ISSN: 2146 - 9466
www.ijtase.net
International Journal of New Trends in Arts, Sports & Science Education – 2022, volume 11, issue 3

DON'T LET WILDFIRES DESTROY OUR WORLD: DATA PROCESSING

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Received: February 22, 2022 **Accepted:** April 11, 2022 **Published:** July 31, 2022

Suggested Citation:
Hacisalihoğlu Karadeniz, M., & Şehit, A. G. (2022). Don't let wildfires destroy our world: Data processing. *International Journal of New Trends in Arts, Sports & Science Education (IJTASE), 11*(3), 145-160.

Abstract

Global warming and wildfires are one of the most important scientific issues of the twenty-first century. This is a problem that has serious ecological and sociological implications. To prevent the problems that arise, environmental education and environmental awareness are important. Consequently, members of humanity should be aware of their responsibilities regarding the environment. Therefore, the main aim of this study is to reveal the perceptions of eighth grade students about global warming and wildfires with the context of Data Processing Learning Domain. The participants of the study were 27 8th grade students from a secondary school. The research was completed via a qualitative study based on the case study; data collection tools were eleven open-ended questions about global warming and wildfires on data processing. According to results of content analysis, students know that the global warming and wildfires are dangerous and harmful for humanity and wildlife. But students have difficulties about displaying data, analyzing and interpreting data, interpreting graphs and converting graphs to each other. Thus, it is suggested to design learning environments for students to be able to experience data processing as a whole. Moreover, environmental education should be introduced to all levels of education. It is suggested that it is important to make educational programs built on environmental education more widespread.

Keywords: Global warming, wildfires, data processing learning domain, 8th grade students

INTRODUCTION

One of the things we pay the most attention to when making informed decisions is data (Kazak, Fujita, & Turmo, 2019). Data Processing is a subject of general interest and importance in Turkey and the world (Baki & Celik, 2018). Organizing, collecting, analyzing, interpreting, and representing data are part of statistics (Uyen et al., 2021). Attention to statistical literacy also shows its effect in reports on mathematics and statistics teaching, and attention is drawn to statistical literacy (Franklin et al., 2007; NCTM, 2000). It is possible to see this learning domain in the curriculum of all grade levels in secondary school. Statistics is the subject of learning about organizing, collecting, analyzing, interpreting, and representing data. Within the scope of data processing learning domain, they are expected to be able to pose a researchable question, obtain data about that question, process and analyze the data, and finally interpret the results in the 5th grade (Ministry of National Education, 2018). NTCM (2000) points out in its standards related to mathematics teaching that individual should experience the statistical process and be trained in the field of statistics. Wallman (1993) stated that one of the aims of teachers in primary and secondary education is to try to train students to be statistically literate. In the 6th grade of the curriculum, they can organize the data related to two multiplicities, and in the 7th grade, they can examine and interpret concepts such as circle and line graphs (Ministry of National Education [MEB], 2018). Finally, it is envisaged that in the 8th grade, they will be able to interpret the graphic types consisting of at most three data groups, create the appropriate graph according to the data obtained as a result of the research question, and make conversions between graph types (MEB, 2018). Understanding the graphics, which are common in many areas of daily life, and making the correct interpretations enable students to learn this subject in

depth (Baki & Celik, 2018). It is important that students experience the statistical process, adopt the role of researcher, control and organize the research process (Rumsey, 2002). The ability to group data, group them and organize them around certain criteria is not a skill specific to mathematics course (Gultekin, 2009). Data processing is also a subject in which problem-solving skills are actively used, and it is one of the most comprehensive mathematics subjects thanks to examples that require students to apply skills such as mathematical language and reasoning (Baki & Celik, 2018).

Data processing is a learning domain that is actively used not only in mathematics but also on the basis of many professional groups. Thanks to the production-machine graph made by an industrial engineer, people can see which machine can produce more, while the psychological counselor uses data processing to analyze the data of the personality test. Likewise, there is no need to have a profession to be able to process data or analyze data. Because in today's world, to become conscious citizens and consumers who try using the decreasing resources efficiently, individuals should have data literacy and associate this situation with daily life (Zacks et al., 2002). In this context, it is necessary to have a good knowledge in the field of data processing to raise individuals who can use resources logically and organize their possessions efficiently. In addition, attention is drawn to the importance of increasing the statistical literacy levels of individuals for all education levels and raising statistically literate individuals (Chick, & Pierce, 2012; Ramirez, Schau, & Emmioğlu, 2012).

In this study, it has been tried raising awareness about the future of our world by associating "Global Warming" and "Wildfires" with the achievements in the Data Processing learning domain in the program. The cause of global warming, which has become one of the most fundamental problems of the century we live in, is the deterioration of the environmental balance and accordingly the unavoidable environmental problems in environmental problems (Emli & Afacan, 2017). The most serious and important environmental problems we have experienced are global warming and the climate change it has brought with it (Orbay, Cansaran, & Kalkan, 2009). The unplanned and excessive use of resources, various problems encountered because of not taking the necessary precautions against the environment, and the direct or indirect damage to humanity because of these problems, reveal how serious and dangerous global warming is. According to Dogan (2017), educators frequently express the concept of environmental education to increase environmental awareness of people to prevent the problems that arise on an individual basis. To provide education in this direction, individuals should be aware of their responsibilities regarding the environment.

