Use of Movie Scenes as Simulations to Enhance Students' Performance on Selected Physics Concepts

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Abstract: This study examined the effectiveness of using movie scenes as simulations in enhancing student's performance on selected physics concepts. The study compared two groups of second year Bachelor of Elementary Education students in Samar State University in which the experimental group was taught physics concepts using the movie scenes as simulations, and the control group was taught using the traditional lecture method. Pre-tests and post-tests were used to collect the data. The quantitative data collected was calculated using a dependent t-test and independent t-test. Although the findings suggested that both methods were effective in teaching physics concepts, students in the experimental group had shown a larger gain in their post-tests than their counterparts in the control group.

Keywords: teaching math, method of teaching, teaching strategy, teaching-learning, movie-aided teaching (MAT)

1. Introduction

Much has been said about the significance of science in the society. Science had been of great importance internationally for sustainable and socio-economic development as well as for the technological advancement of nations (Olufunke, 2012) Science, therefore, is a requirement in all countries due to the many challenges faced by them. Such challenges include emergences of new drug-resistant diseases, effects of genetic experimentation and engineering, the ecological impact of modern technology, dangers of nuclear war and explosions and global warming among others (Alsop & Hicks, 2001). Many of the technological advancement used as tools in solving these problems are products of Physics.

Physics has always prided itself on being the cutting edge in science, of developing genuinely new concepts and ways of looking at the world (Alimen, 2009). The remark attributed to Lord Rutherford that "only physics is science, all else is stamp collecting." The principles and concepts of Physics have been widely used in economic, scientific and technological advancement such as information and technology which reduced the world into a global village through the use of computers and satellites. Also, Physics education enables learners to acquire problem-solving and decision-making skills that pave the way for critical thinking and inquiry that could help them to respond to widespread and radical changes in all the facets of life (Olufunke, 2012). It is, therefore, important that youth of today be equipped with the knowledge of the subject.

Math and Science performance of Filipino students is lagging behind other countries in the world as shown in the results of the Second International Science Study (SISS)

and Third International Mathematics and Science Study (TIMSS). In the paper of Orleans (2007), achievement of Filipino students in the different science subject areas including physics appeared below the international standards which are attributed to factors such as non-major teachers and poor teaching training.

Alegre (2012) revealed that Physics is a real big frustration to students in his study on students' early and recurring experiences and perceptions about Physics. Students confirmed that their achievements in Physics are very much affected by their attitudes and anxiety. Hence, it is a must for Physics educators to do some interventions or upgrade their teaching strategies and approach to make Physics learning more engaging and interesting for learners.

Currently, the youth have very high access to a various forms of media. The internet alone has almost any type of media available, from recorded TV shows to movies, documentaries, magazines, music, games, and videos, a rich potential source of tools for learning. A survey on media use and youth lifestyle showed that Filipinos aged 15 to 24 years old represent the biggest consumers of information technology in the past few years (Cebu Daily News, nd). These findings imply that youth of today are more interested and attracted to information technology.

Interactive multimedia have been proven to facilitate learning. Teaching through movies is an effective way to reach people's affective domain. It promotes insightful attitudes as it provides link learning to experiences (Blasco & Alexander, 2005). Teaching with movies triggers that disclose emotions allows questions, expectations, and dilemmas to arise for both learner and teacher. (Blasco et.al, 2015). Using movies in the arts are considered effective. There were few studies using movie clips in aiding teaching which was proven to be effective such as the study of Dubeck (1998). Using a blended method (movie-based simulation with instructor-based training) of teaching medical students have also been proven to have improved student performance (Malik et.al., 2013).

