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# Evaluation of Multimedia Assisted Applications Designed According to 7e Learning Model on Student Opinions*

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**Abstract:** The aim of this study is to indicate students' views about a research which is oriented towards the phases of 7E learning model and multimedia supported practices in teaching of some concepts. The research was applied to 5th grade students who are educated in state school bound to National Education Ministry in the fall semester during the years 2014-2015. In the research, the unit "The Change of Matter" is taught with the help of multimedia supported practices according to 7E learning model. The research is qualitative approach and case study have been applied to this study. As a data collection tool, "Multimedia supported practices' Process Evaluation Form" which consists of open-ended questions is used. Content analysis is utilized while analyzing the data obtained from the result of multimedia supported practices' Process Evaluation Form. At the end of the research, it is revealed that information and communication technology ought to be used more and course materials which are designed so as to appeal more sense organs are important in Science teaching. Moreover, it is pointed out that the phases of 7E learning model frequently arouse curiosity among students. Encouraging students to study in groups makes many beneficial contributions to the communication among students as well as sparking them towards Science course through relating the past knowledge of the students with their daily life.

**Keywords:** *7E learning model; Information and communication technology; Multimedia; Science teaching.*

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## Introduction

In the age we live, education and teaching provided with traditional methods and tools have left education and teaching with multimedia applications realized using information-communication technologies. Information and communication technologies are used as tools to communicate with other people and bring products to the market, without expressing the thoughts of the learning-teaching

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individuals (Banerjee, Cole, Duflo and Linden, 2007). It is a system that collects under one roof multimedia applications, video-film, photo-picture, computer animations and simulations, audio files, hardware and programs required to combine computer-based digital information and programs (Alessi and Trollip, 2001).

The advantages provided by students and teachers in using multimedia-supported applications, which are products of information and communication technologies in educational environments, are expressed by many researchers (Song and Kang, 2012). The use of technology in the constructivist learning approach requires that students be in a position to support their thinking processes, not in the traditional way of conveying information, alleviating teacher role and focusing on teaching (Karaagaclı and Mahiroglu, 2005). Research has shown that science teaching can be learned from formal sources and at the same time it can enhance the learning quality of learners through teachers who plan their lessons using informal sources such as written, visual media, television programs, animations, simulations, video-films. Therefore, audiovisual tools and equipment are effective in science teaching (Diogo, António and Nilza, 2011; Tlhoaele, Hofman, Winnips and Beetsma, 2015).

In science class, the use of multimedia-supported applications has positively affected science teaching, the lessons have become more enjoyable, fun, and the knowledge learned using technological materials has become more conceivable (Albert, 2012; Arıkan, 2003; Ayvacı, Abdüsselam and Abdüsselam, 2012; Chang, 2007; Minaslı, 2009; Perkins, Moore, Podolefsky, Lancaster and Denison, 2011; Turkan, 2010). It is observed that using animation, simulation and video-films in science lessons affects science teaching, and students have contributed positively to the topics and concepts of the unit. These contributions can be expressed as academic achievement in the field of learning products, the attitude to the course and the development of scientific process skills (Akcay, Tuysuz and Feyzioglu, 2003; Akpınar and Ergin, 2005; Buyukkara, 2011; Copur ve Mogol, 2012; Ersahan, 2007; Gregorius, Santos, Dano and Gutierrez, 2010; Kaman, 2012; Karaduman, 2008; Kocak and Onen, 2012; Muri, 2011; Pektas, Celik, Katrancı and Kose, 2009; Popejoy, 2007).

Although the Scientific Curriculum revised by the Ministry of Education in 2013 does not point directly, it is based on the Constructivist learning approach. In order for the constructivist approach to be implemented in schools, teachers need to use a set of learning models that they can apply effectively and relatively easily (Ozmen, 2004). Different models such as 3E, 4E, 5E and 7E models are proposed for the use of constructivist learning approach in science teaching, which advocates that students make use of their previous experiences and preliminary knowledge to understand new situations. 7E learning model is an improved version of the 5E learning model (Bybee, 2003; Eisenkraft, 2003). Starting from 3E, each next cycle of the model is an expansion of the prior model. For instance, 7E cycle differs from the 5E in two ways. The *engage* phase in 5E is expanded into *elicit* and *engage*. Thus, more emphasis is placed on prior understanding and tacit knowledge that can be used as a basis for the learning to take place. Similarly, *elaborate* and *evaluate* phases are expanded into *elaborate*, *evaluate* and *extend* phases. "*The addition of the extend phase to the elaborate phase is intended to explicitly remind teachers of the importance for students to practice the transfer of learning*" (Eisenkraft, 2003). Finally, Eisenkraft proposed elicit, engage, explore, explain, elaborate, evaluate, and extend discrete elements for the 7E learning cycle and he said "*research on how people learn and the incorporation of that research into lesson plans and curriculum development demands that the 5E model be expanded to a 7E model*" (Eisenkraft, 2003). The primary aim of the 7E learning cycle is to highlight the increasing importance of provoking previous understandings and transferring the concepts to new contexts. In studies conducted with 3E, 4E, 5E and 7E models developed for the use of the constructivist approach in science teaching, it has been observed that the science lesson for students is more enjoyable, interesting and motivating and that students are positively developing their attitudes towards science lessons and that the learned information is effective in keeping in mind (Avcıoglu, 2008; Balım, Türkoguz, Aydın and Evrekli, 2012; Bilgin, Coskun and Aktas, 2013; Boddy, Watson and Aubusson, 2003; Buyukkara, 2011; Cepni, San, Gokdere and Kucuk, 2001; Dasdemir, 2013; Degirmencay, 2010; Demirezen, 2010; Gurbuz, 2012; Hırca, Calık and Seven, 2011; Kali and Linn,

2008; Polyiem, Nuangchalerm and Wongchantra, 2011; Ozmen, 2004; Pradhan and Mody, 2009; Saglam, 2006; Sarac, 2015; Shaheen and Kayani, 2015; Yenice, 2014).

In the literature, they have taken the opinions of 26 high school students and the physics teachers applying through interviews in the study they conducted for using the 7E learning model. As a result of the study, the results of the 7E learning model showed that the students increased their interest towards the lesson (Palic Sadoglu and Akdeniz, 2015). Gurbuz conducted a semi-structured interview for the steps and implementation of the 7E learning model with six middle school students (Gurbuz, 2012). As a result of interviews with middle school students, it was found that they developed a positive attitude towards the science course, but found that the 7E learning model had negative opinions that the students were not enough at some stages during the implementation. In the literature, it is not found that there are multi-media supported applications and students' opinions in the context of the 7E learning model of fifth grade students in secondary school. Accordingly, it can be said that the study will be unique, multi-media supported applications in the field and 7E learning model will contribute to the lecture about the use of the phases together. Particularly, it is considered that the students whose opinions about using the 7E learning model with technological materials will contribute to the education process and that the analysis of the teachers' practical competences will contribute to the literature critically.