For developing environmental awareness of individuals; they need to be able to understand, interpret and make inferences about the situations they are in. In this way, individuals can understand the role they play in natural events and the impact of constructions on nature. At this point, data processing is a learning domain that explains and explain the current situation to individuals. Data processing learning domain are in primary school, secondary school and secondary school mathematics curriculum, and many target behavior is specified in sub-learning domains within these learning domains (MEB, 2013a, 2013b). Today, the skills of understanding and drawing graphics are used to express and explain many situations. These skills also play a major role in individuals' acquiring accurate information in their daily lives. (Gokkurt, Ozdemir, & Comarli, 2019) also stated that since data processing-learning domain is frequently used in different fields such as economy, geography, science and communication, individuals should acquire these skills in school environments.

In the study, questions were also asked about:

- Misplacing the data on the graph which is one of the most common mistakes made in the field of Data Processing,
- Misreading the graph
- Forming inappropriate question sentences.

With questions on the worksheet, it was examined in which situations the students had difficulty creating graphics, what they paid attention to when comparing the graphics, how they evaluated the graphics, and what they took as a basis when making conversions between the graphics. Hacisalihoglu Karadeniz (2016) stated that secondary school fifth-grade students' having some difficulties in data

processing may be due to the insufficient number of examples they encountered throughout their education. Finally, in the worksheet, the students were asked questions such as what precautions we can take against global warming, what we can do to prevent fires and destruction, and it was tried raising awareness about possible events.

Literature Review

When the literature is examined, studies on global warming, environment and nature have been found in Turkey. In their research conducted in 2017, Emli and Afacan examined the mental models of the seventh-grade students about global warming. As a result of the research, it was determined that students were familiar with global warming in general and they expressed it as dangerous and harmful. Another result of the research is that few students think that environmental pollution causes global warming. When examined from this perspective, it was revealed that the students were socially conscious, conscious of the environment, but did not have sufficient knowledge about global warming.

In his study, Dogan (2017) conducted a metaphor analysis examining the intuitive perceptions of secondary school students about the concept of environment. Because of the findings obtained in the study, it has been shown that the environment is expressed not with a single metaphor, but with many metaphors. When the metaphors of the study for the concept of "environment" are examined, the students' concept of "environment" is "environment in terms of pollution", "environment as a clean and healthy structure," "environment in terms of needs," "environment in terms of beauty," "environment in terms of the place where games are played", it has been revealed that they associate them with the reasons gathered under the categories of "environment in terms of living things", "environment in terms of the future" and "environment in terms of livelihoods". The findings show that secondary school students' perceptions of the concept of the environment are present but limited.

In their research, Yilmaz and Vural (2016) determined the knowledge and behavior levels of secondary school students in Erzurum on environmental and nature-related issues. In the research, it was revealed that the students had knowledge about the basic concepts of environment and nature. The rate of transforming the knowledge acquired by the students into behavior was high, but it was found that the rate of students converting knowledge into behavior was lower in questions such as the use of perfume and deodorant in one-to-one matching. A moderate and significant relationship was found between knowledge and behavior levels.

At secondary school level, no study has been found that deals with the effects of wildfires and global warming within the framework of achievements related to mathematics course. It is seen that students and teachers have a great deal of misconceptions about global warming and greenhouse effect at all levels of education. The biggest problem that students are aware of and know about most of the problems that occur around us, but the biggest problem encountered is that students think these problems are not related to each other, that is, they perceive all these problems as if they are happening on their own (Secgin et al., 2010).

A current glance at the literature shows lack of study about information's of middle schoolers about Data Processing learning domain, global warming and wildfires. In this context, this study is important in terms of presenting examples of activities suitable for data processing outcomes within environmental and nature awareness in the mathematics curriculum and guiding mathematics teacher candidates who will be the implementers of the curriculum. This study reveals eighth-grade students' perceptions of global warming and wildfires in the context of Data Processing. In other words, it is revealed the perceptions of eighth grade students about research question generation, data collection, organization and display, data analysis and interpretation, creating graphics, tables and diagrams from different representations of data, and interpreting them within the framework of global warming and wildfires.

METHOD

In this section, information about the research design, participants, data collection tools and data analysis are given.

Research Pattern

This study, which aims to examine eighth grade students' knowledge of data processing learning domain within the framework of global warming and wildfires was designed and conducted in a qualitative case study pattern. Qualitative research method is generally used to obtain in-depth and comprehensive information about a subject (Denzin & Lincoln, 2005; Marshall & Rossman, 2006; Singh, 2007; Patton, 2014). The case study is a research method used to answer how or why questions in situations where a current phenomenon is at the center of the research and the researcher has almost no control over the events (Yin, 2014). Case studies are an inquiry strategy in which the researcher delves into a program, event, activity, process, or one or more people (Creswell, 2009).