Dolores (1990) says that low performance in science and math is due to lack of ability and effort most of which is influenced by the students secondary and tertiary mentors. The abstract concepts attributed to the subject which makes it hard to understand might be one of the causes why Filipino students perform low in math and sciences. Using visual tools has been proven to be very effective in understanding abstract ideas. Using multimedia in teaching Physics resulted to higher cognitive load and higher student performance (Muller, 2008) such as movies. Using movies in teaching Physics was studied by Efthimiou and Llewellyn (2004) showed that students exhibited a strong tendency to participate enthusiastically in discussions specifically when the topic is familiar to them thereby increasing their interest in the subject which may lead into understanding the topic better.

2. Objectives

The study intended to provide empirical evidence on the effectiveness of using movie scenes as simulations in explaining fundamental concepts in Physics to enhance students' academic performance.

3. Methodology

Research Design: The nature of the problem calls for experimentation. A quantitative design was used to collect the data requirements.

Subjects of the study: The study will involve two intact classes of the second year Bachelor of Elementary Education students in Samar State University during the school year 2016-2017. One class (53 students) was exposed to movie scenes as simulations in Physics concepts while the other class (44 students) was taught using the traditional lecture method

Data Gathering Procedure: In this study, a 10-item teacher-made multiple choice type pre-test and post-test were used in each Physics topic. The researcher created one learning setting using movie scenes as simulations in teaching some selected physics concepts in Kinematics. This setting was compared to the traditional lecture method.

Movie Scenes used: The following movies were used to simulate two topics in Physics.

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The Purge Election Year (on motion along a straight line)

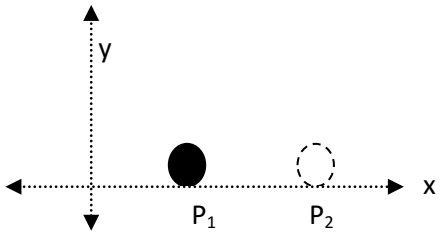
There is a scene which shows a car with a senator and her friends who are about to leave a store and move to a safer place escaping the danger of the Purge night. While on their way, another car appeared and started shooting them. Thus, the driver increased the car's speed to get away from their attackers.

Avenue of Analysis:

The scene is a good representation to analyze average velocity of the senator's car.

We choose the x-axis as the coordinate system of the car with the origin 0 as its starting point. In the movie, the origin is the store. P_1 is the first point reached by car at time T_1 while P_2 is the point reached by car at time T_2. In the movie, P_1 is the point reached by car before they changed their speed and P_2 is the point where they stopped.

Illustration (1):



To compute, we can have:

$$V_{ave} = \frac{x_2 - x_1}{t_2 - t_1}$$

The car has a positive average velocity since it is moving forward in the positive x-direction

The Wedding Ringer (on Projectile motion or motion on 2-3 dimensions)

A breath-taking chase scene involves a car driven by an old yet very adventurous man being pursued by some police cars. The thing is, they were able to jump off one end of a wrecked bridge to the other end of the bridge.

Avenue of Analysis:

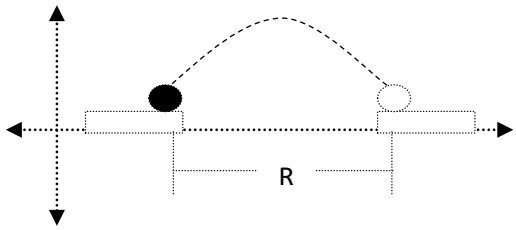
The scene is a perfect from of projectile motion involving initial velocity with angle above the horizontal.

The figure shows a situation where a projectile is thrown at a certain angle above the horizontal to assume a trajectory path and eventually to reach a destination of the same level at a farther point. The equation below was used:

$$R = \frac{V_0^2 \sin \emptyset}{g}$$

R is the distance between the two disconnected end of the wrecked bridge, v_0 is the velocity of the car.

Illustration (2):



and Ø is its departure angle.

Data Analysis: To analyze the gathered data in this study, dependent t-tests were used in determining the differences between the pre and post-tests scores of the control and experimental group.

