



ASEAN Journal of Science and Engineering Education



Journal homepage: <http://ejournal.upi.edu/index.php/AJSEE/>

Video Demonstration: Effects on Student's Metacognitive Skills in Science

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ABSTRACTS

The study investigated the effects of video demonstration on the metacognitive skills of students in science subjects. The 38 respondents are enumerated from Bachelor of Secondary Education major in Science students of Sultan Kudarat State University, the Philippines. This study utilized a quantitative research design to determine the variables of the study and the relationship that occurs between them. The results gathered were treated and analyzed using a t-test and mean rating. The results showed from the collected data, revealed that there is a significant difference in terms of thinking, understanding, performing, and reasoning than without the intervention of video demonstration as seen in the results of the two sets of tests given to the respondents. The teaching strategy using video demonstration is effective for the respondents in this study. Moreover, this strategy can be maximized by the teachers in delivering the lessons. As a result, it is recommended to educational institutions to enhance and strengthen their support in enhancing the skills in creating video demonstrations for their class discussions.

ARTICLE INFO

Article History:

Submitted/Received 11 Jul 2022

First revised 02 Aug 2022

Accepted 18 Aug 2022

First available online 20 Aug 2022

Publication date 01 Dec 2023

Keyword:

Metacognition,

Metacognitive skills,

Video demonstration.

1. INTRODUCTION

Many researchers described metacognition as a thinking aspect, but metacognition is much more than that aspect. It is a strategic way of thinking that leads to greater academic success (Callan et al., 2016). The study by Jayapraba (2013) stated that metacognitive teachings can increase their metacognitive awareness and develop in them a positive attitude towards learning. Students' academic achievement can be increased if teaching strategies are planned in a metacognitive way. Students must be taught how to develop and be aware of the strategies. Further, teachers must improve their students' metacognitive awareness to improve their learning abilities since students know more about effective learning strategies to gain greater metacognitive awareness. Hence, students gained in their academic performance (Magno 2010).

Video-based materials boost student creativity and cooperation hence, can help motivate students and create a distinctive context for their learning experience (Greenberg et al., 2012). There was abundant evidence that metacognitive skills can be trained successfully (Veenman et al., 2004). To bring out students' full potential without placing a heavy burden on their mental capacity and not sacrificing the experience of having enjoyment in learning, the additional idea must be given that can be of huge help to students and teachers. This study aims to measure the metacognitive skills of the students through the help of video demonstrations related to science subjects.

Based on Vrbik & Vrbik (2017) who explained video demonstration as a teaching method, the technology's innovation and a simple admittance to it have added to the ordinary utilization of various specialized guides in all parts of human culture as a basic work resource. In terms of education, especially within the area of physical exercise, when a new task is presented, the most commonly used method is "live" demonstration, which enables smooth information transfer to students. Metacognitive regulates and monitors the student's cognition and includes planning activities, awareness of comprehension and task performance, and evaluation of the efficacy of monitoring processes and strategies. Recent research suggests that young children are capable of rudimentary forms of metacognitive thought. This study was conducted to develop the ability and skills of students using video demonstration. Metacognition has increasingly been recognized as essential for learning. This paper defines metacognition, discusses its importance, strategies, and techniques, and specifies how the instructor can nurture it in students to promote positive learning outcomes after watching videos.

The purpose of this study is to integrate fun lessons while maintaining or further developing the metacognitive skills of the students. With this study, we can interact with audio-visual mediums that can be used in schools with insufficient laboratory facilities. This way is prospective, providing needed support for educational materials, offering guidance for teachers, and contributing to student academic achievement. Generally, this study aims to evaluate the metacognitive abilities of the students in learning science subjects using video demonstrations. In facing obstacles and challenges or vice versa. The high self-efficacy would cause a person to have better metacognitive skills (Magno 2010). The students identified the visual aided method as the more interesting one for learning which helped them in applying the knowledge gained.

This study generally aims to evaluate the metacognitive abilities of the students in learning science subjects by using video demonstrations. Specifically, it aims to answer the following questions:

- (i) What is the level of acceptability of the video in terms of quality and mechanics?

- (ii) What is the level of Pre-test of the Students in Video Demonstration?
- (iii) What is the level of Post-test of the Students in Video Demonstration?
- (iv) Is there a significant difference between the pretest and posttest on Student's metacognitive skills?

