**Abstract**

The aim of this study is to examine the contribution of the data learning area to the general objectives of the mathematics curriculum. The study was designed with case study, which is one of the qualitative research designs. A total of 160 students from 2nd, 3rd, 4th and 5th grades were asked the open-ended question in order to determine which of the general purposes of mathematics teaching in the data learning area in the mathematics curriculum. After the answers given by the students to this open-ended question were read and analyzed one by one, the contribution of the data learning field to the general aims of mathematics education was tried to be supported by student words. The relationships between the general objectives of the mathematics curriculum and the target behaviors of the data learning area were determined. As a result of the research, it was determined that there is a data learning area in each of the general objectives of primary school mathematics teaching. Although data learning area is an important basic learning area, it is seen that this learning area is not given enough importance in our country. The view that the objectives in the field of data learning leads students to (a) data collection: sourcing habit and knowledge generation, (b) data organization: identifying critical aspects and forming concepts, (c) presenting data: synthesizing and generalizing, (d) data analysis: comparing and problem solving emerges.

**Key Words**

Chart • Data learning area • Education • Elementary education • Math education

[1]**Correspondence to:** Dokuz Eylül University, İzmir, Turkey. E-mail: semra.ertem@deu.edu.tr **ORCID:** 0000-0003-3625-3790

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A successful person in the information age is not an individual who takes the existing information and repeats or reflects it when desired, but is an individual with developed creativity skills, who can search for information, access different sources, interpret the information he finds, and produce new solutions in line with old information and experiences in the face of new experiences. A wide variety of studies in the developing world focus on education today as it was in the past, aiming at realizing more effective and efficient education and training. Education systems that require a dynamic structuring gain value not as they get old, but as they renew themselves (Alkan, 1999). For raised individuals to be qualified individuals; It is desired that they have the rising values that today's need such as exploring, predicting, producing information from information, thinking logically, solving problems.

Mathematics has many benefits and is one of the essential elements of the education system. Mathematical literacy involves reasoning mathematically, using mathematical concepts, procedures, facts and tools, describing and predicting events. Mathematical literacy is knowing the role of mathematics in understanding the world constructively, relationally, and reasonably (PISA, 2012). New approaches and techniques-methods are on the agenda and applied in order to raise individuals with the desired qualifications in mathematics teaching (NCTM; 1989, 2000). In this context, instead of the approach in which "the teacher explains, the student takes notes and listens", which is far from daily life and other sciences, where stagnant knowledge and skills and memorization come to the fore, an approach that "offers students superior functions such as research, questioning, reasoning, establishing relationships, solving problems, and communicating" was developed.

Learning mathematics is an important process that begins at an early age and affects life. Since children are in a period in which they develop rapidly physically and mentally in primary school, the programs to be prepared for them vary according to the years and therefore the preparation of the programs requires meticulousness (Altun, 2005). The Ministry of National Education (MoNE) aimed to make the education process efficient with its teaching programs and to increase success at the same time (İlhan & Aslaner, 2018). With the effect of developments and new approaches in mathematics teaching, the need to update mathematics teaching programs arises. In our country, the mathematics curriculum has been changed or revised many times in the last two decades (Dinç, 2021). The general objectives and achievements of the mathematics curriculum, which was revised in 2018, restructured the learning-teaching process. (Aktan, 2020).

According to Baykul (2012), the main purpose of primary education is to prepare individuals for life and higher education. Mathematics plays an important role in the primary school curriculum. It is essential that mathematics teaching in basic education is carried out effectively but without intimidating students. Teaching mathematics in primary education has an important place in the future lives of individuals. Every day, information and scientific information is spreading rapidly. Individuals who are suitable for the type of people that societies need in this process should be qualified and conscious individuals who know how to obtain information, how to analyze it, how to use it, how to interpret it, and how to integrate this information with their daily life besides getting information ready (Dinç, 2021). It has become an important skill for individuals in today's societies to use them in data collection and evaluation, graph creation, data analysis, graph interpretation, decision making and estimation processes, which are encountered both in daily life and in basic sciences.

