

# Educational comics and educational cartoons as teaching material in the social studies course<sup>#</sup>

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## ABSTRACT

This study aims to explore the effect of using educational comics or educational cartoons as teaching material in social studies course on students' academic achievement. Also, it is aimed to reveal the experiences of the students regarding the use of these materials. In the study, the embedded design was preferred among the mixed-methods designs. For the quantitative aspect of this research, pre-test and post-test on the control and experimental group with the quasi-experimental design were used. The study was conducted out with two experimental groups and a control group. The study was conducted with 266 (87 students are in the educational comics group, 88 students are in the educational cartoons group, 91 students are in the control group) 6th-grade students. To analyse the quantitative data, One-Way ANOVA was used. According to the results of the analysis, it was determined a significant difference between the educational comics group and the other groups in academic achievement levels. It was also determined a significant difference between the educational cartoons group and the control group. For the qualitative aspect of this research, phenomenology design was used. To analyse the qualitative data which were collected by semi-structured forms, content analysis was used. As a result of the analysis of qualitative data, it was concluded that students seen both educational comics and educational cartoons as effective materials for educational activities in various aspects. These results show these teaching materials can use by teachers for effective learning in social studies course.

**Keywords:** Social studies, educational comics, educational cartoons, academic achievement, teaching material.

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## INTRODUCTION

Teachers can use a variety of teaching materials in the teaching process to make teaching activities more effective. Educational comics (ECm) and educational cartoons (ECr) are among the effective teaching materials that teachers can use in the teaching process. However, teaching materials may have different effects on students.

Using teaching materials in teaching activities supports students' cognitive, affective, and psychomotor development. Teaching materials are effective tools in the development of different perspectives in students,

enrichment of educational processes, and creation of multiple learning environments. Also, with materials that appeal to students, teachers can overcome many difficulties in the teaching process (Avci Yucel and Ergun, 2015).

Karagoz (2018) states that comics have taken their place in the field of education by adding educational and informative elements to their purpose and content in the development process and that these comics are accepted as a new genre and are named educational comics. Some features of comics encourage their use in

educational activities. Comics can be used in teaching activities thanks to their interesting features for students (Megawati and Anugerahwati, 2012). Topkaya and Yilar (2015) stated that educational comics make the course content more interesting through funny characters and short stories in the teaching process, and this triggers children's imagination and positively affects their motivation towards the lesson. Through the visuals presented with the text, communication is developed and expanded, and these visuals attract the attention of the reader and make the text easier to understand (McVicker, 2007). The fact that comics are quick and easy to understand indicates that they can be a suitable teaching tool for the education of large masses (Weitkamp and Burnet, 2007). Also, comics can be produced, distributed, and used with widespread participation via online formats at a relatively low cost (Hands et al., 2018).

Comics should not be perceived only as today's effective teaching materials. Hutchinson (1949) stated that teachers think that comics have a positive effect on students' motivation and participation in the course. Haugaard (1973) stated that especially children show a natural interest in comics and teachers who use comics during the lesson can benefit from the attractive and motivating features of comics. In Cheesman's (2006) study, students think that comics positively affect the atmosphere of the classroom and turn it into a fun environment. Also, these studies state that comics do not lose their positive effects on students even after time passes.

Another teaching material whose effect was investigated in this study is ECr. Educational cartoons are cartoons that frequently contain some values such as patriotism, kindness, respect, love, helpfulness, and are designed for educational purposes such as providing basic daily knowledge (Coskuncay, 2019).

The connection between cartoons and education is related to the visual elements and movements of cartoons (Ozgokbel Bilis, 2011). Complex relationships in nature can be explained simply by cartoon characters, and intangible concepts can be represented in the behavior of characters with concrete visuals (Temizyurek and Acar, 2014). Students want cartoons to be used in classroom environments because cartoons make visual differences, simplify difficult-to-learn subjects, and are interesting and fun (Cho, 2012).