When the participants and the subject studied are examined, this study is a special case study. The case in this study is to examine students' knowledge about global warming and wildfires within the framework of data processing learning domain. Because, thanks to special case studies, the researched subject can be examined in detail and the case study provides the opportunity to explain the effects of the obtained data on each other (Cepni, 2018; Lewis, 2015; Baki & Celik, 2018). This approach was selected as it would allow getting an in-depth understanding of eighth grade students' knowledge about global warming and wildfires within the context of data processing outcomes. All elements (environment, individuals, events, processes, etc.) that affect a situation are examined in general and the effects of the elements on the situation are investigated (Paker, 2015; Yildirim & Simsek, 2016). To examine this case, a worksheet was prepared with open ended questions about global warming and wildfires and problems related to data processing learning domain.

Participants

The participants of this study are 27 eighth grade students studying at a public school in a province in the Eastern Black Sea Region in the 2019-2020 academic year. In the process of selecting the participants, criterion sampling was chosen from purposive sampling methods. The criteria for the selection of the participants of the study were: (1) the students continue to the eighth grade, (2) knowing the concepts of the Data Processing learning domain and the Data Analysis sub-learning domain, and (3) participant volunteerism. The reason why the eighth-grade students were chosen in the study is that they learned the Data Processing learning domain at every grade level and the concepts of the Data Analysis sub-learning domain from the sixth, seventh grades and came to the eighth grade, thus ensuring readiness for the subject. Therefore, the last two acquisitions of the Data Analysis sub-learning domain in the focus of the study; The achievements of "Interprets line and column graphs of up to three data groups" and "Shows data with column, circle or line graphs and makes appropriate transformations between these representations" are included in the eighth-grade program. The names of the students participating in the research were kept confidential due to ethics and the students coded as "S1, S2, S3, …, S27".

Development and Implementation of Data Collection Tools

In Turkey, within the scope of secondary school mathematics curriculum, eighth grade students learn the objectives of data analysis learning domain within 12 class hours. These 12 class hours about data processing constitute %7 of the objectives of eighth grade mathematics curriculum. In total, 48 class hours are allocated in the curriculum for the Data Processing learning domain. Students learn the final objectives of Data Processing learning domain in the eighth grade. However, "Environmental Education" course is included as an elective course in the program and not every student takes this course. Thanks to the activity, it was raised awareness about environmental education and inform students about the destruction and damage caused by global warming and wildfires. In the first 20 minutes of the activity, the subject of "Data Processing" was discussed and real examples from the events encountered in Turkey and earth were presented to the students. The students were presented

with examples from their close circles, and their thoughts and knowledge on the subject were learned from the examples they encountered or heard.

The stages of the activity are as follows:

In the introduction part of the first 20 minutes of a class; the effects of forest destruction, wildfires and global warming, which have occurred frequently in recent months, were asked the students.

1-Students are informed about the "Afforestation Work", which was held for the first time in Turkey on 11.11.2019, and they are told how important each tree is for our future. Discussion questions were asked about what could happen in a treeless world, and a discussion environment was created in the classroom.

2-They are asked to devise problem statements about the reasons for the disappearance of forests recently and the reasons for them. The problem sentences formed are written on the board and it is discussed in class whether the problem sentences are suitable for the topic and data collection.

3-The answers to the causes of destruction are written on the board. The answers received are grouped together with the class under the headings of negligence, intent, accident, unsolved (for unknown reasons) and lightning.

4-After the grouping process is completed; “Which of these reasons do you think is most effective in the disappearance of forests?” The question is asked, the reasons are listed, and the opinions of the students are determined by the voting method. The results of the voting are written on the board.

5-In the next 20 minutes of activity students are asked to create a column chart about this data. Any errors or mistakes encountered while creating the column chart are noted.

6- After that, students take a break about 15 minutes. Then in the second part of the activity the students are asked to convert the column chart they created into a line chart in 30 minutes. The process is carefully monitored.

7-Finally, they are asked to convert the formed line graph into a circle graph. Attention is drawn to the percentage calculation’s part.

8-Based on the graphics, students are asked what can be done against global warming and forest destruction.

“What can we do against global warming?”
“What can we do to prevent forests from being damaged or destroyed?”

9-By entering https://www.ogm.gov.tr/tr/e-kutuphane/resmi-istatistikler, the statistics for the years are showed into column, line and circle graphs.

10- In the final part of the activity students were given 10 minutes. Graphics on the website given above are opened in the classroom and the relationships between the original graphs and students’ graphs are discussed.

The worksheet was first used in a pilot study, and the worksheet was arranged considering the data obtained in the study. The pilot study was applied to eight 8th grade students, and it was observed that the students were both insufficient in the field of data processing and learning and were unconscious about the impact of global warming on our lives and the environment we live in. We observed that the biggest question encountered in the pilot study was that the questions asked the students were asked in a single question, not as two separate questions, so that the students answered one question and skipped the other question. About this problem, the questions were arranged. It was noticed that the worksheet was wasted with too large spaces and shapes, contrary to the principle of economy, and to correct this issue, the spaces and shapes left for the answers of the students were resized. The questions asked were also made clearer and the worksheet was given its final form.