We often encounter numerical data in our daily life. These numerical data surrounding our lives have an important place in drawing conclusions, making critical evaluations and making decisions. Creating meaningful results from the data is directly related to how the data is interpreted. Although the need to interpret the data and draw conclusions from the data is evident in many areas, studies are carried out for a more widespread and effective use of data (Guven et al., 2015).

The foundations of students' mathematical development are formed in the first years. Students' ability to communicate with language, drawing and other symbolic tools develops rapidly in these years (Seymour, 1996). Children learn by exploring, their interests and daily activities are natural tools for developing their mathematical thinking. Mathematics learning depends on students' curiosity and interest. And it naturally develops in line with their experiences. It is essential that every child develops a solid mathematical foundation, especially in the early years. It is in these years that ideas about what mathematics is and what it means to know and learn mathematics as a student. In the following years, these views affect the student's thinking, performance, behavior and decisions about learning mathematics (NCTM, 2000).

According to the New Jersey Core Curriculum Content Standard (2001) children are actually natural researchers. They are as concerned with the world around them as they are with the habits and thoughts of their classmates, teachers, neighbors, and family. As they are naturally curious, they often ask questions like “How many?”, "How much?", "What kind?", "Which of these?" Such questions often contribute to the initiation of studies on data collection and analysis. The necessary infrastructure for data collection and analysis in children already exists.

As stated in the Madisan Metropolitan School District Standards (2001) from the earliest years, children have the ability to draw, use their manual dexterity and cut paper or physically show what they want to present visually. In data collection and analysis, graphs of real bodies, shape graphs, column graphs, line graphs, and circle graphs are all ways of presenting data. The presentations prepared by the students from the data they collected should be shared and discussed in their environment. Because they reflect the understanding of the students.

Children, who are the assurance of our future, must have the ability to interpret and analyze data in order to make sound decisions. Since data is used to describe events in the past or to predict future events, dramatic developments in technology have brought the world into the information age. All people need experience in the data analysis process and general concepts in order to make the right decisions. Learning some basic information about data and statistics is also important in order to better understand, interpret and evaluate information in daily life. For several centuries, it has been seen that one of the most important needs in many fields such as engineering, medicine, economics, physics, chemistry and biology is statistical information (Tosun, 2021). Knowing what happens when new data is added or removed from different statistics is one of the important issues in data analysis. The main purpose of data collection is to find answers to questions that cannot be answered immediately (Forsythe, 1997).

One of the most important subjects of primary school mathematics teaching is data collection and analysis. The general principles, contents, curricula and standards of school mathematics, which occupies an important place in mathematics education, are explained in documents published at certain times by the National Council of Teachers of Mathematics (NCTM) at the international level. According to the document “Principles and Standards for School

Mathematics [PSSM]" published in 2000, the field of data and statistics education should be included at all levels of mathematics education (NCTM, 2000). Altun (2008), interpreted data and statistics as the ability to systematically collect and organize information; express and analyze the results obtained with graphs; interpret and evaluate information as a result of the analysis, and finally use it at the decision-making stage.

Tosun and Ünal (2019) stated that the need for data learning area in mathematics education programs is increasing gradually. According to Baki (2015), the purpose of data processing and statistics learning area is to create research questions, collecting data, processing data, organizing data, expressing and interpreting data with different forms of representation as well as being able to calculate the probabilities of an event by examining the states of its occurrence. Tosun (2021) stated that students have problems in high-level thinking about the subjects and graphics within the scope of data processing learning area. Given the evolving society, the data-driven activities required include a broader, more process-oriented perspective that encompasses important skills such as describing, inferring, interpreting and analyzing data beyond graphing data (NCTM, 2000).