Cartoons can be not only an effective material for cognitive learning but also an effective teaching material for affective and behavioral learning (Ates, 2019). Besides, they can be used in educational processes, as well as to save the educational environment from boringness. They can provide a fun classroom environment for students. Cartoons contribute to the learning process by enriching the educational environment with such effects (Arikan, 2001; Araboga, 2018; Cho, 2012; Pitriana and Syahrudin, 2013; Ulfa et al., 2017). Cartoons increase students' motivation, focus

their attention on learning, and activate students (Aprianti, 2017). Cartoon characters can be role models for children, they can change their behavior (Habib and Soliman, 2015). Abuzahra et al. (2016) state that the use of cartoons has an effect that can even turn students' negative attitudes into positive ones.

When literature is examined, many studies reveal that the use of teaching materials increases the effectiveness of teaching activities. However, it is still the subject of research on which material will be more effective. These researches will increasingly continue with new teaching materials, new methods, or new scientific/technological developments.

As a result of the literature review, it was determined that ECm and ECr have positive effects on students when they are used as teaching materials. However, no study has been found to determine which of these teaching materials are more effective in social studies education. When viewed from this aspect, determining the effects of these teaching materials can guide teachers in the choosing of teaching materials. In this way, teachers can choose materials by considering which teaching material is suitable for the needs.

### **Aim of the study**

The aim of this study is to determine the effect of using ECm or ECr as teaching material in 6th-grade social studies course on students' academic achievement. Also, it is aimed to reveal the experiences of the students regarding the use of these materials. The main research question of this research was "Do ECm and ECr affect student achievement in 6th-grade social studies education?" Regarding this main research question, the following sub-research questions have been determined.

### **Sub-research questions**

Is there a statistically significant difference between the academic achievement between two experimental groups that are used ECm and ECr as teaching materials?

What are the experiences of ECm Group students about using ECm in social studies course?

What are the experiences of ECr Group students about using ECr in social studies course?

Do the qualitative data obtained from interviews with ECm Group and ECr Group support the quantitative data?

### **METHOD**

In this study, the effects of ECm and ECr on students' academic achievement were compared and students'

experiences about these materials were determined. In the study, quantitative and qualitative data collection methods were used in line with the targeted purposes. In this respect, the research is mixed-method research. Greene et al. (2005) express the mixed methods in social sciences as involving more than one analysis or data collection method in the same research.

In the quantitative aspect, ECm and ECr were used as teaching materials in different experimental groups and the effects of these teaching materials on academic achievement were tried to be determined. So, a quasi-experimental design with pre-test and post-test control groups was used. The most distinctive feature in quasi-experimental design studies is that it is participants is not possible to randomly assigned to groups (Creswell, 2012).

This study also aims to reveal the experiences of the students because of experimental practices and their thoughts because of these experiences. In the qualitative aspect of this study, phenomenology design, one of the qualitative research designs, was used. In phenomenology design, it is investigated how participants perceive, explain, remember, and interpret a phenomenon. The participants in the studies in which the phenomenology is used must have direct experience of the study subject (Patton, 2014). It was aimed to reveal the student experiences about the teaching materials used in the experimental groups with semi-structured interviews. 158 6th grade students who had experience with teaching materials were consulted using semi-structured interview forms (78 students for ECr and 80 students for ECm).

### Study group

The study was conducted with 266 (130 male, 136 female) 6th-grade students studying at three different secondary schools in Kilis (a city in Turkey) city center in the 2018-19 academic year. Three different schools representing high, middle and low socioeconomic status were determined for the study. Two classes from each of these schools were chosen for the experimental groups, and one class for the control group. The criterion sampling method was used to determine schools and classes in the study group. The criteria determined for this study; the schools where the study has been conducted are located in the city center, working of smart boards or projection devices in classes, teachers have at least five years of experience.

The study included a similar number of students from each school. A total of 87 students are in ECm group, 88 students are in the ECr group, a total of 91 students are in the control group. Each group included a similar number of students with similar socio-economic status. The classes in the experimental and control groups of the study were determined by random sampling.

### Data collection tools

In the quantitative aspect of this study, Science, Technology and Society Academic Achievement Test (STSAAT) was used as data collection tools. STSAAT was developed to determine the effects of the materials used on students' academic achievement. In developing the test, the learning outcomes in the learning area were primarily examined. There are four learning outcomes in Science, Technology and Society (STS) learning area. Seven multiple-choice questions were prepared for each learning outcome, considering Bloom's Taxonomy. While creating the item pool, the textbook approved by the Ministry of National Education and the question books of different publishers were examined.

