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Examination the effect of science fiction films on science education students' attitudes towards STS course

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Abstract

The purpose of this study is to find how science fiction films affect science education students' attitudes towards STT (Science Technology Society) course. In addition science students' opinions were sought in order to determine their thoughts to the use of this kinds of film in science courses.A questionnaire regarding students' attitudes towards STS course conducted to second grade students from Mersin University Science Teacher Education department as pre and post test and open ended questions were administered to assess their opinions. Students worked with grouped of 2-3 person and each group chose a science fiction film. They asked to critique selected films in order to determine how science and technology was used and how these usage affect on society in that films. Each group wrote a report and create a powerpoint presentation to explain their findings. Qualitative and quantitative data analysis were used for data analysis. As a result of pre- and post tests analysis, it was found that application of science fiction films in STS course changed students' attitudes positively. In addition it was also determined that students' have positive thoughts about using these kinds of film in science course.

Keywords: Science fiction films, Science Technology Society, Science and Technology Education

1. Introduction

Today's rapid developments in science and technology are changing our way of life dramatically. Each individual needs an increasing amount of scientific knowledge to understand the rapid developments in science and technology, such as communication, transportation, energy and medicine. In this way every citizen needs to be scientifically literate. According to Duban (2010), scientific and technological literacy relates to the ability on the part of all citizens in the community to be able to understand and explain some of the scientific concepts and facts at a basic level, and also having the skills to monitor technological developments and use them in life. Scientificallyliterate individuals understand the nature of science and the nature of scientific knowledge, understand basic science concepts, principles, laws and theories, and also use them appropriately. The implementation of the National Science and Technology Program (MEB, 2006) aimed to increase the number of individuals who understand writings, films and discussions in the popular media. In today's society, due to the wide use of visualization, it is increasingly difficult to distinguish truth from fiction. The National Science Foundation also emphasized that the information available is gradually increasing, and it will increase further in the future.For this reason, it is extremely important to distinguish the truthfrom fiction (NFS, 2000). This situation especially emerges in science fiction films in that scientific knowledge in these kinds of film cannot be understand.

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Science fiction involves scientific and technological developments relating to the present and the future, and it speculates about the effect of new discoveries and scientific developments on humanity (Voskuyl, 2009). However, it is expressed that science fiction has become synonymous with any discovery in science that is too incredible or too unexpected to imagine. This expression annoys many scientists because the "fiction" label has the popular connotations of "willingly false or misleading" (Czernada, 2006).Science fiction films are fictional stories involving scientific and technological developments. Shaw and Dybdah (2000) indicate that through the use of special effects, film makers can create different worlds and make things seem real and believable to the audience. These probable and possible science illustrations can be used to help students understand scientific principles. Studies have shown that science fiction films can be used when hands-on direct experience is not possible or practical. Consequently, students can encounter concepts in a new context. This provides a new avenue for learning. In addition, such an approach can improve attitudes toward real science (Cavanaugh & Cavanaugh, 1996). Moreover, as these kinds of film affect students' interest, they can be thought of as a good opportunity for students to participate in a science course (Cavanaugh & Cavanaugh, 2004).

Studies revealed that science applying science fiction for teaching purpose provides many benefits. These benefits include (Bixler, 2007; Cavanaugh & Cavanaugh, 1996; Cavanaugh, & Cavanaugh, 2004; Öngel-Erdal, et.al., 2004; Segall, 2002; Shaw, Dybdah, 2000);increasing interest in science, providing understanding the scientific content, improving positive attitude towards science, increasing success in science, providing visualization to abstract subjects, providing scientific thinking, improving creativity, providing scientific literacy, providing motivation to learning scientific contents, developing interconnectedness of science disciplines, encouraging students to explore scientific concepts, understanding of scientific process and understanding ethical consideration of science and technology. In addition to these benefits, students can review what they know about current technology and can predict what can be done with this technology in the future (Shaw& Dybdah, 2000). Furthermore science fiction films are important because viewing the film provides an opportunity to compare and contrast different periods of life on this planet (Cavanaugh & Cavanaugh, 1996; Cavanaugh & Cavanaugh, 2004).Researchers have mentioned that students acquire science, not only from formal sources, but also from informal ones. This learning includes non-print media, television programs and movies. They also emphasized that if teachers can deliberately plan the interweaving of the two, they will be able to enhance the quality of students' science learning (Shaw & Dybdahl, 2000). Therefore to teach science effectively, it was suggested that educators need to understand how popular culture influences their students' perceptions and understanding of science (Barnett et al., 2006). For this purpose, in many studies, science fiction films were used in various forms generally at the undergraduate level (Barnett et al., 2006; Bixler, 2007; Laprise & Winrich, 2010; Neves et al.,2000). In this study the intention is to determine how science fiction films affect science education students' attitudes towards a Science Technology Society course. This is one of the most important courses that contribute to students' scientific literacy. In addition, students' opinions were sought in order to determine their thoughts to the use of science fiction films in science courses.