Mathematics Curriculum developed by MoNE (2018) consists of four learning areas: (a) numbers and operations, (b) geometry, (c) measurement and, (d) data processing. Data collection and analysis is also specified within the data processing learning area. The basic concepts in these four learning areas were discussed in each class and the concepts were expanded and presented to the students as they passed to the upper grades. Accordingly, it can be argued that examining primary school students' views on data learning is important in terms of understanding their perspectives and experiences on this topic. As can be seen in the literature mentioned above, it is noteworthy that there is not enough research in this area at the national level. The aim of the study is to examine the students' views on the field of data learning and to examine the contribution and role of this field to the general aims of mathematics education.

## Method

### Research Model

This study, which examines the contribution of the data learning area to the general objectives of the mathematics curriculum throug student views, was designed as a case study from qualitative research designs. According to Yıldırım and Şimşek (2013), qualitative research is defined as "research in which qualitative data collection techniques such as observation, interview and document analysis are used, and a qualitative process is followed to reveal perceptions and events in a natural environment in a realistic and holistic manner". An important feature of the case study is the in-depth investigation of one or more cases (Merriam, 1998). The aim here is to reveal the results related to a certain situation (Yıldırım & Şimşek, 2013). This method differs from other research methods because it is preferred especially when asking what, how and why questions to understand different subjects of education (Çepni, 2012; Yin, 2003). A case study is a research method that examines situations in their real-life context, is used in situations where there are more than one data source, and provides a holistic interpretation of the study (Merriam, 1998).

### Study Group

The study group of the research consists of primary school students. The study group consists of 160 students randomly selected from the 2nd, 3rd, 4th and 5th grade students. Students are shown as Student 1, Student 2, … Student 160 in the quotations in the presentation of the findings.

### Data Collection Tool

Taking expert opinions from the lecturers working in the mathematics education graduate programs of the Faculty of Education, 160 students consisting of 2nd, 3rd, 4th and 5th grade primary school students were asked an open-ended question "Why do you like the data learning field?". After the answers given by the students to this open-ended question were read and analyzed one by one, it was tried to determine the students' views on the data learning area and the general purposes of primary school mathematics teaching. The relationships between the general aims of primary school mathematics teaching and the target behaviors of the data learning area were determined.

### Data Analysis

The interview results obtained from the students were evaluated by using the descriptive analysis method, without making any changes in the student expressions. The concordance between the analyzes of the two researchers was calculated by Miles and Huberman (1994) as 82% of the inter-rater reliability formula.

## Findings

In this study, in which the contribution of the data learning area to the general objectives of the mathematics curriculum was examined, the participants asked the question “Why do you like the data learning area?” their answers to the open-ended question are presented in the context of General Objectives of Primary Education Mathematics Teaching.

**Students’ ability to develop a self-confident approach to mathematical problems by developing a positive attitude towards mathematics with their experience in learning mathematics.**

According to the data obtained from the participants, it is seen that the data learning area covers the aim of developing a self-confident approach to mathematical problems by developing a positive attitude towards mathematics, which is one of the general aims of mathematics teaching. In this context, Student 1, a 2nd year student, stated that she wanted graphics to be discussed in every mathematics lesson because she enjoyed that graphics were fun and beautiful. Similarly, Student 2 and Student 3 expressed that they liked the graphic subject. 3rd grade students, Student 29, Student 42, and Student 56, also stated that when they think of graphics, they think of shapes and tables, and it gives them pleasure to take care of them. It can be seen from the statements below that 4th and 5th grade students also stated that they enjoyed drawing graphics.