The multiple-choice question pool of 28 questions was examined by two social studies teachers and three instructors who are experts in the field of social studies education. And a pilot test has been conducted to check the test items. Students participating in the pilot test were determined based on criteria sampling. 128 7<sup>th</sup>-grade students, who were similar to the study group for socio-economic status and who were trained in the test gains in the previous year, participated in the pilot test. In line with the expert's opinions and the data obtained from the pilot test, the test was finalized. The data obtained by the pilot test were analysed through the program called Test Analyze Program (Brooks and Johanson, 2003).

The KR-20 reliability coefficient, item discrimination index, item difficulty index, and item-total correlations of the test and the items in the test were calculated. In the item analysis conducted for the construct validity of the test, it was decided to exclude 8 questions from the test. In the final test, the item difficulty index average of 20 questions was calculated as 0.46 (the lowest, 0.60; the highest, 0.33), and the item discrimination index as 0.60 (the highest 0.77, the lowest 0.35). Besides, the KR-20 value of the test was calculated as .84.

In the qualitative aspect of this study, a semi-structured interview form was used to determine students' experiences with teaching materials and their views on these experiences. For this aim, 5 questions were prepared for interviews by authors. For the prepared questions, the opinions of 2 field experts were taken and 2 questions were removed from the form in line with these opinions. To test the form shaped by expert opinions, a pilot study was conducted with 3 students. Face-to-face interviews were made by the researcher in person. Pilot implementations mean both testing the questions and the interviewer self-testing (Cansız Aktaş, 2019, p.122).

### Preparation of teaching materials

For this study, four different ECm were prepared and four different cartoons were decided upon. The ECm used in

the study were prepared using the website called Pixton. The ECm preparation process specified by Topkaya (2016a) was followed. This process consists of five stages:

- Stage 1: Preparation of educational comics scenarios suitable for the students' level.
- Stage 2: Presenting the prepared scenarios to expert opinion in terms of language and expression.
- Stage 3: Drawing the scenarios prepared.
- Stage 4: Placing speech bubbles in illustrations.
- Stage 5: Pilot implementation of educational comics.

An example of comics is shown in Figure 1.

The educational cartoons used in the study were created by using the parts of different cartoons related to the course outcomes. The cartoons used in the study were selected among the educational cartoons (İstanbul Muhafızları, Canım Kardeşim). The cartoons of İstanbul Muhafızları and Canım Kardeşim, broadcasted by TRT (a TV channel) for primary and elementary school-age

children, are among the cartoons that children watch the most (Kadan and Aral, 2017). Opinions of one field expert instructor who is an expert in the field of social studies education and two social studies teachers were taken for the cartoons used in the study.

### Process

Firstly, students and teachers were informed about the use of teaching materials and the functioning of the small group discussion technique and they were enabled to participate in a pilot study for this process. Then pre-tests of the data collection tools were carried out. After the pre-tests were completed, the STS learning area started to be lectured in all groups participating in the study. Small group discussion technique was used as an activity at the end of each topic regarding the learning outcomes in the learning field. During these activities, ECm was used as teaching material in ECm Group and ECr was used in ECr Group. After the lesson process, the post-test was carried out.

