Effects of Documentary Films on Students' Attitude towards Science: A Pretest and Posttest Study

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Abstract — **Documentary films about science have grown significantly in the past decade or so. The advancement of media technology has provided new opportunities for documentary films to create an impact. How an individual is influenced by these films has been a subject of many researches.**

This study investigated the effects of documentary films on students' attitude towards science. Fourth year BSE Physical Science majors has been the subject of the pre-experimental one group pretest and posttest study. Several documentary films including: BBC's Chemistry: A Volatile History; BBC's Atoms; BBC's Secrets of Quantum Mechanics; PBS/Nova's Einstein's Big Idea; PBS/Nova's The Elegant Universe and National Geographic's Cosmos: Space Odyssey, were given as a subject of study, a supplement or an assignment for one semester in their subject Modern Physics.

Using Thinking About Science Survey Questionnaire, data on the influence of these films have been gathered and analyzed. The questionnaire is designed to provide a profile of how people evaluate science vis-a-vis other important aspects of culture. The results of the computation remarkably showed no significant difference on students' pretest and posttest. These films were considered as a mere entertainment, hard to understand and just a mere FYI.

Keywords—**Attitude Towards Science, Documentary Films, Modern Physics, Thinking About Science Survey.**

I. Introduction

Teachers and researchers have long been recognized the pedagogical benefits of educational videos. They have been observed to facilitate thinking and problem solving [1]; increase motivation [2]; enhance learning experience [3] and assist students achieve mastery learning [4].

Documentary videos, similarly, have been used as a powerful tool both for social and political change with remarkable success. One example, is the "Not in Our Town" documentary movie – it is about the residents of Billings, Montana who stood up for African Americans, Jews, and native Americans when they were targeted by White Supremacist. It was used in Bloomington, Illinois by the coalition for Diversity and Reconciliation to address the city's hate crime problem. It resulted in posting symbolic signs and declaring "No Racism, Not in Our Town" by their local officials. [5]

In similar manner, the USC Annenberg Norman Lear Center used the 2010 Oscar Nominee Food, Inc. to study viewers of more than 2000 and found out that those who saw the movie had significantly changed their eating and food shopping habits. The Food, Inc. documentary provides a critical look at the industrialized nature of America's food supply. It explores the relationship between how food is produced, human health, workers' rights, animal welfare, and other issues. [6] In addition, the Carolina Alliance for Fair Employment, a labor advocacy organization used the "Uprising of 34" – a documentary about a thousand mill workers that was brutally halted during the Great Depression, and successfully made the local city council approved the construction of a monument honoring the seven workers killed in the strike. [7] Further, the study of Jessica M. Nolan [8] about the renowned documentary, An Inconvenient Truth, showed that after seeing the film, viewers exhibited significantly more knowledge and concern about global warming; in addition to an increase in motivation to reduce greenhouse gases through behavioral change.

The study of Moore [9], suggests that in order to improve students' success in science, there are two things that must be considered: what we teach them (concepts) and how we teach them (attitude). In reality, however, the development of desirable attitude towards science is not the primary goal of most science courses. Teachers focus primarily on increasing students' knowledge of the subject rather than increasing their favorable attitude toward it. This poses a problem because attitude formation is one of the important aspects of instruction according to the study of Cherif and Widen [10]. It is concluded that students who possess positive attitude towards science perform better academically [11] and that there exists a positive correlation between attitude and academic achievement.

In general, the way science is taught, plays an important role in shaping students' attitude towards it. Whatever instructional tool and design used in the classroom contribute significantly to the students' appreciation of science. The use of educational videos can contribute to significant learning gains by promoting teaching effectiveness among learners [12]. Documentary films are effective in affecting behavioral change. Despite the numerous evidences of the pedagogical benefits of documentary films and educational videos, no substantial literature and researches study how this videos and films affect student's attitude towards science.

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This study investigated whether documentary films affect students' attitude towards science. Specifically, it sought to answer the following questions:

1. What effect do documentary films have on students' attitude towards science?
2. Is there any statistically significant difference on the pretest and posttest of the students' attitude towards science?

II. Methodology

The study determined the effects of documentary films on students' attitude towards science using the pre-experimental single group pretest and posttest study. The fourth year Bachelor of Science in Education (BSE) major in Physical Sciences had been the subject of this investigation during the first semester of school year 2015-2016 in their Modern Physics course.

A number of documentary films have been selected to provide the necessary intervention and for analysis. These films include: BBC's Chemistry: A Volatile History; BBC's Atoms; BBC's Secrets of Quantum Mechanics; PBS/Nova's Einstein's Big Idea; PBS/Nova's The Elegant Universe and National Geographic's Cosmos: Space Odyssey. These were given as a subject of study during class discussion, a required supplement or as an assignment.

Data on the effects of these films have been gathered and analyzed using the Thinking About Science Survey Questionnaire [13]. The questionnaire probed on how people evaluate science vis-à-vis other aspects of culture providing clear information about the over-all attitude towards science. It defined attitude towards science, as used in this study, in terms of the following components: Epistemology; Science and the Economy; Science and the Environment; Public Policy and Science; Science and Public Health; Science, Religion, and Morality; Science, Emotions and Aesthetics; Science, Race and Gender; Science for All (see Appendix).

Weighted mean was used to quantify the pretest and posttest results, analyzed and interpreted using the following scales:

4.21 – 5.00 – Highly Positive
3.41 – 4.20 – Positive
2.61 – 3.40 – Neutral
1.81 – 2.60 – Negative
1.00 – 1.80 – Highly Negative

T-test was used to determine whether effects on students' attitude towards science exist. Computations were all done using Minitab.