> “Graphics are fun and beautiful. It was so enjoyable that at first I wondered what it was like. Then I saw that it was so enjoyable that I would like to do it in every math class, it is very enjoyable.” (S:1- 2nd grade)
>
> “Drawing shapes is fun, I enjoy painting, I love drawing.” (S:2-2nd grade)
>
> “I love dealing with graphics. Maybe I like it because we draw shapes, I don't know, but maybe I love listening to it and writing about it, not just drawing its shape. I love that subject a lot, I like it very much.” (S:3-2nd grade)
>
> “Graphing is like measuring our knowledge. I like to make graphics.” (S:2-3rd grade)

"When I think of graphics, I think of shapes, pictures, lectures and mathematical tables, and I love graphics" (S:29-3.Grade)

"Graphics have been like a game to me since 1st grade, I always say we should process them. But I think we probably won't work because we've grown." (S:42-3rd grade)

"I like the graphic unit because I like shapes. Shapes appeal to me. It improves our dexterity." (S:56-3rd grade) "I like graphics because they are easy to understand, I don't like math, but graphics made me love math. (S:85-4.class)

"I learn with pleasure in the graphics class. In short, I am both learning and having fun. I love it because I learn by seeing." (S:100-4.class)

"I never get bored while drawing graphics. Because graphics are for both learning and drawing fun." (S:150-5th grade)

"I like to show an ensemble or a fraction on a graph. My favorite charts are the column and circle chart. Because these graphs seem complicated at first glance. That's how I feel like I've grown. Great people also deal with complex and big things." (S:130-5.class)

"I can do graph questions without distinguishing between hard or easy. Because these questions seem very enjoyable to me." (S: 140-5th grade)

"It is very nice to work with shapes and lines. It's fun to draw with pictures like this. We can understand those subjects better from these graphics" (S: 160-5. grade)

**Students' ability to make sense of the relationships between people and objects and the relationships between objects by using the meaning and language of mathematics,**

The students' opinions reveal the purpose of appreciating the power of mathematics and its structure that includes a network of relations by using the meaning and language of mathematics, which is one of the general purposes of mathematics teaching. Student 92, a 4th grade student, understood the importance of mathematics thanks to graphics and stated that it is frequently used in other daily life. Again, Student 143, Student 146 and Student 81 stated that the graphs were used to find the number of trees in the forest, the number of a community, and that it was used by people from all professions.

"Using graphics in every field shows that it is important for people, each graphic has its own benefit, knowledge and taste. I believe these will benefit me a lot when I grow up." (S: 155-5th grade)

"Graphics come in handy in everyday life. It is useful in forecasting weather conditions, measuring fever of patients.(S: 92-4th grade)

"Not only us students, but also people from various professions use graphics such as lines and shapes." (S: 143-5th grade)

"With the graph, we can immediately find the number of a very large community without the need for long processes.(S: 146-5th grade)

"In graphics, we save both time and paper. For example, instead of using a large piece of paper to count trees in a large forest, we can quickly find the number of trees using graphs." (S: 81-4th grade)

**Students' ability to understand mathematical concepts and use these concepts in daily life**

According to the data obtained from the participants, it has been seen that the data learning area serves to understand mathematical concepts and systems, to establish relationships between them, and to use them in daily life and other learning areas, which is one of the general purposes of mathematics teaching. 4. Student 85, who is a 6th grade student, stated that graphics can be used in presidential elections and meteorology, while Student 158 stated that graphics are a very enjoyable unit and that they learned what can be grown in some regions.

"I love graphics. Graphics describe shapes, animals, plants, that is, pictorial mathematics for me" (S:42-3.class)

"It is very enjoyable to draw pictures of different sizes"(S:89-4.class)

"Graphs can be used in mathematics, in meteorology in presidential elections"(S:85-4.class)

"The graphics are a very enjoyable unit. Because with graphics, I understand what is grown in some of our regions"(S:158-5th grade)

"I see these graphics mostly in the heat and cold section of the social lesson and the graphics section of the mathematics lesson"(S:117-4.grade)

"Hot and cold are explained to us with graphics in the social studies lesson" (S: 83-4. Grade)

"We can learn crowded things quickly. We can immediately learn how many things in nature are."