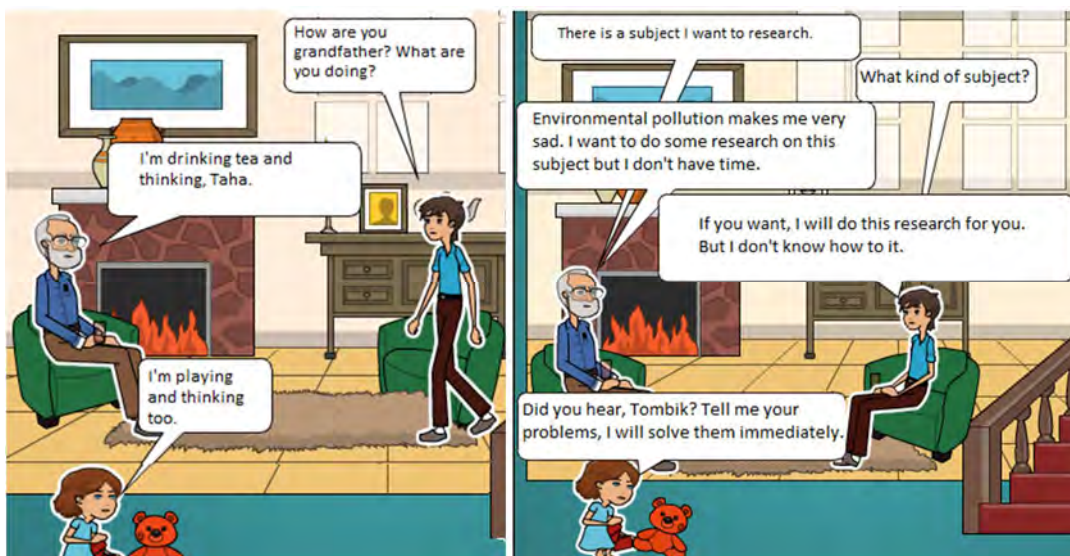


Figure 1. Example of comics.

### Data analysis

The quantitative data obtained from the experimental and control groups were analysed using the SPSS 25.0. In the analysis of the data, the statistical significance level between variables was decided upon as .05.

One-Way ANOVA and Tukey were used to analyse STSAAT data. Effect size values are given in addition to the value obtained as a result of the analysis. The effect size expresses the strength of the interpretations about the differences between groups in a quantitative study or

the relationships between variables (Creswell, 2012).

For the qualitative aspect, semi-structured interview forms were distributed to the students in the experimental groups and they were asked to answer the questions in writing according to their experiences in the implementations. In addition, a total of 12 students, including two students from each class, were interviewed face-to-face to reach student experiences. During these interviews, questions in the semi-structured interview form were used. To reach maximum diversity in determining the students who were interviewed face to

face, the students who got the highest and lowest scores from data collection tools were determined. Interviews were conducted with students selected voluntarily among the identified students. Collected data were analysed by content analysis.

## RESULTS

### Quantitative results

One-Way ANOVA was applied to STSAAT pre-test and post-test data. Thus, it was tried to determine whether there was a significant difference between the academic achievements of the groups. The findings obtained from the analysis are expressed in tables. Descriptive statistics of the mean scores from the STSAAT pre-tests are given in Table 1.

When Table 1 is examined, it is seen that the groups' STSAAT pre-test mean scores are very similar to one another but the groups' STSAAT post-test mean scores are different to some extent.

To observe whether there is a significant difference

between the mean scores of all groups obtained from STSAAT, the data were analysed with a One-Way ANOVA and the results are shown in Table 2.

When the STSAAT pre-test results are examined, it is seen that there is no statistically significant difference between the academic achievement levels of the study groups regarding the STS learning area ( $p = .547$ ,  $p > .05$ ). [(Levene test results show that the variances are homogeneous ( $p = .847$ ;  $p > .05$ )). The fact that there is no statistically significant difference between the academic achievement levels of the groups indicates that the groups' academic achievement of STS learning area is similar level.

STSAAT post-test data were analyzed by One-Way ANOVA and the results are shown in Table 3.

When the STSAAT post-tests are examined, it is seen that there is a statistically significant difference between the academic achievement levels of the study groups regarding the STS learning area ( $F_{2,263} = 48.638$ ,  $p < .05$ ). [As a result of the Levene test, variances were found to be homogeneous ( $p = .824$ ;  $p > .05$ )). Therefore, the Tukey test was used and the results were presented in Table 4.

**Table 1.** Descriptive statistics of the STSAAT pre-test and post-test mean scores.

	Groups	N	$\bar{x}$	SD
Pre-test	ECm Group <sup>i</sup>	87	25.862	7.400
	ECr Group <sup>ii</sup>	88	24.943	7.091
	Control group	91	26.098	7.666
	Total	266	25.639	7.382
Post-test	ECm Group	87	80.229	8.066
	ECr Group	88	76.875	8.452
	Control group	91	68.571	7.898
	Total	266	75.131	9.490

<sup>i</sup> Educational comics group, <sup>ii</sup> Educational cartoon group.