The aim of this study is to indicate students' views about a research which is oriented towards the phases of 7E learning model and multimedia supported practices in teaching of some concepts that belong to to the parts. For this purpose, an answer was searched in the question "*What are the opinions of the students about the multimedia assisted practices used in science teaching and the stages of the 7E learning model?*"

## Method

Research has used phenomenology design from qualitative research designs. In case studies, it is generally aimed to reveal and interpret individual perceptions or perspectives related to a certain phenomenon (Creswell and Clark, 2011; Yıldırım and Simsek, 2011).

### *The Sample of the Study*

The study group of the study consisted of 46 students (24 males and 22 females) who were educated in the fifth grade of a junior high school affiliated to the Ministry of National Education in Istanbul in 2014-2015 academic year. These students are studying in two different classes. Experimental practice was followed in both classes in the same way. These two classes were determined by a random sample method among 13 classes at the 5th grade level in school. These two classes were determined by a random sampling method among a total of thirteen classes at the fifth grade level in school. In a random sample, it is assumed that each individual in the state has the same chance of being selected (Teddlie and Yu, 2013). Participants are between the ages of 10 and 11 and the necessary permission has been obtained from the Provincial Directorate of National Education for the implementation of the process evaluation form. The 7E learning model is explained in detail to the relevant Science Teaching teacher before the application and to all the students in both classes. In the implementation process, the multimedia-supported material that they would use at each stage of the 7E learning model was shown to the students and the course was taught together with the researcher and the Science Teacher.

### Data Collection Tool

"*7E Learning Model and Multimedia Assisted Applications Process Evaluation Form*" consisting of six open-ended questions is used in order to determine students' views on the use of technology in education and training, audiovisual and visual materials in education and training, multimedia supported applications and the steps and applications of 7E learning model and student

opinions were taken in writing. The questions on the form have been about the technology, audio and visual materials in education and training, multimedia supported practices and the steps of the 7E model. The prepared open-ended questions were examined by 3 field trainers specializing in science education and computer and instructional technologies and necessary adjustments were made in line with the recommendations of experts. According to this, since a question is not aimed at the purpose of the meaning, two questions are thought to cause unnecessary recurrence in one question and the question has been removed from the questionnaire form consisting of open-ended questions. Thus, the questionnaire consists of 6 questions.

**Actions Processed**

For the "*The Change of Matter*" unit in the study, the researchers prepared multimedia supported activities designed according to the 7E learning model. These activities have been applied to students in science class by a science teacher who has 12 years of experience and knows 7E learningmodel. The application is 5 weeks and it takes 20 lessons. "*The Change of Matter*" unit is about how to change the state of matter, melting, freezing, boiling, evaporation, coagulation, sublimation, ripening, distinguishing properties of matter, melting and freezing point, boiling point, heat and temperature and heat.

In the teaching process in practice, the sections and concepts of the unit related to the multi-homed materials consisting of pictures, experimental activity drawings, computer simulations and animations, video-film shootings and presentation files are explained to the students in order to realize the stages of the 7E learning model. Afterwards, "*7E Learning Model and Multimedia Supported Applications Process Evaluation Form*" was given to the students and their opinions about the steps of multimedia application and 7E learning model were taken in writing from the students.

## Analysis of Data

The content analysis method was used when analyzing the data obtained from the application of the form. The main purpose of content analysis is to reach concepts and associations that can explain collected data (Creswell and Clark, 2011). In the content analysis examination, they were coded separately by the first and third author in the field of educational researches. For the credibility of the codings, the formula of Reliability = Opinion Alliance / (Opinion Alliance + Opinion Separation) X 100 was applied on the coding made by both investigators (Miles and Huberman, 2002). The similarity percentage between the encodings made by the researchers was 85%. This ratio indicates that reliability is provided in terms of data analysis. The data generated according to the categorized categories in the coding were evaluated separately for each question and the closest meaningful expressions were identified and grouped and the same / similar response frequencies were calculated and tabulated. In addition, the written opinion forms received from each student are coded as $S_1$, $S_2$, $S_3$.....$S_{44}$, $S_{45}$ and $S_{46}$.

## Findings

In the form, the students were asked the first questionin in the classroom, "*Which technological tools and equipment do you use visually and audio visually?*" The answers of the students in writing to this question are shown in Figure 1.

During the education-training process, most students stated that they met with computers, projection equipment and experimental equipment. On the other hand, the students stated that they rarely met with the latest technological tools such as smart board and camera. 12 students stated that they did not answer the question asked or did not encounter any technological material. Some quotations from the students' expressions regarding the situations of encountering visual and auditory technological tools in the educational process are given below.

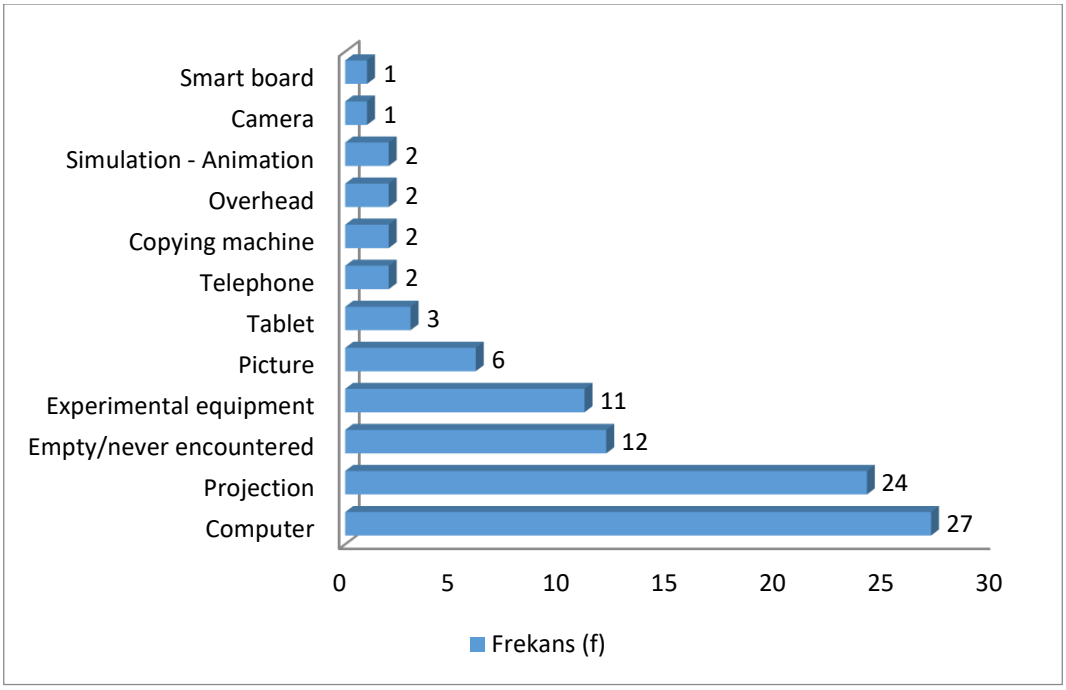


*Figure 1*. Visual and Auditory Technological Tools

$S_5$: *"Up to this time, I have compared computer and projection. Exploring something on the computer and watching something on the project is fun and memorable."*

