Teaching Strategies to Increase Science Subject Achievement: Using Videos for Year Five Pupils in Primary School

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Abstract: Student difficulty in understanding basic concepts and scientific knowledge is a major obstacle when achieving teaching objectives for Science subjects in primary schools. Abstract concepts and knowledge, which cannot be seen or touched, are important issues. Teaching strategies using media (video) can impact the learning process. This study examines the impact of using videos as a teaching strategy for delivering scientific knowledge to pupils in primary schools. Science is a core subject in primary and secondary schools in Malaysia, so it is important to ensure that pupils do grasp the basic concepts. The study applied quantitative methods on a sample of 18 pupils in Year Five from one of the National Schools in Bangsar, Kuala Lumpur. Data were analyzed using SPSS descriptive statistics and translated into tables and diagrams. The findings suggest that a video teaching strategy helps pupils improve their understanding of basic concepts and knowledge in Science classes. Pupils showed positive changes in attitude and interest, so learning Science can then become fun.

Key words: Science · Learning process · Media and video strategies · Teaching strategies

INTRODUCTION

Science is a subject that plays an important role in fulfilling the aspirations of the National Education Philosophy. In line with the National Education Policy Act enacted in 1996, Science is today a core subject in all primary and secondary schools throughout Malaysia. The Science Curriculum for primary schools is designed based on this National Science Education Philosophy which states that:

"In line with the National Education Philosophy, science education in Malaysia fosters a culture of science and technology with emphasis on individual development to become competitive, dynamic, robust and resilient and able to master science and technology skills." [1]

Science in the primary schools is a three-year program for pupils at Level II (years 4, 5 and 6). The curriculum aims to help pupils learn about themselves and their environment through both experience and investigation. However, the ability of pupils to understand basic science knowledge in the fourth theme, Investigating the Earth and the Universe, does need proper attention. The nature of the knowledge is abstract rather than concrete and result in a low level of mastery among pupils. Pupils have difficulty imagining and understanding how such phenomena occur, which leads to failure in explaining the theory correctly.

Thus, researchers decided to conduct a study on the effectiveness of media strategies using videos to enhance pupils’ understanding of scientific facts. This study examines the effectiveness of using videos in teaching Science to pupils in Year Five. The study also aims to improve student assessment scores on examinations or tests. In general, the use of videos adds varieties to the teaching of Science subject and they are viable teaching techniques for learning in schools.

Operational Definition

Teaching Strategy: The term refers to the manner in which teachers want to achieve the goals of instruction. A strategy will cover several aspects of the sequence and structure of the information to deliver and then decide how to achieve it [2].

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Basic Science Knowledge: Encarta Encyclopedia states that science in the broad sense of the word explores the meaning of knowledge—knowledge gained by systematic sensory experience that can be objectively proven. In the context of action research, basic science knowledge of pupils is referred to as the ability to master the Fourth Theme, namely to investigate the earth and the universe. The Field of Study for this theme is the Earth, Moon and Sun and the Natural Phenomena and Astronomy [3].

Video Media: According to Hofstetter and Tway [4], "Multimedia is the use of a computer to present and combine text, graphics, audio and video with links and tools that let the user navigate, interact, create and communicate ". In this study, video deals with the knowledge of basic science involving the Fourth theme. It is relevant only to investigate the earth and the universe, such as the video-related cycle of the earth around the sun, moon cycles, constellations, planets and to understand the phenomenon of day and night.

Use of Media in Teaching and Learning: Yusuf [5] states that the medium of instruction used in teaching and learning can be divided into eight categories. These details are:

- Rigid Media (transparencies, slides, microfilm, etc.)
- Motion Media (video, film, disc, etc.)
- Graphics (drawings, posters, cartoons, etc.)
- Rigid Photos (photo, scan cards, postcards, etc.)
- Exhibit Media (models, dolls, dioramas, etc.)
- Exposure Media (chalkboard, flannel board, story boards, etc.)
- Audio Media (speech, audio tapes, compact discs, etc.)
- Print Media (teaching modules, textbooks, newspapers, magazines, etc.)