(S:12-3rd grade)

**Students' ability to use their estimation and mental processing skills effectively**

As a result of the opinions of the participants stated below, it clearly reveals that the purpose of the data learning field is to use the estimation and mental processing skills, which are among the general purposes of mathematics teaching. Student 82, Student 95 and Student 100 stated that they could do the operations in their minds thanks to the graphics.

"I love to draw graphs. This makes it easy for me to process. Besides, I open my mind by doing the things I will do with the process in my mind"(S: 82-4.class)

"I love drawing graphics. Because I do the operations from the mind"(S: 95-4.class)

"I like the graphics unit because I can solve it mentally and without processing" S:100-4.class)

**Students' ability to develop their mathematical literacy skills and use them effectively.**

As a result of the students' opinions, it is seen that the data learning area covers the general purpose of mathematics education, the aim of developing and effectively using the mathematical literacy skills necessary to receive an advanced education in mathematics or other fields. Student 20, Student 96, and Student 53 understood the importance of mathematical literacy and wrote statements stating that a graph is a short-cut representation.

"I think the graphics are a beautiful thing, we draw a picture of how many people are in our class, for example, five people. we write how many people you show under it"(S:53-3rd grade)

"It is a short way to make a graphic representation."(S:96-4.class)

"For example, we can show my class size in a short way. For example, while a worker counts the trees in the forest, the graph shows it in abbreviations."(S:20-3rd grade)

**Students' ability to develop their mathematical literacy skills and use them effectively.**

As a result of the data obtained from the participants, it is clearly seen that the "data" learning area fulfills the general purpose of mathematics teaching, to express their own mathematical thinking and reasoning in the process of solving mathematical problems. Student 45 and Student 88 stated that they could solve many problems immediately thanks to graphics.

"We solve a lot of problems in the column chart. So much has been produced this year, so much this year. The column chart is also very nice."(S: 45-3rd grade)

"Graphic questions are very easy, can be done immediately. We can immediately answer the questions by looking at the line graph. The air temperature may be like this on average this month and this next month"(S: 88-4th grade)

"We can also make a graphic with the objects around us"(S:12-2.class)

**That students value mathematics by being aware of the fact that mathematics is a common value of humanity**

The following views of the students coincide with the purpose of giving value to mathematics, being aware of the fact that mathematics is a common value of humanity, which is one of the general aims of mathematics teaching in the field of data learning. Student 52, who is a 3rd year student, stated that the shapes drawn gave him different emotions and that he cared for himself in this way.

> "That round shape I drew; it makes me think like a love, communication, commitment, that is, a society." (S:52-3rd grade)
>
> "I understand the questions better in graphs. I solve problems better. Tomato production in this season is this much, in other seasons it is like this. Thanks to the graphics, I can understand the operations more easily. It makes problems easier."(S:145-5.class)

**Students' ability to use mathematical terminology and language correctly to logically explain and share their mathematical ideas**

According to the data obtained from the participants, it is seen that the data learning area covers one of the general purposes of mathematics teaching, to use mathematical terminology and language correctly in order to explain and share their mathematical thoughts in a logical way. Student 72, Student 149, Student 110 and Student 97 stated that they understood how important the use of rulers was when drawing graphics.

> "I like graphics. If there were no graphics, I would not know the ruler very well in mathematics" (S: 72-3rd grade)
>
> "It's hard to draw graphs. It is more difficult especially when you have cm." (S:149-5th grade)
>
> "One of the reasons I like graphics is that we use rulers while drawing graphics" (S:110-4.class)
>
> "What I like about graphics is because we draw more and find dimensions. Finding a measure is good for me because it is found while drawing" (S: 97-4th grade)

**Students' ability to develop their metacognitive knowledge and skills and consciously manage their own learning processes**

According to the data obtained from the students' opinions, the data learning field contributes to the development of cognitive knowledge and skills, which is one of the general aims of mathematics teaching, and to the conscious management of their own learning processes. Student 147 and Student 109 stated that they can consciously manage their own learning processes by making forward-looking predictions thanks to the graphics..