$S_8$: *"Our first teacher in the first class gave us training on the project. We understood better than the education we did with the book. It was very good for me."*

$S_{11}$: *"I have not encountered any audiovisual and visual tools in the educational process until today."*

In the second part of the questionnaire, students were asked "*How do you generally evaluate multimedia-supported applications designed for the Science and Matter's Change Unit?*" The answers given by students in writing to this question are shown in Figure 2.

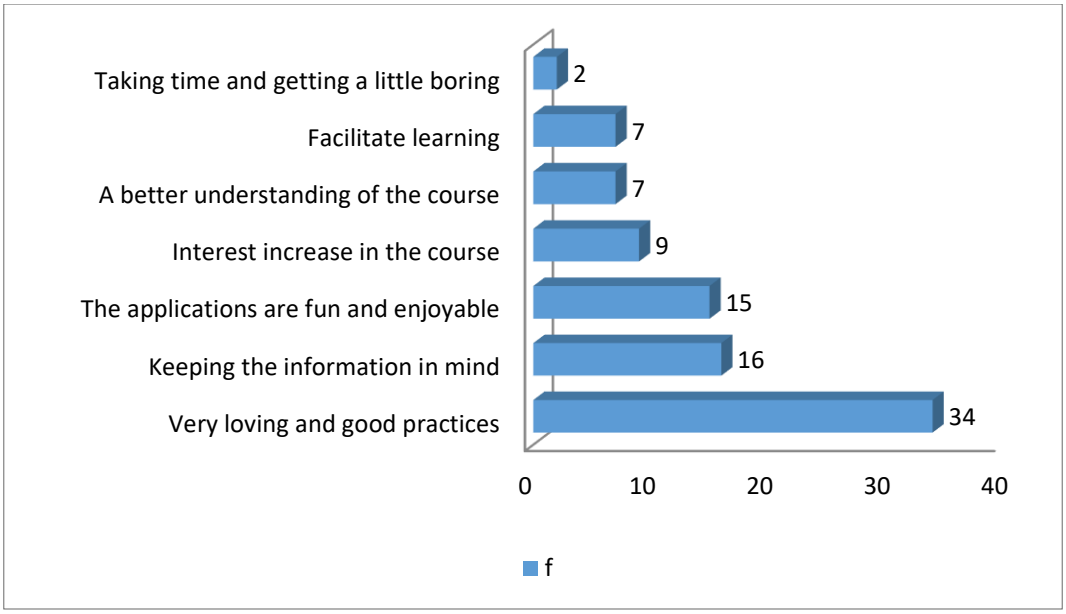


*Figure 2*. Evaluation of Designed Multimedia Supported Applications

Students expressed that they liked multimedia-supported applications designed for science exchange course and that they were good at applications and that they helped to make the information they learned better with the multimedia-supported applications, and they found the multimedia-supported applications fun and enjoyable. On the other hand, two students stated that multimedia-supported applications were a bit boring and took time. Some cites from the statements made by the students regarding the evaluation of multimedia-supported applications designed for the Matter's exchange unit are given below.

$S_7$: *"I think it's a very good way of teaching for students. Lessons become fun and educational with the multimedia system."*

$S_{26}$: *"I believe that the benefits of such applications are very much in us. Because we understand these things better with videos, pictures and animations, and he keeps better in our minds."*

$S_{35}$: *"I understand better with things like video, pictures and computer animations."*

For the third question in the form, students were asked, "*Do you think that the Multimedia Assisted Practices designed for the Science of Matter's Change Unit is beneficial to the students? How?* " The answers given by students in writing to this question are shown in Figure 3. There were

two students who stated that there was no benefit for multimedia applications and a student who was partially injured.

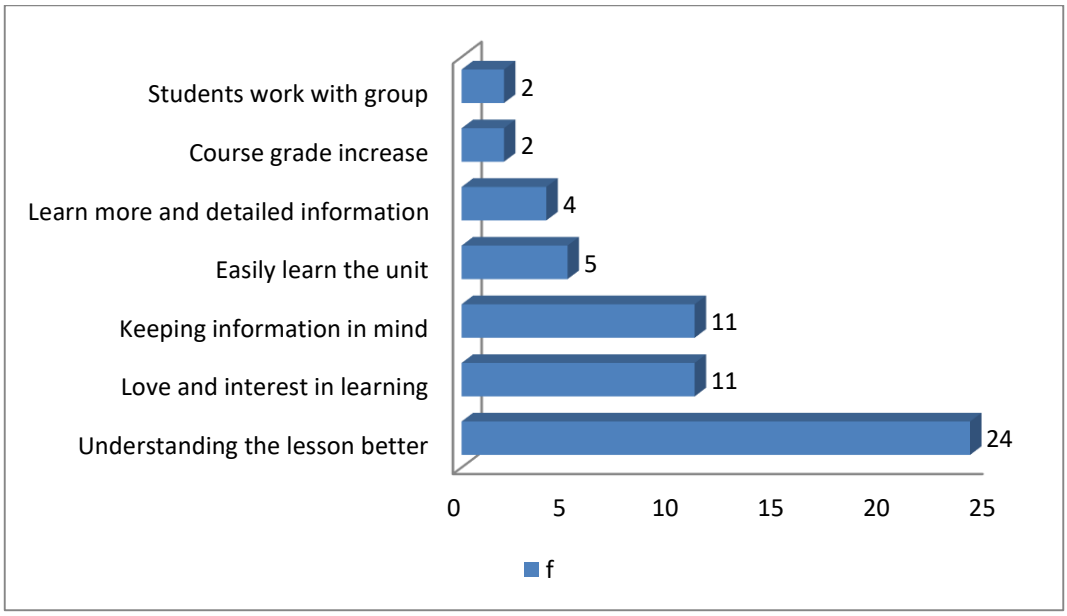


*Figure 3***.** Benefits of Designed Multimedia Assisted Applications

As regards the benefits of multimedia-supported practices, they expressed a better understanding of the lesson, liked the lesson, increased their knowledge of the lesson, and that the learners had a better lasting mind. Below are some excerpts from the statements made by students about the benefits of multimedia-supported applications designed for the science unit course unit.