There are many functions of media used in teaching and learning. In this study, the uses of media (video) that are examined are as follows:

The Functions of Media

Organizing Lessons: In order to use media in a lesson, the teacher needs to prepare the lesson systematically and ensures that the lesson is well organized. The use of media is thus investigated, carried out, evaluated and then improved upon according to the pupils’ needs and learning objectives.

Providing Information: Different media, such as television, educational radio stations and films, provide educational information to communicate the teaching and learning process.

Connecting Pupils with the Lesson: Events happening outside the classroom can be recorded, using photos and videos or written in a book and then brought into the classroom. Pupils can thus relate easily to the events, as they were captured through the media and later presented clearly.

Enrichment of Experience: Films offer pupils new experiences. For example, pupils’ living in non-seasonal countries do not experience snow. The teacher can show snow through film that let pupils imagine being in a country where it does snow.

Making Learning Fun: Learning occurs when there are changes in behavior. Pupils are motivated to learn when they watch films, television and other forms of media. This motivation will foster pupils’ interest as the classroom environment and encourage learning. A change in pupils’ behavior can occur when they enjoy watching and listening to interesting media and the pleasant experience leads to meaningful learning.

Catering to Individual Needs: Learning should be conducted according to the pupils’ individual capability to complete a certain unit. Pupils do not have to wait for the teacher; they can work at their own pace and follow a syllabus organized before hand by the teacher based on the pupils’ individual abilities.

Teaching and Learning Model (Media-Based): There are various models available for teaching and learning strategies using media. In this study, we use the ASSURE Model, introduced by Heinich, Molanda, Russell and Smaldino [6]. ASSURE means "to ensure it happens" and is an acronym. The letter A stands for Analyze the learner and identifies readiness and prior knowledge related to the topic pupils will be taught. Any study of age, talent, class and economic status of pupils should be conducted to facilitate the teaching and learning process. The letter S–States the Objective or the specific objectives for the intended outcome. The second letter S stands for Select. Teachers have to modify or prepare media used according to the subject content they want to deliver to their pupils. Teachers should select existing media and adapt it to their teaching objectives.
If the chosen media is not suitable, teachers should make proper amendments first. If the existing media is not compatible with the objectives of the teaching, the teachers will have to find new media or more suitable medium that contains the title and objectives of the lesson plan. The letter U stands for Use of Media. Teachers plan how to use the media and provide facilities suitable for the presentation. Plan activities should both attract pupils and motivate them to learn. Follow-up activities for enrichment purposes also must be prepared by teachers. The letter R- Require Learner Response looks for a response from pupils during and after the learning session. Teachers should have a reliable reinforcement or remedial method based on the response obtained and also desired. Finally, the letter E of the acronym stands for Evaluate Materials. At this stage, teachers should review and evaluate the materials they did use and answer the following questions:

- Were the objectives achieved?
- Were the materials used helpful in teaching and learning?
- Did the pupils use them properly?
- Was the teaching and learning environment comfortable?
- Can those questions be answered precisely?

**METHODS**

This study is an action research that follows the Kemmis and McTagart model [7]. The study was conducted in one of the National Schools in Bangsar, Kuala Lumpur. The school selected was a girl’s school that applied the streaming class system for their pupils’ management. The sample chosen consisted of one whole class of Year Five pupils with 18 eleven year old girls. They were the weakest pupils (last class) in Year Five at this school. The research was conducted in collaboration with the teacher teaching the science subject for that class. She had seven years’ experience in teaching the science subject at the year five level.

Throughout the study, the teacher was asked to deliver two methods for teaching the same topic. At first, the traditional method was used where teaching involved chalk and talk and discussion was carried out. After that, a pretest containing 5 basic questions about the topic was given to pupils to identify their initial knowledge. Next, using the same sub-topic, the teacher used a media-based approach. This approach consisted of four separate videos representing four subtopics related to water cycle, solar system, constellation and the movement of the earth the moon and the sun. Pupils learned the sub-topic by watching a video related to the teaching objective. The teacher explained and discussed the issue using the video interactively. During the teaching and learning process, teacher pauses the video scene and encourages pupils to ask questions as well as give their explanations according to their understanding. Teacher would resume the lesson by furthering the unclear explanation. After that, a post-test that contained 5 basic questions was given based on the video shown. The score for each test was recorded by the teacher. A comparison of those tests was used to determine the effectiveness of the methods in helping pupils grasp the sub-topic taught by the teacher. Data were analyzed using SPSS descriptive statistics and translated into tables and diagrams. Performance was measured using three scales: I - Improve, S - No change and D - Decrease.