> "Thanks to the graphics, I took a temperature measurement for a week and was able to predict what the temperature would be like the next week. (S: 147-5th grade)
>
> "I can learn from this month's water consumption chart in Izmir whether I will have water in the future".(S: 109-4. Grade)

**Students' ability to develop the characteristics of being systematic, careful, patient and responsible**

As a result of the data obtained from the participants, it shows that the data learning area realizes its purpose of developing the characteristics of being systematic, careful, patient and responsible, which is one of the general aims of mathematics teaching. Student 155, Student 101 and Student 72 stated that drawing graphics requires attention, care, time and effort, and they get angry when they cannot draw.

> " Sometimes I get angry when I can't make the drawings in the column chart. (S: 72-3rd grade)
>
> "We need to take care of the graphic drawing. If we don't care, the graphic won't be pretty and we won't be able to understand much." (S:101-4.class)
>
> "It's very nice to draw graphics. It is also difficult to draw. We strive to make it. But it is entertaining. In my opinion, the most laborious and beautiful of graphics is the figure graphic. Graphics keep people busy because they create effort."(S:155-5.class)

**Students' ability to develop the power to research, produce and use knowledge**

According to the following opinions of the students, the data learning field contributes to the development of the power of doing research, producing and using information, which is one of the general aims of mathematics teaching. Student147, a 5th grade student, stated that he did not feel himself in the lesson while drawing graphs and that his attention was focused on something else. Student 100 stated that graphics improved their imagination.

> "I don't feel myself in class while drawing the column chart, it feels like I'm trying to focus my attention on something."(S: 147-5. Grade)
>
> "When we draw these on our notebook, we should draw them carefully. While we are drawing, our notebook is filled with information. It can also help future generations."(S:155-5th grade)
>
> "We can show something without writing, develop our imagination, we can show it to someone who is illiterate, we can show something in a short way."(S:100-4.class)

**Students' ability to express concepts with different forms of representation**

The following views of the students clearly reveal the general purpose of mathematics teaching in the field of data learning, to enable students to express concepts with different forms of representation. Student 118, a 4th grade student, stated that he liked this learning area very much because he could show his feelings with shapes and pictures. Student 142 and Student 73 also stated that they liked the painting lesson very much and that graphics also developed their imaginations.

> "I love graphics because they are easy to paint, draw and process. The collars of the students, the hats of the boys, and the hair of the girls are very beautiful."(S:75-3rd grade)
>
> "Sometimes, when my graphic is not beautiful, my other friends say it is beautiful."(S:72-4.grade)
>
> "I love the graphics unit because you can show my feelings in every way with pictures. When I think of a fruit, I can show it immediately with a shape graphic."(S:118-4.class)
>
> "I like graphics because they are so easy and enjoyable. Drawing is my favorite subject. Graphics improve my imagination."(S: 142-5th grade)

**Students' ability to establish the relationship between mathematics and art and develop aesthetic feelings**

As a result of the data obtained from the participants, it is seen that the data learning area overlaps with the general aims of mathematics teaching, to establish the relationship between mathematics and art, and to develop aesthetic feelings. 5th grade student Student 157 states that graphics require effort, but that he also develops his drawing and that he experiences a different phenomenon while drawing, which shows that the data can develop aesthetic feelings.

> "Graphics are the subjects that develop our drawing and require effort in drawing. While we are drawing these, a different phenomenon can cover us."(S:157-5th grade)
>
> "Graphics is a fun subject. This issue is like a cluster issue. The pictures of the graphic are beautiful." (S:42-3rd grade)
>
> "When I draw shapes and lines, it looks beautiful to my eyes." (S:92-4.class)

## Discussion and Conclusion

In this study, it was tried to examine the contribution of data learning area to the general objectives of the mathematics curriculum in order to reveal how important the data learning area is. When students exhibited an acquisition of the data learning area, it was desired to determine which goals of the mathematics lesson contributed

to this behavior. As a result of the literature review and the analysis of qualitative researches, it was seen that the data learning field serves many purposes of mathematics. These are listed as follows.