$S_2$: *"Yes it was useful to me. School books were inadequate for lectures, but with this practice I understood better."*

$S_6$: *"Yes, it was worth it. I liked science lessons more. I got better at the science class when I got higher."*

$S_9$: *"Yes, there is. Thanks to them, I remember what I learned and I do not forget.*"

For the fourth question in the form, students were asked "*Do you want Multimedia Assisted Practices in other lessons?*" The answers given by students in writing to this question are shown in Figure 4.

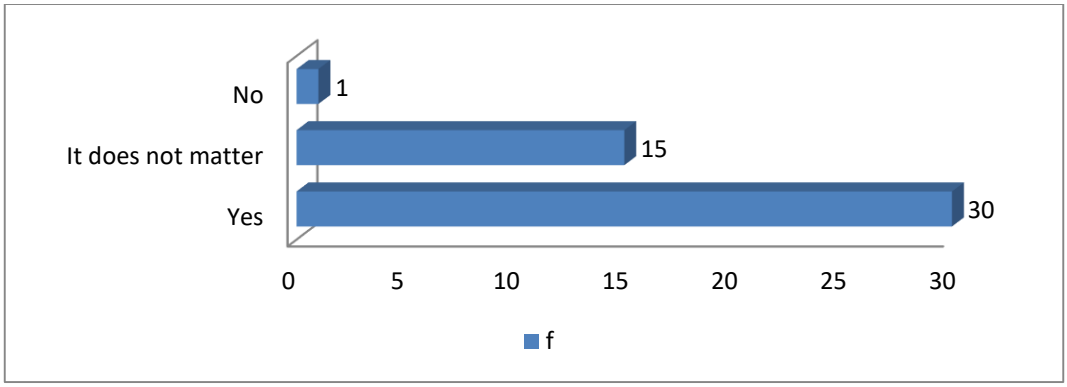


*Figure 4.* Demand for Multimedia Assisted Applications in Other Courses

30 of the students stated that they would like to apply multimedia-supported applications in other courses. A student does not want to apply multimedia applications in other courses. On the other hand, 15 students gave an unmistakable answer that means practicing or practicing. Some quote from the answers given in the other lessons to the multimedia-supported applications designed for the science course matter's exchange unit is given below.

$S_1$: *"Yes"*

$S_{15}$: *"It does not matter"*

$S_{42}$: *" No"*

The fifth question in the form was directed to students "*What are the positive or negative aspects of Multimedia Assisted Practices designed according to the 7E Learning Model?*" The positive responses of the students in writing to this question are shown in Figure 5.

While students demonstrate positive aspects of multimedia supported applications designed according to the 7E learning model; that they understood the lesson better, that the information learned was permanent, and that the lessons were more enjoyable.

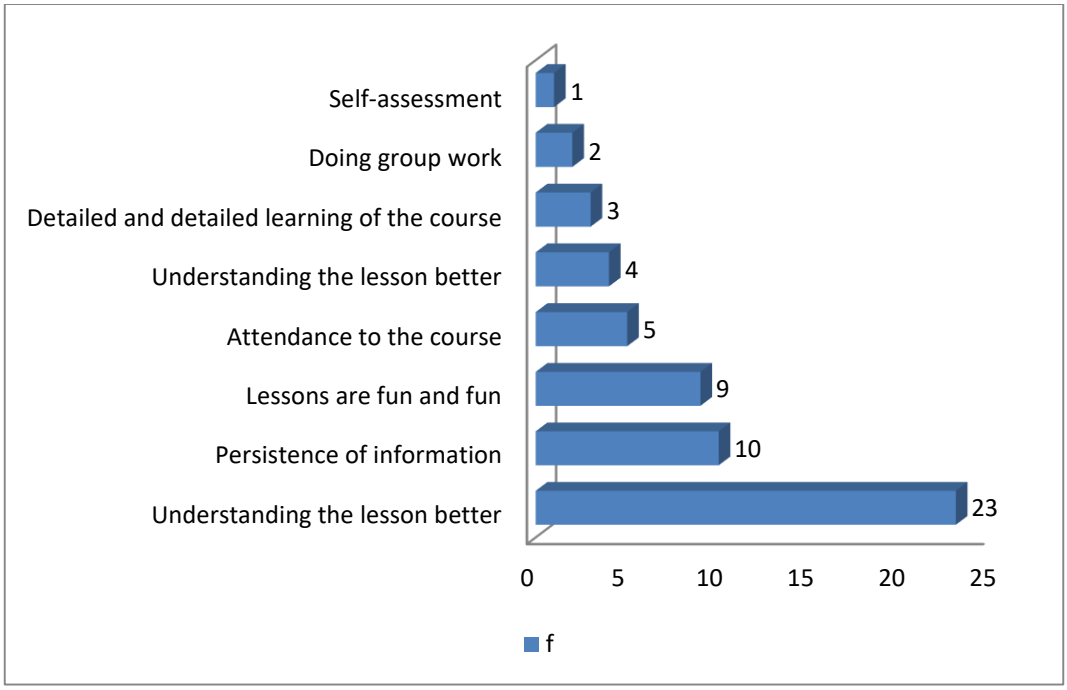


*Figure 5*. Positive Aspects of Designed Multimedia Assisted Applications

The negative responses of the students to the fifth question in writing are shown in Figure 6.