Data Collection Tools and Data Analysis

Questions developed and used as a data collection tool in the study were prepared by considering the achievements in the sub-learning domains of the Data Processing learning field. Since the problem of the study is to determine the students' perceptions of the data subject at the basic level, it is revealed the perceptions of the eighth-grade students about the achievements in data processing. The questions were prepared according to Data Processing learning domain acquisitions in the secondary school mathematics curriculum because eighth grade students learned all the data processing gains in the curriculum. The questions in the prepared worksheet were examined by experts in the fields related to content validity and reliability. A pilot study was made before actual study with the participation of eight students and the questions were applied in the classroom environment with a time limit of 40 minutes which is one class hour. In the pilot study, a 10-minute interview was held with the students to whom the questions were applied, and then the questions were given their final form. When answers given to the questions by students were examined, it was seen that the answers given to the two questions were the same with other questions and two questions with low content validity were removed. In this study, 11 open-ended questions were used as the data collection tool.

Context analysis is used for data analysis and analyzing of in-depth interviews are made by researcher. Content analysis is a type of qualitative analysis that helps to reveal hidden codes in data (Fraenkel & Wallen, 2009). The basic goal in content analysis is to reach concepts and relations that can explain the gathered data. Data that are summarized and interpreted in descriptive analysis are more deeply analyzed in content analysis. The analysis of the data was done with the content analysis method. In this process first, the opinions of the interviewed participants were analyzed and put into written form. Secondly, answers given by the students to the questions from worksheet were coded. The written data were coded by the researcher according to the sub-problems of the research. Then, the data were re-coded by two coders and the reliability calculations were made. In the calculation of consensus among coders, the value obtained with the formula [consensus / (consensus + disagreement) x100] was calculated as 85.9% (Miles & Huberman, 1994). The data from the students' worksheets were analyzed separately. During the analysis process, repeated analyzes were made and revised by taking expert opinion. In addition, the changes made in the studies on the codes during the analysis process were recorded historically from the beginning to the end of the analysis, and the connection of the thematized data with the original data was tried to be preserved. In other words, the data obtained from all data collection tools were combined in the association stage. After the analysis, separate codes were created by the researchers in line with the answers of the students. In this context, some students' views were shared in their own words to make the findings clearer and more understandable. Codes/reasons tables for the coding were created. The obtained data are also presented in the text as frequency values and sentences from students' answers were given as sample sentences. In the study, students were selected as S1, S2, S3, S4 etc. and analyzes were presented with these codes. The questions, which were rearranged in line with expert opinions, were applied to the students with the participation of the researcher and total of 80 min which are two class hours were given to answer questions. For keeping children's attention, news about global warming and wildfires in Turkey was watched and discussed. In the first 40 minutes, students answered questions about global warming and wildfires, while in the second 40 minutes they answered questions about data processing learning domain. Students took a break between these classes and discussed about topic at break time. The answers given by the students to the questions were divided into categories in terms of accuracy, and the number of students in the categories was presented in the findings section in tables.

RESULTS

"What do you think a world without trees would be like? Please explain." The answers given to the question were subjected to content analysis, and percentage (%) and frequency (f) values are presented in Table 1.

Table 1. "What do you think a world without trees would be like? Please explain."

Codes / Reasons	f	%	Sample Sentences
The amount of oxygen would be insufficient	16	20,77	There would be no environment for oxygen to be regenerated, and some animals lost their lives.
Forming the basis of life	13	16,88	Can't live, can't breathe, lots of wildfires, lots of diseases, lots of deaths...
Having difficulty during breathing	8	10,38	I think it would not be possible to breathe, so it was very difficult to breathe from the fumes of the exhausts of the cars and factory chimneys..
There would be desertification and drought	4	5,19	We could not get clean air, diseases would multiply, our country would become dry and desert.
Negatively affect the generation of animals	4	5,19	I think there would be no world without trees, people could not live, could not breathe, there would be no trees and no animals.
Would cause disease	4	5,19	It can cause various diseases due to lack of oxygen and it brings a lot of natural disasters after it.
There would be more than one natural disaster	4	5,19	It would be bad constant floods, earthquakes, etc. there would be natural disasters and it would be unbearable, I can't imagine an environment without trees.
Green areas would be less	3	3,89	If there is a world without trees, there will be no green place.
The amount of carbon dioxide increased	3	3,89	The world would be low in oxygen and high in carbon dioxide.
Global warming would increase	3	3,89	If there were no trees, global warming would increase and the world would become uninhabitable.
There would be no Earth without trees	2	2,59	I don't think there would be Earth without trees.
Would cause wildfires	2	2,59	There would be fires, no life.
There would be no books	1	1,29	A world without trees; would be without oxygen, without books and without protection.
Would be unprotected	1	1,29	A world without trees; would be without oxygen, without books and without protection.
Exhaust fumes would increase	1	1,29	I think it was impossible to breathe, so it was very difficult to breathe from the smoke of the exhausts of the cars, from the smokes of the factory chimneys.
Factory fumes would rise	1	1,29	I think it was impossible to breathe, so it was very difficult to breathe from the smoke of the exhausts of the cars, from the smokes of the factory chimneys.
Increased use of gas masks	1	1,29	People can't breathe, everyone would be walking around in gas masks.
It would be a creepy world	1	1,29	It would be very creepy flowers insects birds squirrels etc. What will animals do?
Afforestation should be done	1	1,29	I wish the municipality would plant trees instead of concreting.
It would be a formless and colorless world	1	1,29	It would be formless and colorless in appearance, and it would be bad for people's health.
There would be no clean air	1	1,29	I think it's like there would be no breath, because without trees or flowers, there would be no fresh air.
There would be no happiness and peace	1	1,29	A world without trees would be the worst thing in my life, because trees allow us to live for ourselves, trees give us peace and make our world beautiful.
Would be wars for water resources	1	1,29	Without plateaus, gardens and forests, global warming will increase and the world will be at risk with desertification and drought. If water is found somewhere, countries will be at war.