- That the students feel as if they are in the painting lesson and enjoy it in the data learning area in the mathematics lesson, that they draw original shapes using colored crayons, that the lesson feels like a game to them, that they do not understand how time passes when drawing graphs, and that they draw different graphs according to the data is effective in gaining self-confidence, developing positive attitudes towards mathematics and self-confidence
- It contributes positively to students' appreciation of the power of mathematics and its structure that includes a network of relationships, seeing graphic pictures in newspapers and media, using line graphics when specifying air temperatures in meteorology, making use of pie charts while teaching fractions in mathematics lessons, and using different geometric shapes in drawing shape graphics. Similarly, comparing graphs with each other (geometrically similar and different aspects between shapes, column and circle graphs), making use of pie charts (dividing the pie into four, cutting a piece) while teaching fractions and percentages in mathematics class also makes the student's attitude towards mathematics positive.
- It shows that students benefit from shape, column and circle graphics while drawing "precipitation by regions, temperatures by years, products by months" in life studies, social studies and science lessons, and use the concepts of horizontal and vertical axes while solving puzzles in individual and collective activities lesson and students can use it in other learning areas. In addition, while interpreting the figure graph, students understood the concepts of size and smallness, fewness and abundance by using their expressions, they learned the concepts of length and shortness by using their expressions while interpreting the column graph, they understood the concepts of low-height, closeness-distance when interpreting the line graph, and using the terms few-many when comparing percentages in the circle graph they show that they comprehend the expressions of size-smallness. This is a positive factor in students' ability to understand mathematical concepts and systems, to establish relationships between them, and to use them in daily life and other learning areas.
- Students can concretize on graphic examples and perform mental operations, in figure graphics, for example, if each figure shows 2 students, they can do these operations in their mind when it is asked how many students will 5 figures show, in a circle chart, for example, they can divide the cake into 8 and say that half of the cake is taken when 4 is taken, when the temperature drops in temperature graphics knowing that the temperature is dropping and you are starting to feel cold and visa versa means that these factors contributes positively to students' ability to use their estimation and mental processing skills effectively.
- Students' use of addition and multiplication while interpreting the graphs while telling how many entities the shapes represent; Benefiting from the four operations while calculating the proportions of the slices in the circle graph contributes positively to gaining the necessary mathematical knowledge and skills in order to receive an advanced education in mathematics or other fields.

- In the process of solving mathematical problems, there are factors that positively affect students' ability to develop their mathematical literacy skills and express their reasoning. Among these factors are students' ability to solve simple problems (which one is big, which one is small, etc.), while they interpret their graphs, to reach new information from the information given in the given figure, column, line graphs, and to pose a new problem from the given ones. Gaining ideas about time while reading graphs and making predictions for the future (when looking at wheat production by years, how much this year, how much this year), being able to read the line graph (the graph has that number when this point of the graph is at this position), interpreting the circle graph (that percentile slice covers this much area) are among the factors that have a positive effect.

- Students can transform the given graphics into problems, turn them back into graphs and shapes, make predictions about the future while interpreting column and line graphs and set up problems (such as what the temperature will be in July), create different problems when comparing the information in the circle graph, develop their problem solving strategies and develop their own thoughts in the problem solving process and be able to easily express their reasoning contributes positively to their ability to use these in solving problems in daily life.

- Students use a ruler while drawing graphs, create a chart of the given data, count the shapes in the graph, measure the area covered by the shapes on the graph, use the measurements when reading the heights of the bars in the column graph, the numbers on the axes of the line graph, and the amount of slices in the circle graph (large value, small value) and use compass while drawing the circle graph and these allows students to use mathematical terminology and language correctly to explain and share their mathematical thoughts in a logical way.