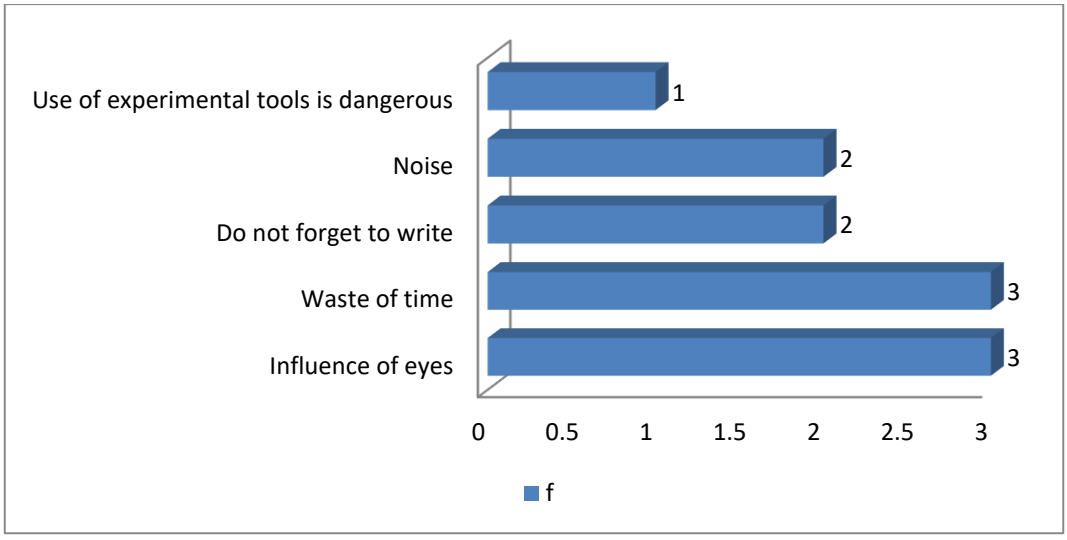


*Figure 6*. Negative Aspects of Designed Multimedia Assisted Applications

Students expressed the pain of their eyes most of the time when they pointed out the negative aspects of multimedia-supported practices, that they were a waste of time and that they forgot to write. Below are some excerpts from the statements made by the students regarding the positive or negative aspects of multimedia supported applications designed according to the 7E learning model.

$S_{13}$: *"There are positive aspects. Multimedia supported applications helped to keep this in mind. But it was slowing down."*

$S_{18}$: *"I understand the positive aspects better. I interpret the pictures better. No negative."*

$S_{44}$: *"I'm afraid of the booze burning."*

As a sixth in the form, students were asked "*Can you explain your thoughts on 7E Learning Models followed during Multimedia Assisted Practices?*" Students are required to respond individually to each stage in written form for evaluation. The results are shown in tables form.

• The thoughts of the students about the Elicit Stage (What we know) are shown in Figure 7.

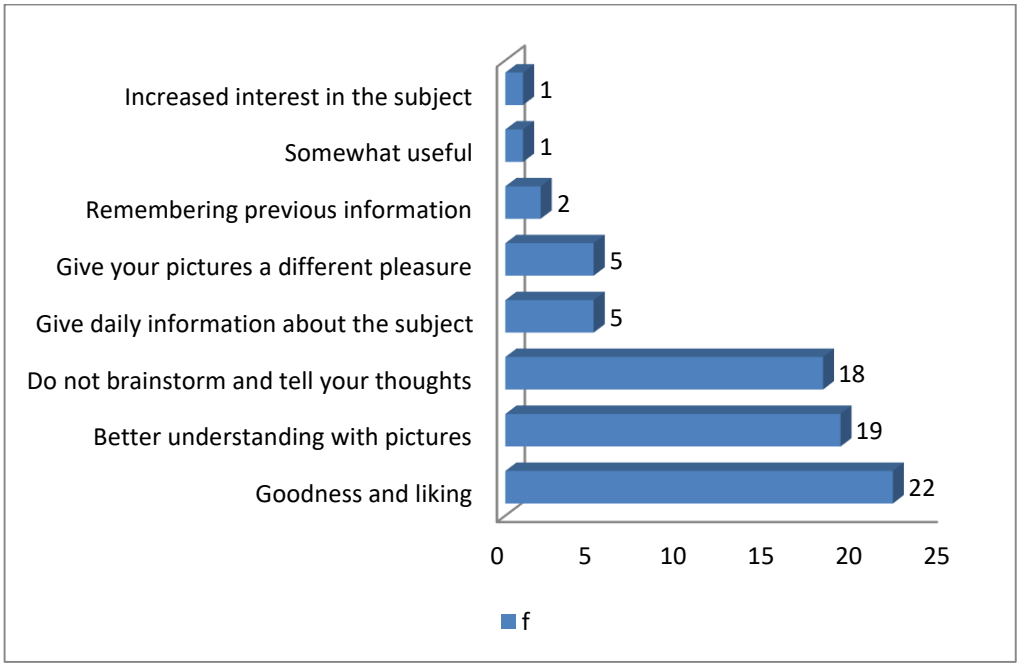


*Figure 7***.** Thinking of the students about the Elicit Stage.

Regarding the stage of Elicit; the students expressed that this phase is good, that they go to their likes, that they understand better what is shown in the pictures and brainstorm by sharing their thoughts about the pictures shown. Some cites from the statements made by the students about the elicit stage are given below.

$S_{16}$: *"I understand better with pictures. We make ideas as a group. Together we present our ideas. We are discussing what we understand from the pictures."*

$S_{27}$: *"I understand better by looking at pictures, expanding my interpretation."*

$S_{38}$: *"I remember seeing pictures beforehand."*

- The thoughts of the students about the Engage Stage (We are curious) is shown in Figure 8.

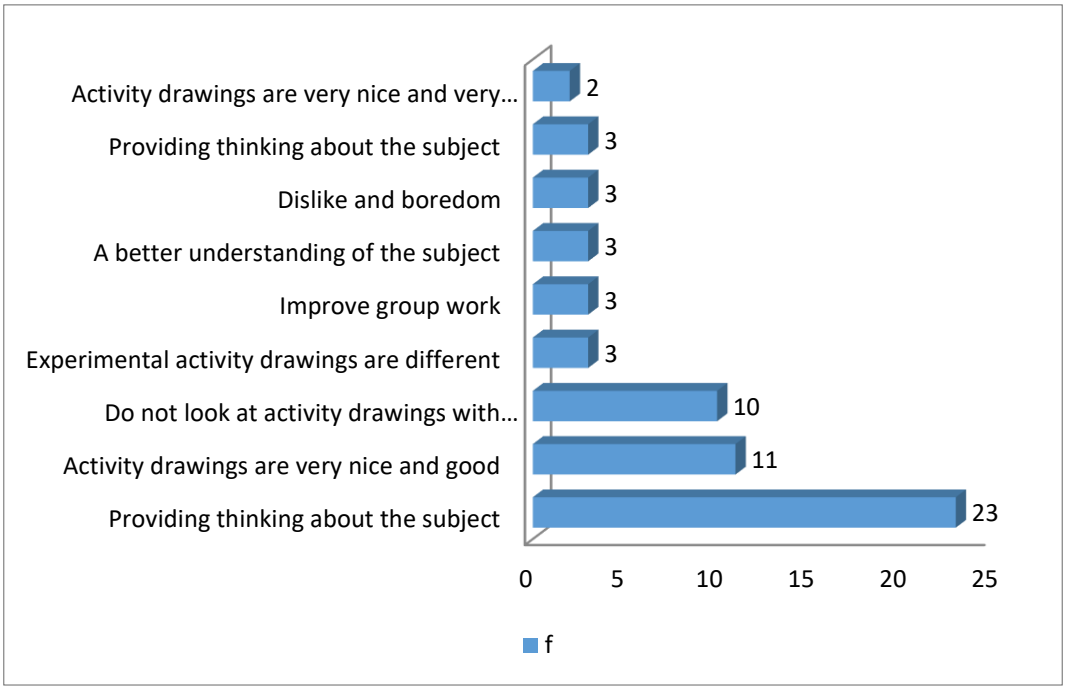


*Figure 8***.** Thinking of the students about the Engage Stage.