As can be seen in Table 1, it is seen that most of the students interpreted the question of what a world without trees would be like in the first question, regarding the lack of oxygen. Another code, the basis of life, was associated with a treeless world by most students. There are four participants who think that there will be desertification in the world because of treelessness. Other participants also mentioned that green areas will be less, and global warming will increase. In Table 2a, the students' answers for the "What can be reason of wildfires?".

Table 2a. "What can be reason of wildfires?"

Codes / Reasons	f	%
Glass shards	21	32,81
Not putting out the fires	14	21,87
Global warming	5	7,81
Cigarettes	4	6,25
Wildfires	3	4,68
Weather events	3	4,68
Plastic wastes	3	4,68
Unconsciousness of people	2	3,12
Carelessness of people	2	3,12
Waste thrown into the forest	2	3,12
Extremely hot weather	1	1,56
Windy weather	1	1,56
Uncontrolled fires	1	1,56
Objects that can reflect light	1	1,56
Environmental pollution	1	1,56

As seen in Table 2a, the students mostly associated the causes of wildfires with glass shards. Another most mentioned answer is about not putting out the fires. Regarding this answer, at the end of the application, the students gave examples from the situations they encountered. Five students also stated that global warming causes wildfires. In addition, four students gave the information that cigarettes can ignite bushes and start a fire. In Table 2b, "What kind of questions would you ask for research about wildfires?" regarding the causes of wildfires. The answers given to the question were analyzed.

Table 2b. "What kind of questions would you ask for research about wildfires?"

Codes	f	%	Sample Research Questions
Causes of wildfires	5	13,88	What are the main causes of wildfires?
No answer	4	11,11	-
What they pay attention to while having a picnic	4	11,11	To do research on this, I would have people talk about what they do when they went on a picnic.
Consequences of leaving glass shards in the forest	3	8,33	What does it cost to leave glass shards in the forest?
Ways to prevent wildfires	3	8,33	What can we do to prevent wildfires?
Effect of glass shards on wildfires	2	5,55	What problems does glass shards in the forest cause?
Throwing garbage into nature	2	5,55	Why are you throwing garbage to nature?
The reason for people's unresponsiveness to wildfires	2	5,55	If I had researched about it, "Why?" I would ask the question. "Why do we sit and watch?" "Why is nobody doing anything?" or "Why?", "Why do you think they do this?"
Measures to be taken to prevent wildfires	2	5,55	How can we prevent wildfires?
Putting out fire	1	2,77	When you go to the forest, do you put out the fire or collect the garbage?
Reasons why people pollute the environment	1	2,77	Why do you throw garbage to the forests?
Picking up the garbage	1	2,77	What do you do with the glass bottled drinks after you drink it?
Need of nature	1	2,77	Nature does not need us, we need nature. Why are we doing this?
Anthropogenic causes	1	2,77	What are the things that people cause?
Unnecessary use of oxygen	1	2,77	Why don't we care about forests? Why are you wasting your oxygen?
Things to do to extinguish wildfires	1	2,77	What can we do to put out wildfires?
Measures to be taken to protect forests	1	2,77	What can we do to protect forests?
Causes of deforestation	1	2,77	Why are forests disappearing?

According to Table 2b, it was seen that five of the students asked questions about researching wildfires, four of them asked questions about what they were doing while having a picnic, and three students each asked questions about the effect of glass shards on wildfires and the consequences of leaving it in the forest.

Table 3. "Which of the reasons you wrote is main cause of wildfires?"

Codes / Reasons	f	%
Glass shards	13	27,65
Fires and ashes	8	17,02
People giving harm to nature	8	17,02
Environmental pollution	3	6,38
Plastics	3	6,38
Global warming	2	4,25
Cigarettes	2	4,25
Weather events	1	2,12
People being unconscious	1	2,12
Deliberate tree felling	1	2,12
Arsoning forests	1	2,12
Burning bushes uncontrollably	1	2,12
Batteries	1	2,12
Sparks driven by strong winds	1	2,12
Temperature	1	2,12

According to the data in Table 3, the students think that the most common cause of deforestation is glass shards. When the other codes in the table are examined, it is seen that most of the answers given are human-induced factors. The conclusion that can be drawn from answers is that the students think most of the wildfires are caused by humans.

Table 4. "What measures can be taken to prevent wildfires?"