4. Results and Discussion

There were two trials made in this study. The experimental group in the first trial was exposed to a teaching-learning process involving viewing a video clip from a movie entitled The Purge Election Year for the topic motion along a straight line. The experimental group in the second trial viewed a video clip from the movie entitled The Wedding Ringer for the topic about motion on two dimensions specifically on projectile motion. The control group for the two trials was handled using the traditional method of teaching using white board and oral discussion.

Pretest scores between experimental and control group are not significant which means at the start of the evaluation; the two groups are identical. Shown in table 1 are the pre-test and post-test scores of the two groups of students. After the intervention, a post-test was conducted. Post-tests shows that the traditional and the instruction with movie simulation have significantly improved students learning in physics on the two topics presented.

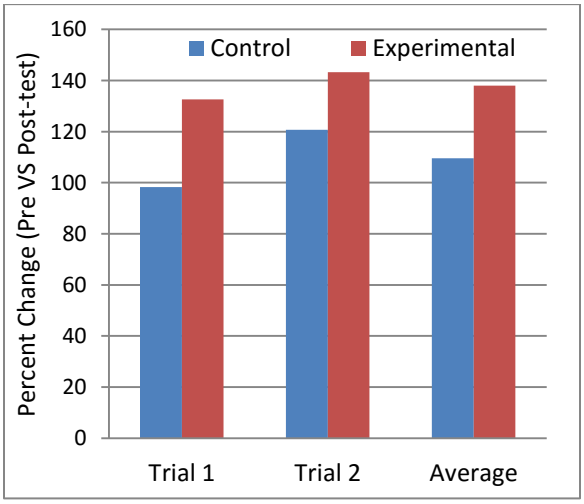


Figure 1. Pre-test vs. Post-test performance

The group which was subjected to traditional instruction (control) have improved by about 109.48% while the other group with additional aid through movie clips (experimental) performed 137.96% or about 26.01% better. The average difference of improvement is about 26.01% which was calculated to be significant as shown in Table 2.

This improved performance through the use of movie scenes can be attributed to the kind of interest produced in watching

Table 1. Test of Difference between the Pre and Post-test Scores

Topics	Statistics	Control Group (without movie scenes)		Experimental Group (with movie scenes)	
		Pre-test	Post-test	Pre-test	Post-Test
Motion on straight line	Mean	3.96	7.85	3.89	9.05
	St.Dev.	0.96	1.20	1.26	1.15
	Computed t	17.33		23.1	
	Critical t	1.68		1.68	
	Interpretation	Significant		Significant	
Projectile motion/2-3 dimension motion	Mean	3.52	7.77	3.72	9.05
	St.Dev.	1.10	1.10	1.11	1.20
	Computed t	21.70		27.15	
	Critical t	1.68		1.68	
	Interpretation	Significant		Significant	

Table 2. Test of Difference between the Gain Scores

Test	Statistics	On Motion Along a Straight Line		On Projectile Motion	
		Control Group	Experimental Group	Control Group	Experimental Group
Pre Test	Mean	3.96	3.88	3.89	9.05
	Computed t	0.33		0.87	
	Critical t	1.66		1.66	
	Interpretation	Not Significant		Not Significant	
Post Test	Mean	3.88	5.05	4.25	5.32
	Computed t	3.97		3.85	
	Critical t	1.98		1.98	
	Interpretation	Significant		Significant	

physics in action. As shown in the study of Blasco et.al (2015), movies allow the learner to grasp the topic in a narrative model grounded in the learners' familiar world that is framed in emotions and images.

5. Conclusion and Recommendation

This study proves that the use of movie scenes as simulations in teaching physics concepts can enhance students' performance on the subject. However, there are some factors which may threaten the validity of this study. One is the number of students per class factor. One class has more students than the other class. This is a factor that could not be avoided because the researcher used intact classes as subjects of the study. Recommendation for further study could be that future researchers explore other movie clips for other Physics topics.

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