Regarding the stage of Engage; the students stated that they mostly think about the topic by means of experimental activity drawings which are mostly hidden, and that they give excitement to the lesson, which is the excitement of the activity drawings that are hidden. Some quotes from students' expressions about the arousal phase are given below.

$S_{20}$: *"I think, it's a delightful stage."*

S29: *"We tried to figure out what the students did in the experimental activity drawings. I think it was very beautiful."*

S41:*"We were having fun while filling in the empty template in the experimental activity drawings. We were making comments."*

• The thoughts of the students about the Explore Stage (Learning Story) are shown in Figure 9.

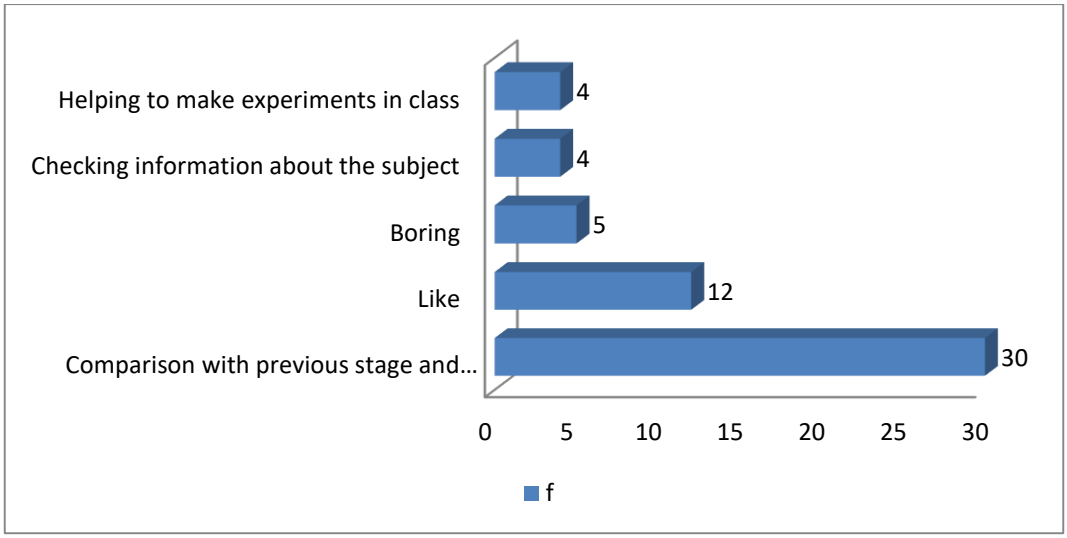


*Figure 9***.** Thinking of the students about the Explore Stage.

Regarding the stage of Explore; the students stated that they generally compare the expressions with the previous stage through clear experimental experimental activity drawings, check our own writings and correct our mistakes. Some students stated that they were a bit bored at this stage. Some quotations from the students about the stage of explore are given below.

S22:*"We compare our expressions with the expressions in the experimental activity drawings, and if we do, we better understand our faults and deficiencies."*

S33: *"When we received the answers in the drawings, we saw and corrected them."*

S40: *"I did not make much use of the experimental activity drawings in this section."*

• Students' thoughts about the Explain Stage (We are learning new information) are shown in Figure 10.

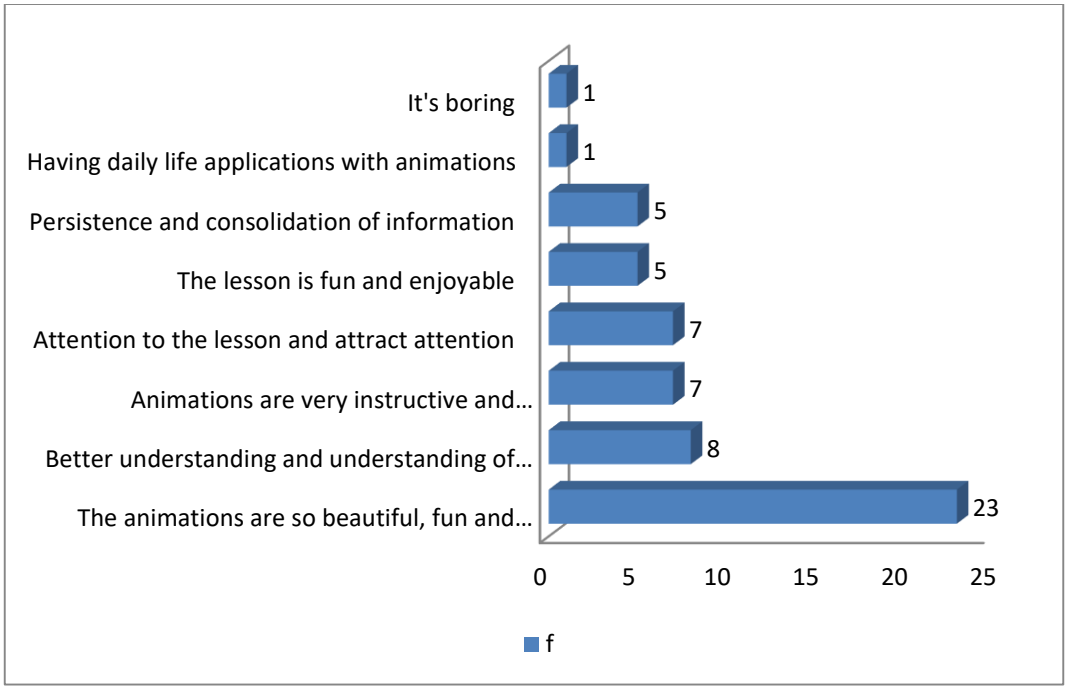


*Figure 10.* Thinking of the students about the Explain Stage.