This study is timely and can help contribute to the filling up of knowledge gaps. This study can help in building, validating, and refining prevailing theories. The result can help in solving the pressing issues of certain areas specified in the area of education. This study is somehow one of the concerns of government, especially in the Department of education.

The results of the study will be of great benefit for the following:

- (i) Commission on Higher Education. The result will be used to further improve many pedagogies of the Teachers and maximize the efficiency of their teaching methods in many schools that deal with science-related subjects and improve the metacognitive skills of the students in each school.
- (ii) College of Education Dean. Data gathered will give the dean information on how video demonstration affects the metacognitive skills of the students. The results will enable the dean to improve the teaching styles in enhancing the metacognitive skills of the students. Data given will help the dean to initiate collaboration among faculty and chairpersons in planning the advancement of teacher education concerning the new curriculum.
- (iii) Professors. The results of the study will give the professors an insight into how video demonstration is effective to exercise the student's metacognitive skills. The results of the study will help the professors to improve their teaching-learning styles in assessing students' metacognitive skills.
- (iv) Students. The results of the study will help the students to identify which is better: traditional demonstration or video demonstration. The data gathered will give the students a better way of learning. With that, students will improve academically.
- (v) Future researchers.
- (vi) The result will serve as additional information for future researchers that can be used hereafter.

2. METHOD

2.1. Research Design

This research study used quantitative research. Quantitative research design is aimed at discovering how many people think, act, or feel in a specific way. Quantitative projects involve large sample sizes, concentrating on the number of responses, as opposed to gaining the more focused or emotional insight that is the aim of qualitative research.

2.2. Research Location

The Research study was conducted in Sultan Kudarat State University ACCESS Campus located at Tacurong City, Province of Sultan Kudarat, Philippines (6.6693° N, 124.6297° E). Sultan Kudarat State University ACCESS Campus is known for offering high-quality education in the following college departments: College in Teacher Education, College of Agriculture, College of Criminal Justice Education, College of Health and Science, and College of Law.

2.3. Respondents of the Study

The respondents of the study are 35 Fourth-Year Students of Bachelor of Science in Education major in Science Academic Year 2020-2021 of Sultan Kudarat State University.

2.4. Sampling Technique

This study used total enumeration sampling. In which the sampling units are selected subjectively. The selected respondents can serve as a source of primary data due to the objectives of the study.

2.5. Research Instrument

We designed eighteen video demonstrations incorporated into the lesson plan that tackles science-related subject (Inorganic Chemistry). We also constructed a fifty-item pretest and posttest and a 4-point Likert's Scale survey questionnaire consisting of 40 items referring to the experience of the respondents before and after watching video demonstrations. The designed instruments underwent face validation by the three field experts and were provided with a validation tool as a guide in the validation process. For the reliability test, of the instruments, we conducted a pilot testing on the 3rd year BEd Science major of Sultan Kudarat State University who are qualified in the criteria of the study.

The reliability result was analyzed using Alpha Cronbach (Coefficient Alpha) measuring the internal consistency of the instrument. It also specified the anonymity of the respondents and the data is confidentially generally analyzed without the respondent's identity publicized.

2.6. Data Gathering Procedures

In conducting the study, permission to conduct a letter was sent to the Office of the Dean of the College of Teacher Education. Upon the approval, communication to the students of Bachelor in Secondary Education Major in Science of Sultan Kudarat State University was done. Then, the date of the conduct was arranged. In this setting, we administered an online pretest through Google Form to its respondents. After the test, we conducted a video demonstration, an intervention in Inorganic Chemistry through Google Meet. After that, a posttest and survey were administered to the respondents using the same platform and gathering the needed data (See **Figure 1**). The respondents' anonymity and their responses were secured under the Republic Act No. 10173 also known as the Data Privacy Act of 2012 which protects the fundamental human right of privacy, of communication while ensuring the free flow of information to promote innovation and growth. The duration of study began on the second (2nd) week of October and lasted for 24 days. After conducting, we tallied the answers to efficiently analyze and interpret the responses.