**Table 2.** One Way ANOVA results regarding the differences between the STSAAT pre-test scores.

Groups	Sum of Squares	df	Mean Square	F	p
Between groups	66.183	2	33.091	.605	.547
Within groups	14375.171	263	54.658		
Total	14441.353	265			

\* $p > .05$ .

**Table 3.** One-Way ANOVA results regarding the differences between STSAAT post-test mean scores.

Groups	Sum of Squares	df	Mean Square	F	p
Between groups	6445.082	2	3222.541	48.638	.000
Within groups	17425.313	263	66.256		
Total	23870.395	265			

\* $p < .05$ .

**Table 4.** Tukey Analysis Results Related to the Differences Between STSAAT Post-Test Mean Scores.

Groups	ECm Group	ECr Group	Control group
ECm Group	-	.019	.000
ECr Group	.019	-	.000
Control group	.000	.000	.000

\*p < .05.

When the results of Tukey analysis are examined, it is seen that statistically significant differences are in favor of the ECm Group when all the groups are compared, while the comparison of the ECr Group and the control group is in favor of the ECr Group.

In the effect size analysis, it was determined that the ECm implementations have a large effect size (Hedges'  $g = 1.453$ ) on the academic achievements when compared with the control group's implementations. It was determined that the ECr implementations have a large effect size (Hedges'  $g = 1.011$ ) on the academic achievements when compared with the control group's implementations. It was determined that the ECm implementations carried out in the EG1 have a small effect size (Hedges'  $g = .403$ ) on the academic achievements when compared with the ECr implementations.

### Qualitative results

In the qualitative aspect, the findings from interviews are given. Transcript data from semi-structured interviews were subjected to thematic analysis to reveal the experiences of students regarding the lessons with ECm and ECr.

As seen in Figure 2 when qualitative results on the use of ECm are examined, the codes from the analysis of the interviews with the students of the ECm Group were collected under the main theme of "Use of ECm". Under this main theme, there are four sub-themes: "Contribution to the Lesson" "Individual Contribution" "Difficulties Encountered" and "Students' Suggestions".

The codes for the "Contribution to the Lesson", which from the students' experience expressions about ECm, are shown in Table 5. The codes are supported with direct quotations.

Some students' statements about using ECm in terms of contributions to the lesson are given below:

FCmA1: When comics are used, we can learn more fluently. ...When it comes to comics, we're taking a break in a fun way. ...When I saw comics after prose texts it drew my attention.... After the comics came into class, I had a feeling like let the Social Studies course start.

FCmB1: It makes us love the subjects we do not like. After we liked it, that information stays in our minds.

When I feel a lack of knowledge, I read it again.

FCmC1: They increase my interest in the lesson. As I read comics, I was wondering what would happen. I was wondering what it said in the images.

CmA1: It develops my mind better. It also functions as a topic repetition.

CmA5: I liked the lesson more. It was more fun. I like it because painting is my life. In addition, I am learning information while improving my visual memory.

CmB25: I have more fun with comics, and I participate more in the course and I want that course to start quickly.

CmC24: The comics made a change in class.

The codes related to the "Individual Contributions", which from the students' experience expressions about using ECm as teaching material, are shown in Table 6. The codes are supported with direct quotations.

Some students' statements about using ECm in terms of individual contributions are given below:

FCmA1: Because they are funny, they do not preoccupy one's brain. I learning tirelessly and fluently with them. That way I was learning fluently. The characters in the pictures could be a little funny. ...In this process, increased my interest in the social studies course.

FCmB1: When the comics are used, it becomes like a summary. Therefore, they give us the root of knowledge.

FCmC1: I understand more quickly when told with humor. I don't forget when I learn with fun. I also learn from pictures. My achievement improves because I listen better. I am working more.

CmA1: Comics implementation improved my performance in social studies course. I thank my teacher for that.