Regarding the stage of Explain; students generally stated that computer animations and simulations shown are very exciting, very beautiful and funny, that they understand better what they are doing with these materials, and that computer animations and simulations are very instructive, informative, and interesting to the lesson. Some citations from the statements of the students about the explain stage are given below.

$S_{12}$: *"I understand better when we learn what we do not know, from animations to videos, and from the teacher's explanation."*

$S_{17}$: *"It was my favorite part of multi-media supported applications."*

$S_{37}$: *"I think, we've done more fun lessons with animations."*

• The thoughts of the students about the Elaborate Stage (Learn More) are shown in Figure 11.

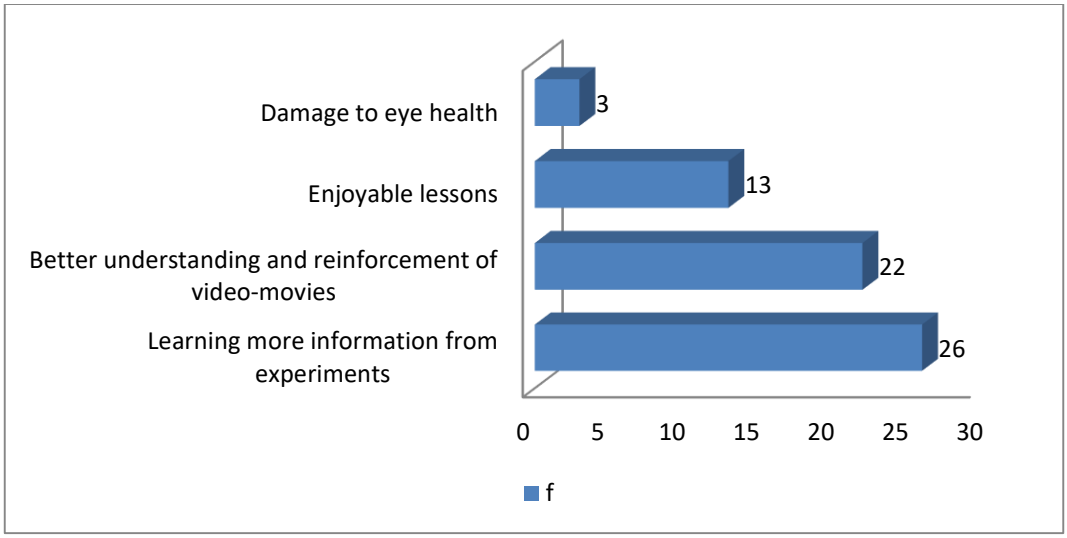


*Figure 11*. Thinking of the students about the Elaborate Stage.

Regarding the stage of Elaborate; in general, students have expressed that they learn more, understand and reinforce the subject, that video-films and lessons are fun, video-films are very beautiful, and they like them very much. Some of the statements from the students about the expansion phase are given below.

$S_{20}$: *"I like the videos and movies we watched about the subject very much. It was a very instructive step."*

$S_{28}$: *"It was so beautiful that we had more knowledge with the experiments."*

$S_{39}$: *"I liked the videos we watched, the lesson was fun."*

• The thoughts of the students about the Evaluate Stage (We check what we learn) are shown in Figure 12.

Regarding the stage of Evaluate; students generally stated that they carefully checked the questions displayed in the presentation file and that they checked their learning and that the different types of questions shown in the presentation file were very enjoyable, funny, instructive, informative and that they learned better and reinforced their knowledge. Below are some citations from the students' statements about the evaluate stage.

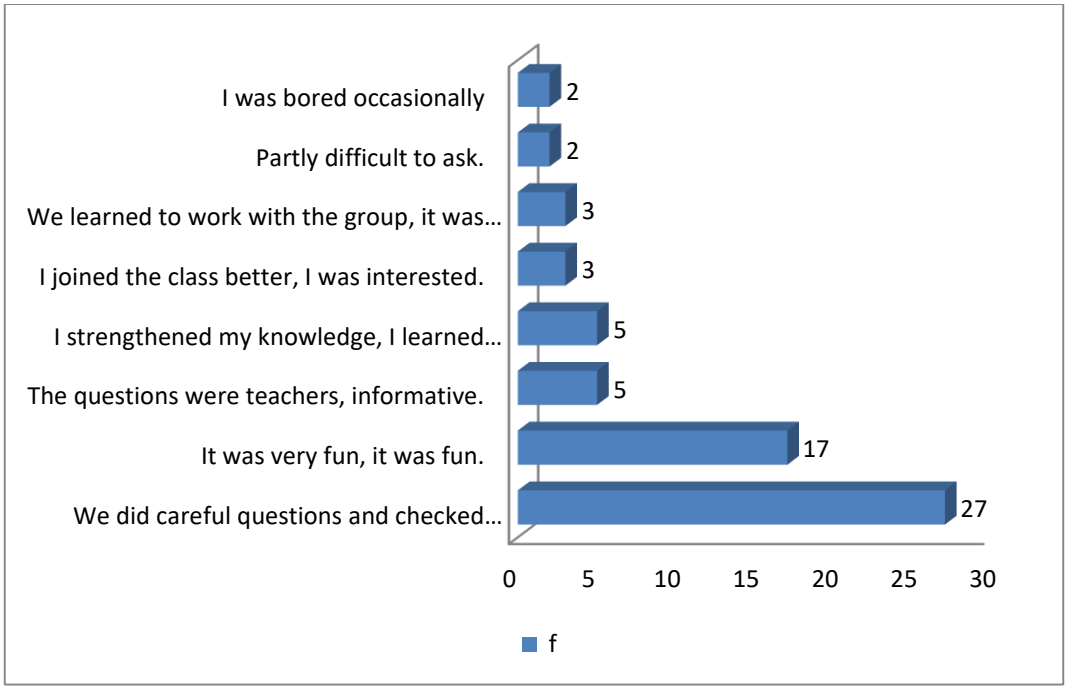


*Figure 12***.** Thinking of the students about the Evaluate Stage.

$S_{31}$: *"We remembered our inquiries with questions and checked our knowledge."*

$S_{32}$: *"We strengthened what we learned better."*

$S_{43}$: *"With the group we solved the questions and checked what we learned."*

The thoughts of the students about the Extend Stage (We Follow Daily Life) are shown in Figure 13.