- Although the graphs they draw form a small part of the whole, they have general information about the whole and if they have a good command of the graphs, they can comment on a whole from the small piece of data they have. For example, while making comments about the temperatures in the Aegean Region, students also have information about the meteorological positions of Turkey. These, in turn, contribute to students' ability to develop their metacognitive knowledge and skills and to consciously manage their own learning processes.

- Students should be able to draw graphs and figures patiently, carefully and in a regular way, examine the graphs carefully and make comparisons such as more or less, small and large, use their skills while drawing graphs, and should be orderly, careful and meticulous while creating the tables of data, contributes positively to the development of their personality traits such as being patient, orderly and systemic.

- The factors that contribute positively to students having a personality that makes research, produces information and develops their power of use are that they can express their ideas clearly while commenting on the graph, decide for themselves what to show when drawing the figure graphs, and obtain information by looking at the graphs. In addition, this idea is supported by the fact that they get information by looking

at the graphics, try to explain and spread the graphical knowledge they have gained to their environment, and decide on their own which data should be displayed with which graphics.

- When comparing the graphs drawn by the students with each other, the criticism that yours is beautiful but mine is ugly, the different perspectives on shapes in a given shape graph, the use of different colored pencils while drawing column, shape and circle graphs, and the use of different shapes in the shape graph arouse their intellectual curiosity and helps them move forward. In addition to these activities, interpreting the graphics and making predictions about the future, the formation of opposing thoughts with their friends and the ability of the students to self-criticize (I wish I didn't draw like this, my friends wouldn't like it), ability to express concepts with different representations helps students develop their intellectual interests.
- The use of colored crayons by the students, the beauty of the drawn figures and graphics, the harmony of colors in the colors and the uniformity of the drawings, the different colors of the pie slices in the circle graph, the use of different line options in the line graph, the symmetry feature in some graphs enable students to establish a relationship between mathematics and art and they enables them to develop aesthetic feelings.

In this regard, data collection and analysis in MMSD K Dec 5 Mathematics Content Standards for Data Analysis and Probability, (2001) related standard gives students and teachers the opportunity to establish a connection between a large number of thoughts and operations related to numbers, algebra, measurement and geometric concepts. Student working on data analysis and probability, mathematics and sciences with the issues of contemporary life and a natural method that can establish a relationship between the similarity is determined with this study constitutes. It emphasizes that students should be able to use and interpret data correctly, make predictions based on data, and develop their decision-making skills in order to become conscious citizens and consumers (MoNE, 2009).

According to their research, Özel Kadılar et al. (2021) emphasized that statistical information is always encountered in daily life, therefore, data processing and statistical skills should be given more place in curricula, and statistical thinking and statistical literacy are very important today and they stated that data-related acquisitions should be given more space at all levels of education from pre-school to university. Tosun (2021) said that it is important to learn some basic information about data and statistics in order to better understand, interpret and evaluate information in daily life and he also emphasized that for several centuries, one of the most important needs in many fields such as engineering, medicine, economics, physics, chemistry and biology has been statistical information based on data.

As stated in the New Jersey Core Curriculum Content Standard (2001) reasoning in areas related to data collection and analysis helps students succeed in business life. What is learned at school may seem to the student as something predetermined and bound by rules. Students working on data and statistics can learn that the solutions to some problems depend on assumptions and that there is a certain level of uncertainty in them. Their explanations are consistent with the findings of this study.

From all the above information, it is understood that the "Data" learning area is an important basic learning area. On the other hand, it is seen that this learning area is not given enough importance in the first stage of primary education in our country.

In short, "Achievements in the field of data learning, students;

| | | | | |
|---|---|---|---|---|
| Data collection | → | Sourcing habit | → | Producing information |
| Data editing | → | Identifying critical aspects | | →Creating concept |
| Data presentability | → | Synthesis | → | Generalizing |
| Data analysis | → | Comparison | → | Problem solving |

appears to be leading the way.

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