III. Results And Discussion

A. Effects of Documentary Films on Students Attitude Towards Science

Five areas considered in the questionnaire showed no changes after exposure to documentary films. Epistemology, Science and Economy remained Positive after implementation of the documentary films. Science and Environment, Science and Gender and Science for All remained Neutral as the pretest and posttest were computed. Remarkable changes have been observed on the following areas: Science and Public Policy – from Positive to Neutral; Science and Public Health – from Positive to Neutral; Science and Religion – from Negative to Positive; Science, Emotions and Aesthetics – from Neutral to Positive. Over-all results showed no change from Positive.

It is important to note that before the implementation of the documentary films students have positive attitude towards Public Policy in Science – adhering to the idea that science acts in the public interest. Yet, the posttest result showed a shift towards Neutral. This shift can be attributed to the presentation of the personal life of the scientists in the documentaries. Revealing that scientists are not superheroes, nor extraordinary but an ordinary persons with extreme passion in science and focused in understanding science phenomena for personal glory.

The pretest and posttest mean results using the Thinking About Science Survey Instrument is presented below.

TABLE I: WEIGHTED MEANS OF TSSI PRETEST AND POSTTEST

Components	Pretest Mean	Interpretation	Posttest Mean	Interpretation
Epistemology	3.783	Positive	3.594	Positive
Science and Economy	3.995	Positive	3.845	Positive
Science and Environment	3.250	Neutral	3.313	Neutral
Science and Public Policy	3.800	Positive	3.385	Neutral
Science and Public Health	3.750	Positive	3.375	Neutral
Science and Religion	2.300	Negative	3.421	Positive
Science, Emotions and Aesthetics	3.000	Neutral	3.425	Positive
Science and Gender	3.000	Neutral	3.010	Neutral
Science for All	3.256	Neutral	3.344	Neutral
Over-all	3.449	Positive	3.464	Positive

Similar positive attitude was observed in Science and Public Health – that science made it possible to conquer diseases and physical affliction and the great advances in public health will not continue without science. Yet, posttest result showed a shift towards Neutral, indicating that the documentary films showed that diseases and medical problems can be resolved using an alternative approach or students cast doubt whether science can really solved medical problems. In Science and Religion, however, a Negative attitude is shifted to Positive after exposure to documentary films. This indicates that the films provided a more open mind approach in dealing with it. A shift from Neutral to Positive attitude was observed in Science, Emotions and Aesthetics, indicating that students viewed science as elegant and scientist are passionate about their work.

B. Statistical Difference of Pretest and Posttest of TSSI

The t-test result showed no significant difference on the students pretest and posttest with an over-all p-value of 0.911. Similarly, no single component showed significant change. (Table II)

This can be attributed to the following: (1) language used – most documentary films are produced by BBC and the

narration is done in British accent. It is evidently observed that students had difficulty in understanding them. They would say "Ahhh", like a Eureka moment, when the researcher explained a portion of the film they cannot understand fully. (2) moviegoer attitude – their natural tendency is to watch the films as if they are watching it in the theater or in TV. Their concentration most of the time was on the scenery and portrayals of the subject scientists. Science concepts are usually undermined. They showed difficulty even in identifying the scientist being portrayed. (3) length – films require at least an hour to watch. Some students lost interest and divert themselves from doing something else (4) Access – not everyone has access to either computer or internet connection. Oftentimes, students watched assigned films in an uncomfortable expensive internet shops.

TABLE II: TEST OF SIGNIFICANT ON STUDENTS' ATTITUDES TOWARDS SCIENCE

Components	t-values	p-values	Analysis
Epistemology	0.74	0.478	Not Significant
Science and Economy	0.57	0.550	Not Significant
Science and Environment	-0.19	0.865	Not Significant
Science and Public Policy	1.34	0.214	Not Significant
Science and Public Health	0.74	0.513	Not Significant
Science and Religion	-2.07	0.084	Not Significant
Science, Emotions and Aesthetics	- 1.07	0.365	Not Significant
Science and Gender	-0.02	0.987	Not Significant
Science for All	0.03	0.973	Not Significant
Over-all	-0.11	0.911	Not Significant

$p \leq 0.05$ significant

IV. CONCLUSION

Analysis showed that the documentary films did not provide any significant effect as indicated by the t-test result. This meant that students' attitude towards science cannot be simply altered by watching documentary films. These films were considered as a mere entertainment, hard to understand and a mere "for your information" only. It would require a more compelling learning experience to influence student's attitude towards science.

APPENDIX

Thinking About Science Instrument Category Description

1. **Epistemology -** Science is a superior, exemplary form of knowledge that produces highly reliable and objective knowledge about the real world.
2. **Science and the Economy -** Modern industrial, commercial, and information-based economies depend on scientific developments for increasing production, wealth and general public welfare.
3. **Science and the Environment -** Science is necessary for the discovery, development, and conservation and protection of natural resources and the environment in general.
4. **Public Policy and Science -** Science acts in the public interest. Science should thus be supported by public funds; however, the science community is more than capable of policing scientific activity.
5. **Science and Public Health -** The conquering of disease and physical affliction and the great advances in public health are made possible by science and will not continue without science.
6. **Science, Religion and Morality -** People make moral choices about the use of scientific findings but science itself is morally neutral. Science is also neutral with regard to religion. The importance of science, however, is such that science must be protected from the intrusive activities of some religions.
7. **Science, Emotions and Aesthetics -** Scientists are often passionate about their work but the work of science best proceeds on the basis of objective reason and empiricism. There is a beauty to science. Indeed, "elegance" is often required of scientific ideas.
8. **Science, Race and Gender -** Science is an "equal opportunity employer." Race, gender and other personal factors are irrelevant in science.
9. **Science for All -** The importance of science is such that it should be taught at all levels of schooling. Every citizen should have attained at least a minimal level of science literacy.

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