CmB10: I think the lesson was much better. And I think it will affect my exam grade.

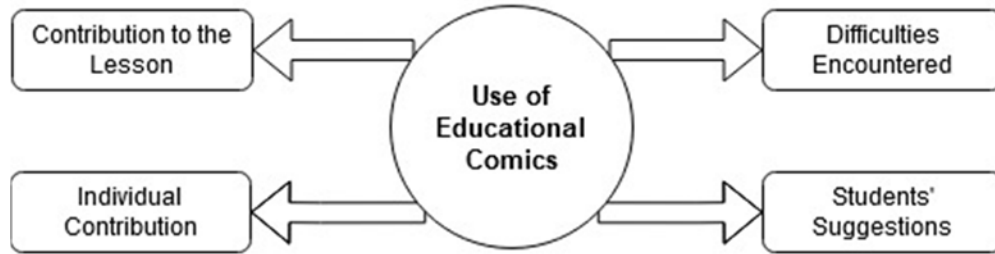
CmA4: I believe it is more educational and fun.

CmB9: I'm focusing more on the subject.

CmA7: Comics add fun to the lesson. Students' motivation increases in the lesson.

CmC10: I have great imagination.

The codes related to the "Difficulties Encountered", which from the students' experience expressions about using ECm as teaching material, are shown in Table 7. The codes in this sub-theme are supported with direct quotations.



**Figure 2.** Use of Educational comics.

**Table 5.** Views of students about the contribution to the lesson of the use of ECm.

Sub-theme	Codes
Contribution to the lesson	Increasing participation in the lesson To like the course To be remarkable Interesting Making the lesson fun Making the lesson more efficient Making a difference To reinforce the subject Increasing curiosity to the subject

**Table 6.** Views of students about the individual contribution of the use of ECm.

Sub-theme	Codes
Individual contribution	Increases the achievement belief Making it easy to learn Provide motivation Developing reading skills Getting the focus Provide permanent learning Develop imagination

**Table 7.** Views of students about the difficulties encountered with the use of ECm.

Sub-theme	Codes
Difficulties encountered	Cause noise Need long time to read Does not explain the subject in detail Making class control difficult

Some students' statements about the difficulties encountered in using ECm are given below:

FCmC1: Some friends are disturbing us by making noise.

FCmB2: I like it but no details are given. It takes a long time to read.

CmC19: Reading comics takes time...

FCmA2: It is not given in detail. A subject is taught once through comics. So, teacher has to explain the subject in textbooks instead of comics.

CmA14: Everyone is looking at the different parts of comics. Therefore, the teacher has difficulty.

CmB8: There was laughter in the classroom because of comics. When everybody laughs, I can't hear the teacher.

FCmC2: For example, there are rules set by our teacher. We wouldn't talk without raising a finger, but when comics are used, the classroom gets out of control.

The codes related to the "Students' Suggestions", which from the students' experience expressions about using ECm as teaching material, are shown in Table 8. The codes in students' suggestions sub-theme are supported with direct quotations.

Some students' statements about the students' suggestions of using ECm are given below:

FCmA1: Comics should be more in the textbooks.

FCmB1: If the comics is a little more detailed while explaining the subject, those who do not understand can understand better.

FCmB2: There should be a summary in addition to the comics, there should be a narration of that subject in a few pages.

CmA23: It should be used in every course. 2-3 activities can be done in a day with comics.

CmA6: It should be more. It should be in all classes.

CmC10: I think everyone should try. When such comics are made on every subject, even those who do not like the Social Studies course may like it.

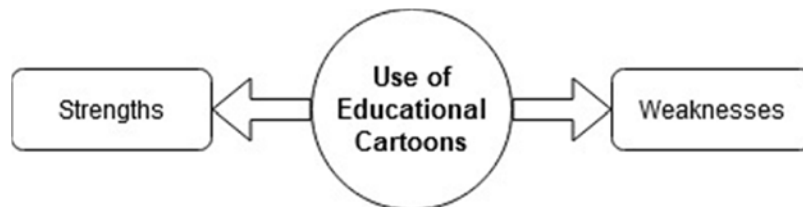
CmC18: It would be better to use the characters of our favorite comics.