Codes	f	%
Collecting glass shards from forests	9	14,06
Keeping the environment clean and orderly	9	14,06
Complete extinguishing of fire and ashes	7	10,93
Increasing afforestation	5	7,81
Prevention of smoking	3	4,68
Increasing penalties	2	3,12
Increasing the number of trash cans	2	3,12
Not throwing out chemical wastes	2	3,12
Starting controlled fires	2	3,12
Taking forests under surveillance	2	3,12
Placing warning signs	2	3,12
Not leaving flammable materials in nature	2	3,12
Cessation of uncontrolled felling of trees	1	1,56
Creating special areas for glass and plastic wastes	1	1,56
Warning of polluters	1	1,56
Creation of a supervisory body	1	1,56
Not throwing waste materials into nature	1	1,56
Installing filters on factory chimneys	1	1,56
Increasing security	1	1,56
Prohibition of drinking with glass bottles in forests	1	1,56
Informing people	1	1,56
Raising people's awareness about environmental education	1	1,56
Setting strict rules	1	1,56
Does not have a thought about subject	1	1,56
Aiming to slow down global warming	1	1,56
Taking measures to prevent greenhouse effect	1	1,56
Irrigation activities for forests	1	1,56
Conservation of green places	1	1,56
Roadside closure	1	1,56

When Table 4 is examined, it is seen that the students attach importance to the collecting glass shards and keep the environment clean and orderly to prevent wildfires. As another precaution, students think that not extinguishing the fires in various activities may cause wildfires, and therefore, extinguishing the fires and ashes will prevent wildfires. The opinions of some students regarding these are as follows.

"I see the children were drinking soda, then throwing and breaking the bottles, those glasses always cause the grass to burn, so there is a fire. Our forests won't burn if we don't throw glass around and smash bottles like those kids." (S22) – Collecting glass shards

"If we don't throw our garbage around and collect the garbage we see and then warn those who throw garbage on the ground, they will be clean like us, so there will be no fire." (S11) – Keeping the environment clean and orderly

"If we put out the fire we lit well when we go to the picnic, there will be no fire." (S6) – Extinguishing of fire and ashes

Table 5. "What can we do to stop global warming? Explain in your own words."

Codes	f	%	Sample Sentences
Increasing the use of filters	9	18,36	Planting, filtering all kinds of vehicles, in short, trying not to disturb the balance of the world before us
Reducing the use of deodorants and perfumes	8	16,32	Not using perfumes and deodorants, releasing greenhouse effect, not using fossil fuels
Afforestation	6	12,24	Let's increase the number of trees
Preventing unnecessary felling of trees	2	4,08	We must ensure that trees are not felling unnecessarily
Extinguishing fires in nature	2	4,08	We can collect shards of glass and plastic bottles, we can put out unquenched fires
Increasing using of electric vehicle	2	4,08	We should use bicycles and electric vehicles instead of motor vehicles
Reducing using of fossil fuels	2	4,08	It can be ensured that fossil fuels are not used
To work in direction of reducing greenhouse effect	2	4,08	Perfumes and deodorants should not be used, greenhouse gases should be released, fossil fuels should not be used
Using public transport	2	4,08	We can reduce the exhausts. For example, we can use public transportation instead of using our own cars
Using of renewable energy sources	2	4,08	Reducing greenhouse effect against global warming and using renewable resources
Reducing the use of substances that harm atmosphere and increasing the use of useful substances	1	2,04	In my opinion, we should refrain from using all kinds of substances that cause air pollution and harm the atmosphere, and on the contrary, we should use substances that are beneficial
Not throwing glass shards into forests or the environment	1	2,04	Not throwing garbage in the forests or the environment, especially not throwing glass
Collecting glass and plastic wastes	1	2,04	We can collect shards of glass and plastic bottles; we can put out unquenched fires
Not to litter the environment or the forests	1	2,04	Not throwing garbage in the forests or the environment, especially not throwing glass
Increasing the use of natural gas	1	2,04	We must literally switch to electricity and gas
Installing mufflers and filters on exhaust pipes	1	2,04	The exhaust pipes must be fitted with a muffler and a filter
Transition from fossil fuel cars to electric cars	1	2,04	We can move from cars with internal combustion engines to electric cars
Raising people's awareness	1	2,04	To raise awareness of people (punish those who do not want to understand)
Reducing paper waste to zero	1	2,04	Paper should not be wasted too much and trees should not be cut down
Building places where chemical wastes can be disposed	1	2,04	Trees should not be cut irregularly, but a place for chemical waste should be made
Ensuring use of natural gas in small towns	1	2,04	I think that the flow of natural gas to small towns by installing filters on the chimneys has a positive effect on the nature

Using bicycles instead motor vehicles	1	2,04	We should use bicycles and electric vehicles instead of motor vehicles

According to Table 5, students think that a measure that can be taken against global warming is to install filters on all vehicles and factories with harmful waste. Additionally, they think that reducing the use of perfumes and deodorants is a measure that can be taken against global warming.

Students mentioned various concepts such as "greenhouse effect" and "fossil fuels" and stated that such things upset the balance of the world and should not be used. When the answers given to the measures that can be taken against global warming are examined, it is seen that the students are aware of the situations occurring in their environment and they can convey these in the sentences they have formed.