**RESULTS**

The findings obtained from the research are presented here. The diagram 1 shows pupils’ achievement in pre-and post-tests for Video 1 (Water Cycle).

Diagram 2 shows pupils’ achievement in pre and post-test for Video 2 (Solar System).

Diagram 3 below show the comparison of Pupils’ Results for Video 3 (Constellation).

Diagram 4 below show the comparison of Pupils’ Results for Video 4 (Movement of the Earth, the Moon and the Sun).

Table 1 below shows the descriptive statistical analysis that involves the calculation of mean, median, mode and standard deviation for the distribution of scores and pupils’ achievement for each sub topic. The total numbers of pupils taking part in the study were 18. The mean for pre Video1 was 32.2, Video 2 mean 41.1, Video 3 mean 41.1 Video 4 mean 42.2. As indicated the mean for the post-test was Video 1 mean 60.0, Video 2 mean 60.0, Video 3 mean 56.7 Video 4 mean 68.9. Generally, there was an increment from pre-test to post-test for all videos shown. Similarly, the median of post-test showed an increment from pre-test to post-test of each video shown. The same goes for mode of each video shown.

**Comparison of Pupils’ Performance Before and After the Study:** Table 2 shows the analysis of student achievement (in percentages) following the study. A performance comparison was shown between the pre- and post-test for each video that was used.
Diagram 1: Comparison of Pupils’ Results for Video 1.

Diagram 2: Comparison of Pupils’ Results for Video 2.

Diagram 3: Comparison of Pupils’ Results for Video 3.
Diagram 4: Comparison of Pupils’ Results for Video 4.

Diagram 5: Pupil Performance after Use of Video Strategy for Each Video Seen.

Table 1: Descriptive analysis of the distribution of pupils’ scores based on the videos.

<table>
<thead>
<tr>
<th>Add title</th>
<th>Pre Video1</th>
<th>Post Video1</th>
<th>Pre Video2</th>
<th>Post Video2</th>
<th>Pre Video3</th>
<th>Post Video3</th>
<th>Pre Video4</th>
<th>Post Video4</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Missing</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Mean</td>
<td>32.2</td>
<td>60.0</td>
<td>41.1</td>
<td>60.0</td>
<td>41.1</td>
<td>56.7</td>
<td>42.2</td>
<td>68.9</td>
</tr>
<tr>
<td>Median</td>
<td>30.0</td>
<td>60.0</td>
<td>40.0</td>
<td>60.0</td>
<td>40.0</td>
<td>60.0</td>
<td>40.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Mode</td>
<td>20.0</td>
<td>60.0</td>
<td>40.0</td>
<td>60.0</td>
<td>40.0</td>
<td>60.0</td>
<td>40.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>20.7</td>
<td>26.6</td>
<td>20.0</td>
<td>21.7</td>
<td>17.5</td>
<td>19.7</td>
<td>15.2</td>
<td>23.0</td>
</tr>
</tbody>
</table>

Table 2: Pupil Performance (%) for the pre- and post-tests for each video.