As seen in Figure 3 when qualitative findings on the use of ECr is examined, the codes from the analysis of the interviews with the students of the ECr Group were collected under the main theme of "Use of ECr". Under this main theme, there are two sub-themes: "Strengths" and "Weaknesses".

The codes related to the "Strengths", which from the students' experience expressions about using ECr as teaching material, are shown in Table 9. The codes are supported with direct quotations.

**Table 8.** Students' suggestions on the use of ECm.

Sub-theme	Codes
Students' suggestions	Should be added to the textbooks
	It should also be in different courses
	It should also be in different subjects
	It should be longer
	Favorite characters should be used



**Figure 3.** Use of ECr.

**Table 9.** Strengths of Using ECr.

Theme	Codes
Strengths	Enjoyable
	Interesting
	To like the course
	Increasing motivation
	Develop the intelligence
	Instructive
	Desire to attend the lesson
	Remarkable
	Ensuring permanent learning
	Evocatory
	More understandable
	Exciting

Some students' statements about the strengths of using ECr are given below:

FCrA1: I wanted the lesson to start quickly. The lesson seemed shorter to me, I wanted it to be longer.

FCrB1: I love cartoons. When it comes to cartoons, I also love the course, it motivates me to course.

FCrC1: Lessons with cartoons increased my interest in the social studies course. I understood better because the lesson had more fun.

CrB4: I started to enjoy the Social Studies course more and to think that some subjects were interesting.

CrA9: I think we were showing more interest in the course. I would like the cartoons to be used in other courses. Because I understand more quickly. It allows me to be more successful.



CrA11: It also makes topics memorable.  
CrC6: It made the knowledge more permanent.

The codes related to the "Weaknesses" using ECr as teaching material, are shown in Table 10. The codes are supported with direct quotations.

Some students' statements about the weaknesses of using ECr are given below:

FCrB2: It tells less. The teacher also needs to explain. I have a hard time following. It feels like watching cartoons at home.

FCrA2: It would be better if it was longer. ...When we miss conversations, we cannot go back.

CrB7: Fine, but I wish it was longer.

FCrC1: When my friends speak it gets harder to understand. When we look at the cartoon, we miss what is told, when we look at what is told, we miss the cartoon.

CrC14: There should be more information. It should explain in detail and many examples should be given.

CrA15: The characters can teach the course slowly. So, we can have a more fun lesson.

CrA7: The teacher should repeat it because the stories in the cartoon are short. Some shortcomings have to be corrected by the teacher.

CrC17: It is unrealistic and kids stuff. It can be like movies and the speech can be a little slow.

CrC10: It is very difficult to take note of important things from there because it is fast.

## DISCUSSION AND CONCLUSION

In this section, the results obtained using the findings of the research are mentioned. This study aims to explore the effect of using ECm and ECr as teaching material in social studies course on students' academic achievement. The results obtained in the study were discussed in line with this aim and supported by the literature.

According to the results of the analysis, ECm and ECr significantly increased the students' academic achievement in the STS learning area. It is thought that ECm has a positive effect on the academic achievement of students due to increases the desire to study, creates permanent learning, improves thinking skills, and positively affects motivation, has visual elements, is fun, is easy to understand is remarkable. Some studies in different fields support this result (Affeldt, Meinhart, and Eilks, 2018; Ekinçi Efecioglu, 2013; Green and Myers, 2010; İlhan and Oruc, 2019; Miranda et al., 2018; Orcan, 2013; Park, Kim and Chung, 2011; Topkaya, 2016a; Unal, 2018; Vassilikopoulou, Retalis, Nezi and Boloudakis, 2011; Yildirim, 2016). It is thought that ECr has positive effects on learning by positively affecting students' attitudes and motivations towards the lesson, increasing their desire towards learning and making creative learning environments, supporting learning

visually and audial. Some studies in different fields support this result (Celik, 2015; Inac, 2010; Iskender, 2007; Oruc and Teymuroglu, 2016; Ulfa et al.,

**Table 10.** Weaknesses of using ECr.

Theme	Codes
Weaknesses	Containing little information
	Difficulty following
	Lack of detail
	Difficulty taking notes
	Making class control difficult
	Be short
	The need to watch it again
	Lack of examples
Unrealistic	

2017).