Table 6. "Which graph do you think is clearer and more understandable? Why?" and "Which graphic do you think might be less accurate? Why?"

Graph Type	Easy to Understand	Hard to Understand
Column Graphs	13	1
Pie Graphs	5	19
Line Graphs	11	6

Looking at Table 6, it was revealed that the students found the column and line graphs understandable and useful, but the circle graph reflected the reality poorly. Some students' views on graphics are as follows:

"When we determine the numbers, it is easy to draw a column chart on squared paper and I can understand it easily." (S8) – Column chart / Clear

"To calculate the circle graph, I must calculate percentages, I also must play with angles. I understand it better than the circle chart because I like calculating." (S14) – Circle graphic / Clear

"To draw the line graph, I first identify the points according to the given ones, then connect the dots so it ends right away." (S2) – Line graph/Clear

"I make a line instead of a column chart, it looks nicer and clearer. What's given in the column chart doesn't look right." (S6) – Column chart / Reflecting the reality less

"What's on the circle graph is hard to understand, and I don't think the numbers there are real in the circle segment." (S18) – Circle graphic/Reflecting the reality less

"The lines confuse me; I can't understand the graph. I think it was misplaced." (S23) – Line graph / Reflecting the truth less

Table 7. Scoring of graphic drawings

	Column Graphs	Line Graphs	Pie Graphs
S1	2	2	2
S2	3	3	0
S3	2	2	2
S4	2	2	0
S5	2	2	2
S6	1	2	0
S7	3	2	0
S8	3	1	0
S9	2	2	2
S10	1	1	0
S11	2	2	2
S12	2	2	0
S13	2	2	0
S14	2	3	3
S15	1	1	0
S16	2	2	0
S17	3	3	0
S18	3	3	0

S19	2	2	3
S20	3	3	3
S21	1	1	0
S22	2	2	0
S23	3	2	0
S24	2	3	3
S25	2	3	3
S26	2	3	3
S27	2	2	3

In Table 7, the graphic drawings made by the students are scored as "0=No drawing, 1=Wrong drawing, 2=Missing drawing, 3=Correct drawing". When the scores were examined, it was concluded that most of the students could not draw the circle graph. Regardless of the students' ability to draw column and line graphs, their inability to create the circle graph according to the given ones and their inability to answer the questions asked about the circle graph, "M.7.3.3.1. In a circle, the center determines the angles, the arcs it sees, and the relationships between the angle measures." and "M.7.1.5.4. in the learning domain of numbers and operations. It solves problems with percentages." It turned out that he did not fully learn his achievements.

In general terms, it was seen that the students were successful in drawing line graphs with an average score of 2.14, while the column graph took the second place with an average of 2.11 points. Although the column and line graphs created by the students have deficiencies in general, 14 students in the class did not draw the circle graph. It was concluded that the students who drew the circle graph correctly had problems in drawing other graphs. Only a student drew all the graphs correctly.

DISCUSSION and CONCLUSIONS

Considering the results of this study, which was conducted to determine the achievements and learning levels related to the subject that students are expected to reach in the field of data processing learning, it was seen that the students could not reach some of the examined acquisitions sufficiently. As a result of the data obtained, it was concluded that the students could interpret the line and column graphs of up to three data groups show the data with column, circle or line graphs, but they could not make appropriate conversions between these representations, especially when converting them to circle graphs. Another result was that the students could not place the data correctly or did not pay attention to the units while creating the column and line graphs. Additionally, some students had some problems in creating a circle graph.

In the study, students; It is among the results that they have a high level of awareness of global warming and deforestation, 15% of the class have problems with creating a column graph, this ratio is also maintained in line graphs, and 56% of the class have problems with converting to a circle graph. In support of this, Selamet (2014), in his study with the fifth-grade students, revealed that the students had the most successful results for line graphics. It was revealed that thirty-seven percent of the students knew how to interpret the given data, but made mistakes or had problems when asked to create graphs with this data.

Wu (2004) stated that students have basic graph solving skills and students are unsuccessful in evaluating the graphs. Yayla and Ozsevgec (2014) showed in their study with 6th, 7th, and 8th grade students that the ability to create and interpret graphs is low in 6th grades. In addition, Bayazit (2011) concluded in his study with pre-service teachers that pre-service teachers have difficulties in understanding and interpreting the relationships between variables while reading graphics. Interpreting the results obtained in statistical literacy in the context of graphs is considered important (Gal & Garfield, 1997; Hovermill, Beaudrie, & Boschmans, 2014; Özmen, 2015; Watson, 2006). Although most of the class created correct or incomplete answer in the construction of line and column graphs, it was revealed that most of the students did not understand the question, left it blank or solved the question incorrectly when converting these graphs to circle graphs and in the part where they had to interpret the data with a circle graph. The reason for this may be that the graphic concepts did not take place in the minds of the students. When the students were asked which graph was clearer and more understandable regarding the graphs they created, most of the students stated that the