<table>
<thead>
<tr>
<th>Performance/Video</th>
<th>Video 1</th>
<th>Video 2</th>
<th>Video 3</th>
<th>Video 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase</td>
<td>94.4</td>
<td>83.3</td>
<td>77.8</td>
<td>88.9</td>
</tr>
<tr>
<td>No Changes</td>
<td>0.0</td>
<td>16.7</td>
<td>22.2</td>
<td>5.6</td>
</tr>
<tr>
<td>Decreased</td>
<td>5.6</td>
<td>0.0</td>
<td>0.0</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Diagram 5 shows the analysis differences in achievement (Pre-test versus Post-test) for the four videos used in this study. The percentage of correct answers increased especially for Video 1. Video 1 recorded 94.4% for increasing performance, 0% for static performance and only 5.6% for decreasing performance. For Video 2, 83.3% of the pupils showed improvement, 16.7% showed no change and no students showed decreased performance. Video 3 also recorded no decline in pupil performance, 22.2% were unchanged and 77.8% showed an improvement in understanding after the study. Video 4 had the same percentage of no change in performance and a decrease in performance of only 5.6%. However, the percentage of pupils who showed improvement after viewing this video reached 88.9%.
Video 1 showed the highest increasing percentage, followed by Video 4 and Video 2. The least percentage of increased performance was for Video 3. Video 3 was the only video with an increasing percentage of below 80%. The percentage of static and decreasing performance recorded for all the videos was considered to be very low. A descriptive analysis (mean, mode, median) also showed that pupils’ achievement between the pre- and the post-tests differed tremendously.

**DISCUSSION**

This study achieved its objectives because pupils’ ability to answer questions on the post-test did increase. The findings show that media-based technique that uses video helps pupils to improve their comprehension and memory of a topic being studied. Pupils showed changes in attitude and more interest toward Science subjects and most of them did master the targeted basic concepts of science. Only two pupils (on average) showed no change in performance for all the videos used.

Researchers believe that family background and other learning problems, such as being non-literate, contributed to these findings. Most pupils came from moderate to poor families, which caused parents to be unable to spend quality time with their children. Parents are busy working and could not be as concerned with their children’s education. Home environment that is not conducive to learning was one of the factors contributing to the lower pupils’ interest in their studies. The factor of class streaming based on overall cumulative performance in the five core subjects (Science, Mathematics, English, Bahasa Malaysia Paper 1 and Bahasa Malaysia Paper 2) also contributed to the achievement gap. This streaming system resulted in the ability of pupils in each subject to be different from one another.

This finding is consistent with the various theories for intelligence in humans (linguistic intelligence, logical-mathematical, visual-spatial, musical, kinesthetic, interpersonal, intrapersonal and naturalist), found by Gardner [8]. The use of video media in the teaching and learning of science can stimulate multiple intelligence styles that exist within pupils while helping them improve their understanding of scientific concepts being studied. This finding is also consistent with Dale’s “Cone of Learning” chart [9], which states that the human memory has a 50% potential to instantly remember what is seen and heard. In his theory, Dale clarifies the effects of different media on teaching and learning to change pupils’ understanding level from difficult to easy. According to him, the use of modern technology in teaching can maximize pupil’s mastery. This concept is supported by Heinich et al. [6]. Concrete experience for students happens when they are directly involved in the learning activity. However, the mastery will decrease if the pupils do not engage in an activity. Indeed pupils’ experience of the abstract is accepted if used via visual and verbal symbols that represent the event. As pointed out by Suleyman et al. [10], science teachers experience difficulty in provision of materials and that material used are not suitable for the students’ level and they cannot use up to date knowledge and instructional methods and technique adequately in their lessons. In this study, the pupils were able to master and remember the concepts of science as seen on a video played and followed by discussion in class.

There is still more room for improvement in methods in order to achieve the desired targeted objectives. In addition, pupils need to be separated based on their level of understanding of scientific concepts for learning to be conducted most effectively. The use of media centered strategies using videos in teaching and learning should be implemented throughout the year. Since, pupils have a lot of free time after their final exams at the end of the year, this strategy is highly recommended because it requires less teacher supervision. Relaxing Science videos that are shown after the examinations will fill the pupils’ free time and strengthen their existing knowledge and understanding of scientific concepts in a pleasant way.

**CONCLUSION**

This action research was generally successful in its objective, namely to provide a positive impact on the pupils. The strategy developed pupils’ interest and made teaching and learning activities more fun. Pupils loved for teachers to teach the subject (Science Learning is fun) and as a result their Science performance increased. Furthermore, this video strategy is a viable alternative for diversifying science teaching and expanding the learning techniques available to teachers. The creative use of video attracts pupils and increased their attention and desire to learn. Pupils not only enjoyed watching the videos as they were aired, but also acquired the knowledge contained in them that had been targeted by the teacher for delivery to the class.
REFERENCES