When compared the effects of ECm and ECr it was observed that there was a significant difference in favor of the ECm Group between ECm Group and ECr Group. This situation indicates that ECm is more effective than ECr on the students' academic achievement in STS learning area. In literature reviews, no study was found to compare the effects of ECm and ECr on students' academic achievement. However, the more positive effects of ECm on academic achievement may be related to some features of ECm that are more suitable for education. Considering the individual learning speeds of the students, ECm is more useful compared to ECr. This makes it easier for students to control the learning time of a subject they are working on. ECm allows students to reason, comprehend, and dream longer than ECr. Also, ECm is more useful than ECr in terms of repeatability. When an ECr is used as a teaching material, every implementation to be made in the ECr affects the entire class. For example, when the teacher stops playing the cartoon for any request, the learning activity will stop for the entire class. However, when ECm teaching materials, this negative situation is avoided. When students read ECm, they can go back to the point which they need and focus on where they need it. Also, they can do these without affecting other students in the classroom. Therefore, we can state that ECm is more effective in giving control of their learning to students. If we explain this control over the learning process with the metaphor of "remote control", when an educational cartoon is used as teaching material, there can be only one remote control in the classroom. This leaves control of the entire process to one person, usually the teacher. However, when using ECm as teaching material, all students in the classroom have a remote control, and they control the own teaching processes.

As a result of the analysis of the collected qualitative data, it was concluded that the students expressed positive opinions about the E<sub>Cm</sub> and E<sub>Cr</sub>, and they saw them as effective teaching materials. In semi-structured interviews with E<sub>Cm</sub> Group, students stated that E<sub>Cm</sub> increases the desire to participate in the lesson, make attractive the lesson, make more productive the lesson, make the lesson funny, make the lesson more understandable, make more permanent learning, increase achievement. These statements are similar to the data in some studies which the effect of E<sub>Cm</sub> was investigated in terms of different variables (Azam, 2019; Cheesman, 2006; Ilhan, 2016; Karagoz, 2018; McNicol, 2017; McVicker, 2007; Olson, 2008; Ozdemir, 2010; Richter et al., 2015; Topkaya and Yilar, 2015; Yildirim, 2016). In semi-structured interviews with E<sub>Cr</sub> Group, students stated that E<sub>Cr</sub> makes more enjoyable, interesting the lesson, and increases motivation. Also, the students stated that thanks to the E<sub>Cr</sub>, interest in the lesson and desire to participate in the lesson increased. The student statements are similar to the data in some studies which the effect of E<sub>Cr</sub> was investigated in terms of different variables (Ates, 2019; Cho, 2012; Cakmak, 2010; Ulas Taraf, 2011).

As a result, the quantitative data obtained in the study show that E<sub>Cm</sub> increases the academic success of the students more than E<sub>Cr</sub>. Besides, when students' expressions are examined, it will be seen that the E<sub>Cm</sub> is primarily seen as an instructive and a factor that increases participation in the lesson, while the prominent feature of E<sub>Cr</sub> is that they are fun. It is thought that qualitative results support the quantitative results of the study.

## RECOMMENDATIONS

Students in the classrooms where E<sub>Cm</sub> and E<sub>Cr</sub> will be used should be informed about the purposes in advance so that they can understand the purpose of the materials.

Teachers who want a fun discussion environment in the classroom can create a discussion environment by E<sub>Cm</sub> and E<sub>Cr</sub>.

In this study, students often mentioned that they liked the fact that E<sub>Cm</sub> and E<sub>Cr</sub> contain understandable information. So, when use E<sub>Cm</sub> can prefer E<sub>Cm</sub> containing clear information instead of E<sub>Cr</sub> containing long paragraphs. Also, while using cartoons, should be given time to understand what is being told to students.

Teachers' experience with these teaching materials is also important. So, studies can be conducted to reveal teachers' experiences regarding the use of E<sub>Cr</sub> and E<sub>Cm</sub> as teaching materials.

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