2. Method

2.1. Sample

This study was conducted during the spring semester of 2010-2011 academic years. The research sample consisted of 36 science education students in second year science teacher education program at Mersin University in Turkey.

2.2.Resrach Instrument

Data related to science education students' attitudes towards Science Technology Society course was collected through the Science Technology Society Course Attitude Scale developed by Afacan and Aydoğdu (2006) and applied as pre and post test. The scale consists of 29 items including 14 positive and 15 negative attitude questions. The reliability of pre test and post test were .88 and .83 respectively. Open responses questions were also asked to the students to determine their thoughts about science fiction films importance and applicable in science courses. In this study, students worked with grouped of 2-3 person and each group chose a science fiction film. Students asked

to analyze selected films by considering how science and technology was used and also what effect such use has on society. Students wrote a report and presented in the classroom.

2.3.Analysis

Qualitative and quantitative data analysis were used for analysis. Statistical analysis of the data was carried out by means of SPSS 11 for Windows. For data analysis, paired sample t test was utilized. Significance levels of .05 were accepted for analysis. Qualitative analysis was done by coding and creating themes related with students' responses. While coding each responses it was realized that a response fitted more than one category, therefore some of the responses put into more than one category. To make adjustment and acceptable sets researcher re-coded the data a few times.

3. Results

The sample consisted of 36 science education students of whom 14 were males and 22 were females; 29 were 20-21 years old, 6 were 22-23 years old and 1 was 24-25 years old.

Table.1.The results of Kolmogorov-Smirnov Test For Pre Test and Post Test

Pre test			Post test		
N		36	N		36
Parameter	$\bar{x}$	113,11	Parameter	$\bar{x}$	117,86
	ss	13,73		ss	10,18
K-Smirnov Z		,498	K-Smirnov Z		1,20
p		,965	p		,075

In this study, to check the distribution of the sample for pre and post test applications, Kolmogorov-Smirnov test was undertaken. The results of these tests indicated that for both test the distribution is not significantly different from normality ($Z_{pre\text{-}test}$: 0,498; $Z_{post\text{-}test}$: 1,20; $p>.05$). In the light of this result, parametric analyses were used for the data analysis.

Table.2.The Results of Paired Samples T Test

Tets	N	Mean	S.Deviation	sd	t	p
Pre-test	36	113,11	13,73	35	-2,145	,03
Post-test	36	117,86	10,18			

As seen in Table 2, Paired Sample t Test was conducted to compare mean test scores of pre and post test at a the significance level of .05. The results revealed that there is difference between pre- and post-test scores and post test mean scores are higher than pre test scores. The results also showed that statistically significant differences were found between these tests (t: -2,145; $p< 0.05$).

In this study, data obtained from students' opinions showed that all of the students agreed science fiction films have importance in terms of contribution to science education. Findings related to applicability of science fiction films presented in the table given below.

Tablo.3. Students' opinions about applicability of science fiction films

Opinions	**f**
A.Applicable	
A.1.Culture and art activity	2
A.2.Scientific activity	
A.2.1.Opinions related to students	
A.2.1.1.Learning concepts related to scientific issues	10
A.2.1.2.*Improving imagination*	6
A.2.1.3. *Improving creative thinking*	6
A.2.1.4.*Improving interpretation*	1
A.2.1.5.*Improving problem solving skills*	2
A.2.1.6.*Improving scientific process skills*	2
A.2.1.7.*Encouraging to do research*	6
A.2.1.8.*Improving scientific literacy*	4
Total	37

A.2.2.Opinions related to course	
A.2.2.1.*Increasing interest in course*	4
A.2.2.2.*Providing visualization*	7
A.2.2.3.*Improving positive attitudes towards course*	3
A.2.2.4.*Association between content and real life*	4
A.2.2.5.*Visualizing probable and extraordinary events*	5
Total	23
B.Partially applicable	3
C.Not applicable	1
Total	66