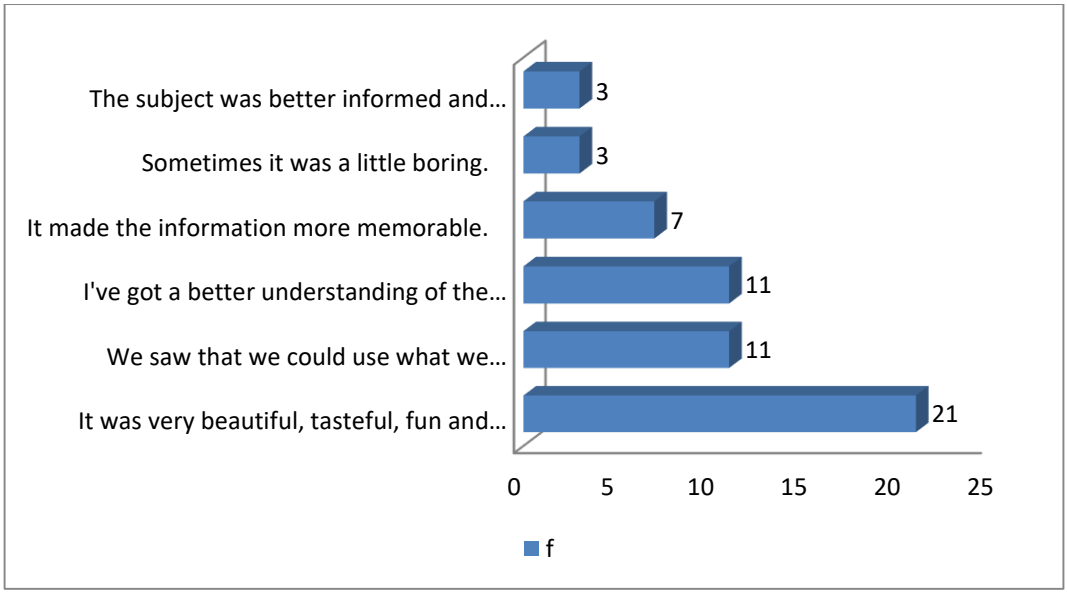


*Figure 13***.** Thinking of the students about the Extend Stage.

Regarding the stage of Extend; in general, the students are very interested in the events in everyday life shown in the presentation file, that they are beautiful, fun and funny, that they use the information they learned in the science course in real life and they know how important the science course is and that the information learned through the examples and events shown in the presentation file have become more permanent in mind. Some abstracts from the students' statements about the extendstage are given below.

$S_{34}$: *"We gave daily examples of daily life to the things we worked on. I really like. I understand that we use what we learn in daily life."*

$S_{35}$: *"We were learning daily science events."*

$S_{46}$: *"This stage enabled us to think more of what we learned by seeing it with everyday examples."*

## Results

In the study, students generally expressed that they liked multimedia supported applications very much, that they found fun and that the lessons learned were memorable. Accordingly, it can be said that using multimedia supported applications in science education affects science education positively, the lessons become more enjoyable and fun, and the learned information is more in this way. These results are similar to the results of the study conducted by Ozmen (2004). Ozmen emphasized that the use of video-films in science lessons affects science teaching and contributes positively to unit topics and concepts in terms of constructivist learning approach.

The result of using multimedia supported applications in science course has affected science teaching positively, the lessons have become more enjoyable and funny, and the knowledge learned using technological materials has been more in mind (Albert, 2012; Boddy, Watson and Aubusson, 2003; Chang, 2007; Minaslı, 2009; Pradhan and Mody, 2009; Türkan, 2010). The use of animation, simulation and video-films in science lessons, the use of visual and auditory materials affects science teaching, and the topics and concepts of the unit contribute positively to the meaning (Akcay and etc.,

2003; Akpınar and Ergin, 2005; Arıkan, 2003; Ayvacı and etc., 2012; Buyukkara, 2011; Copur and Mogol, 2012; Ersahan, 2007; Gregorius and etc., 2010; Kaman, 2012; Karaduman, 2008; Muri, 2011; Pektaş and etc., 2009; Perkins and etc., 2011; Popejoy, 2007). The findings in this study are in harmony with each other.

The students expressed the view that the use of multimedia-supported applications in other courses, not only in the Science course, is necessary in the education and training process. Kali and Linn (2008) used visual activities in science and mathematics lessons to study the effects of visual activities on learning in the students, and stated that visual activities play an important role in supporting science learning. Accordingly, it is thought that the use of multimedia-supported applications is considered necessary in the education and training process not only in Science but also in other courses. Students expressed the loss of time as a negative aspect of the practice, they were uncomfortable in class, especially the eye sensation organ is very tired and they forgot to write. According to this result, it is similar to the results of Gurbuz (2013) and Saglam (2006) studies in the literature, which shows that noise is a noise in the classroom, in addition to the benefits of multimedia applications in science education. In addition, Cepni et al., (2001) stated that a qualitative teaching can be done by using the 7E learning model, but it is time consuming.

As a result of the research, it can be said that students learn to work with group through stages of 7E learning model, they actively participate in learning process through brainstorming, are encouraged to think, have an excitement about the lesson and interest towards the subject. In the literature, Palic Sadoglu and Akdeniz (2015) have taken the views of the high school students who applied on the 7E model in studying the use of the 7E learning model and have reached the result that the students have increased the interest towards the lecture. In a similar study, Gurbuz (2013) conducted semi-structured interviews with 6 middle school students and 7E learning models for their phases and implementation. As a result of the interviews with middle school students, it was found

that they developed a positive attitude towards the science lesson but they were negative about the fact that during the implementation of the 7E learning model some of the students were not enough.

It can also be expressed that students learn new information, that this information is memorable, that they have learned to reinforce the subject, they have adapted to everyday life, and that they have shown a positive attitude towards science. Kocak and Onen (2012) found that motivations of students increased positively when activities carried out by associating students with everyday life learners learned during their work.In addition, it is observed that multimedia supported applications designed according to the 7E learning model influenced science teaching and changed the attitude towards science course positively in the studies performed by Balım and etc., (2012), Gurbuz (2012) and Yenice (2014). In this case, it is revealed that the multimedia supported applications designed according to the 7E learning model used in teaching and learning affects the teaching-learning process positively. These findings in the literature are in harmony with the findings in this study.

In line with the results of this study, the following suggestions can be made to the researcher; the multimedia supported applications designed according to the 7E learning model, the course can be applied to other units of the Science and other courses. A "*teacher manual*" can be created by designing multimedia applications that enrich the use of audio and visual materials at each stage of the 7E learning model for Science Teaching curriculum within Teaching Technologies. Given that this study is conducted with 5th grade students in secondary school, it may be possible to investigate the effect of multimedia supported applications designed according to 7E learning model products at primary, secondary, and other classes, secondary and higher education levels. With the multimedia supported applications designed according to the 7E learning model, it is possible to study about the causes of the negativities against writing, time and classroom management that occur as a result of the course.

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