column graph was clearer and more understandable. The least understandable and clear one is indicated as a circle graph. When the students were asked the reason for this; They stated that to read the circle graph, it is necessary to do more operations than other graphs. The reason for the idea that the circle graph reflects the reality poorly may be due to factors such as the fact that the students do not actively see the circle graph in their daily lives or that the subject is less emphasized. In Yayla and Ozsevgec (2014), in their study on creating and interpreting line graphs, a student who has reached the end of the 8th grade stated that they have a certain experience by making graphic drawings in both the 7th and 8th grades in the science and technology courses and in other courses. Similarly, Friel et al. (2001) stated that students are more successful in reading the data than solving the problems about data. Fact that the 8th grade students were preparing for the high school transition exam during the period when the study data were collected and they solved numerous questions about the subjects during this preparation period may have positively affected their graphic-drawing skills as well as their graphic construction and interpretation skills, and thus the graph-drawing skills were more developed than the 7th grade students. Thy concluded that it may be overdeveloped. Considering the findings, it was concluded that the students had difficulties in the field of data processing and learning. For this, in the education process; it can be suggested that activities including research question generation, data collection, data editing and display, data analysis and interpretation should be given more space in classroom practices (Hacisalihoglu Karadeniz, 2016).

In the study, “What do you think a world without trees would be like? Please explain." It was revealed that 21% of the answers given by the participants to the question included the "oxygen amount" code, and 17 percent included the "creating the basis of life" code. From the answers given, it was revealed that the students gave answers to a question for more than one code. This may be because students have many thoughts about global warming and deforestation in their minds. Emli and Afacan (2017), it has been determined that students are familiar with global warming and students express global warming as dangerous and harmful. For improving student’s environmental education level, it was stated that interactive methods are important for an effective environmental education and that methods such as small group discussions, case studies, films or slides in which an ethical scenario is indicated, interactive videos, role playing, digital story and project can be used (Matthews & Riley, 1995). A result of the study is the realization that some students offer solutions to the problems and difficulties encountered, as innovative as today's conditions allow, and to prevent the problem. It is striking those 8 students stated that they should reduce the use of deodorant and perfume. While two of the students suggested stopping the use of fossil fuels, two students drew attention to the need for studies to reduce greenhouse gases. While two students stated that the use of public transportation should be increased, one student offered an increase in the use of bicycles instead of motor vehicles as a solution suggestion.

It was revealed that most of the students in the study group thought that the most common cause of wildfires was glass shards. Many students stated that glass shards started wildfires, and one student stated that glass creates a lens effect, collecting rays and burning dry grass and straw. Following the glass shards, fire and ashes were identified as another cause. Students in the study group; they have stated many times that unconscious fires and fires and ashes burned in picnic areas and then not extinguished properly cause wildfires. When students are asked to create questions to investigate the causes of wildfires; it was seen that they created questions about the causes of wildfires, what they pay attention to when having a picnic, ways to prevent wildfires and the consequences of leaving glass shards in the forests. All four students left this question blank. It was observed that they pointed out that the environment should be kept clean and tidy with the collecting glass shards to prevent wildfires.

Bargagliotti (2012) draws attention to how research problems should be created about how to collect appropriate data for a problem situation determined in statistics courses. In light of the findings obtained from the worksheet used within the scope of the study, it was concluded that 18 students were successful in producing research questions, and 5 students created questions without a research question. Hacisalihoglu Karadeniz (2016), on the other hand, revealed that students have difficulties producing research questions, collecting, organizing and displaying data, analyzing and interpreting

data, creating graphs, tables and schemas from different representations of data, and interpreting them. Although the students in the study group achieved better results in determining the research problem; they obtained results similar to those presented in the literature on organizing and displaying data, analyzing and interpreting data, creating and interpreting data using different representations.

The reason for these difficulties that secondary school students have experienced in the field of Data Processing may be that the way the graphics are displayed and the transitions between the graphics are not discussed in detail within the scope of the lessons taught, they are not applied and the lessons are not developed with different methods and techniques. For this reason, it can be suggested that mathematics teachers should focus on in-class activities that include open-ended graphic questions that will improve students' graphing skills and high-level thinking. It can be suggested that the subject covered is enriched with transitions between various display formats and graphics throughout the lessons, and the lesson is taught using different teaching strategies/methods and techniques. Because students are not familiar with open-ended questions, teachers' inclusion of qualitative graphic creation activities in lessons may contribute to students' thinking and help them associate graphics with daily life. Instructional practices can be enriched with materials related to the subject by giving examples to students from the environments they are in and the situations they encounter. Additionally, while providing students with experience in Data Processing, it can be suggested that more activities should be given to producing research questions, collecting, organizing and displaying data, analyzing data and interpreting these data. According to the results obtained within the scope of the study, it was seen that the students had problems with the subjects and graphics within the scope of the "Data Processing" learning domain. Considering the interdisciplinary importance of graphs, it can be suggested to examine students' graph perception in interdisciplinary studies. Also, environmental awareness of students can be improved by extending the use of out-of-school learning environments that will enable students to come into contact with nature and to learn by doing. By diversifying the methods used in teaching in school and out-of-school environments that including practice, research and discussion, students can better understand the importance of the environment. It is suggested that the information given within the scope of environmental education and the practices performed should be associated with daily life.

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