Table 3 shows frequency of responses obtained from students' responses about applicability of science fiction films in science course. According to the table, majority of the students thought that science fiction films can be applied in course.Students evaluated the applicability of science fiction films as culture and art and also scientific activity. They also evaluated scientific activity in terms of student and course. According to these evaluation, they stated that implementation of science fiction films in the course contribute to the students' imagination, creative thinking, interpretative skills, problem solving skills, scientific process skills and also encourage them to do research and facilitate learning scientific issues. In addition, they stated that implementation of these films contribute to science course in terms of increasing interest, providing visualization, improving positive attitude, associating context with real life and visualizing probable and extraordinary scientific issues. It can be seen from table 4, learning scientific concept was more mentioned by students compared with others. One of the students stated;

..to provide students better understanding, first the subject is told, after that students watch a film related with subject..

Some of the students indicated that application of science fiction films improve students' imagination and may encourage them to do research. One of the student who agreed these thought commented as follow;

...after watching film, students wonder scientific concepts in the film and begin to explore.. They imagine that content in the film could be realized in real life…In this way, they seeks more…

Another student who thought that scientific fiction film provide visualization in course expressed his opinions as follows;

...Science fiction films present many issues in science visually beautiful and also provide integrity among these issues. This situation increases understanding of knowledge illustrated in the field of science…

4. Conclusion and Recommendation

Assessment of the questionnaire indicated that using science fiction films in course affected students' attitudes towards STS course positively. This result is supported by the response to open response question in which some of the students agreed that science fiction films have benefits as they increase students' interest and attitudes towards science course. This result was found to be consistent with some of the other studies. In the literature, it was also revealed that science fiction can help improve attitudes toward science (Cavanaugh& Cavanaugh, 2004; Laprice & Winrich, 2010). A survey by Laprice and Winrich (2010) examined interest and understanding of non-science major students by using science fiction films as a pedagogical tool. An assessment of the students' perceptions revealed that science fiction films enhanced their interest and understanding of, science and technology.

In this study, students largely responded positively to the open-response questions, as most students indicated that science fiction films are important in science education, and could be applied in science courses. In addition, it was determined that most of the science education students believed in the benefits of using science fiction films in science courses. They believed that, firstly, it develops several skills on the part of the students including improving imagination and developing creative thinking skills, problem solving skills, interpretive skills, scientific process skills and scientific literacy. They also believed that it facilitates the learning of scientific concepts and encourages research about scientific issues. Among these, the most frequently mentioned benefit was found to be that of facilitating learning scientific concepts. However, studies indicate that the films that students were viewing could cause misconceptions in the students' mind (Barnett et al., 2006; Bixler, 2007; Cavanaugh& Cavanaugh, 2004; Shaw & Dybdahl, 2000). As an example, Shawl and Dybdahl found that filmmakers frequently include dramatic sounds in space, although this is not possible in reality. On the other hand, some of these studies also stress that science fiction provides the opportunity to engage in the exploration of difficult concepts, and are also a way for students to encounter familiar concepts in a new context. Therefore researchers agree that educators need to point

out actual errors that occur in a film, in order to help correct these misconceptions. Alternatively, by developing the students' working knowledge of the scientific method, they can discover and correct misconceptions through critical thinking (Bixler, 2007; Cavanaugh &Cavanaugh2004; Shaw & Dybdahl, 2000). Secondly, the science course under consideration has several additional benefits. These are; increasing interest in the lesson, providing visualization of scientific issues, providing positive attitudes towards the lesson, associating scientific issues and real life, and visualizing extraordinary and probable scientific events. Among these benefits the most frequently mentioned was found to be the visualization involved in the course. Studies have also shown that science fiction provides many illustrations (Bixler, 2007; Shaw & Dybdahl, 2000; Segall, 2002). As explained by these researchers, students can view science fiction movies that illustrate what is known about current technology to predict what can be done with this technology in the future. This explanation also supports the students' statements in this study, as they mentioned science fiction films visualising extraordinary and probable scientific developments.

In conclusion, results showed positive attitudes towards STS course and positive thoughts about applying science fiction films in science courses and these results are found consistent with studies in literature. Thus, the use of science fiction films in science education can considered as useful tool for instruction. Further studies can be performed with primary and secondary school students to find effectiveness of science fiction films in science context. In addition as Laprice and Winrich (2010) suggested whether students are learning from the films can be examined.

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