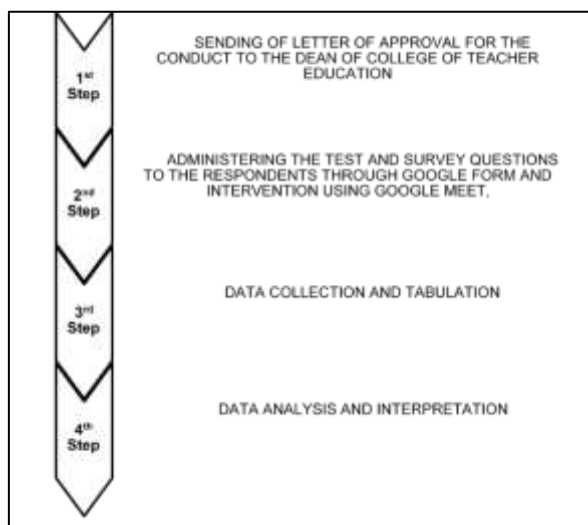


Figure 1. The flow of data gathering procedure in SKSU 2021.

2.7. Statistical Tools and Treatment

The statistical tool that will be used in this study are; Mean rating to determine the level of acceptability of the Video Demonstrations and a T-test for interpretation of the data from the Pre-test and Post-test. We made group the responses according to their knowledge and their existing skills. We then transcribed the different responses. We gather the data by categorizing and analyzing it according to the question of the study.

3. RESULTS AND DISCUSSION

3.1. Level of Acceptability of the Video in terms of Quality and Mechanics

Table 1 shows the level of acceptability of the video demonstration in terms of quality and mechanics. It was found that overall, the students were satisfied with the video demonstration which got the highest weighted mean of 3.86 and was described as strongly agree. In addition, the students strongly agreed on the following indicators: the instructional video was organized by a specific topic so that it was easy to search and review information (weighted mean=3.87); they could hear the presentation and discussion clearly (weighted mean=3.57), and the voice of the demonstrator in the video is very audible (weighted mean=3.57).

Table 1. Level of acceptability of the video in terms of quality and mechanics.

	Statements	WM	Description
1.	This instructional video was organized by a specific topic so that it was easy to search and review information.	3.71	Strongly Agree
2.	I was satisfied with the design of this instructional video	3.54	Strongly Agree
3.	The content is presented interestingly.	3.49	Strongly Agree
4.	I experienced technical difficulty when using/watching the video demonstration.	3.14	Agree
5.	Information was neatly displayed and organized, as well as the relative importance of information was clear.	3.43	Strongly Agree
6.	Learning from video demonstration fits well with my personality and preferred learning style.	3.49	Strongly Agree
7.	The visual quality is good enough for me to see the video demonstration.	3.43	Strongly Agree
8.	I could hear the presentation and discussion.	3.57	Strongly Agree
9.	This video demonstration is efficient in aiding me to understand the topics.	3.40	Strongly Agree
10.	The resolution of the video demonstration is good enough for me to see the text.	3.43	Strongly Agree
11.	The video demonstration is on par in terms of content with the textbook information.	3.46	Strongly Agree
12.	I can hear the audio in the video demonstration.	3.51	Strongly Agree
13.	I was satisfied with the look of this instructional video (visual clarity).	3.46	Strongly Agree
14.	This video demonstration contains accurate information.	3.49	Strongly Agree
15.	The voice of the demonstrator in the video is very audible.	3.57	Strongly Agree
16.	The presentation of topics is very audible to the viewers.	3.51	Strongly Agree
17.	The pronunciation of words is precise and proper.	3.34	Strongly Agree
18.	The video demonstration is too long to watch.	3.03	Agree
19.	The speed of discussion is appropriate for learning.	3.57	Strongly Agree
20.	Overall I was satisfied with the video demonstration.	3.86	Strongly Agree
	Overall Mean	3.47	Strongly Agree

3.28-4.00-Strongly Agree, 2.52-3.27-Agree, 1.76-2.51-Disagree, c-Strongly Disagree

On the other hand, the students perceived that the video demonstration is too long to watch which got the lowest weighted mean of 3.03, described as agreeing. Furthermore, the study revealed that the video demonstration obtained an overall mean of 3.47, which is described as strongly agree. This implied that the students perceived that the video was made perfectly and they found it useful for their learning. In line with this, it was reported in the study of [Chen & Xia \(2012\)](#), that the use of multimedia technology in T&L can deepen the memory and understanding of students through clearer and better quality of graphics, text, audio, and video viewing.

3.2. Level of Pre-test of the Students in Video Demonstration

Table 2 shows the result in the performance of students before the use of Video demonstration as an intervention in the class. This study revealed that in the 50-item test given as a pre-test, the mean score was 18.89 with a standard deviation of 8.17. This result implied that the mean score of the students in the pre-test was below the passing score which is 75%. Thus, the students performed very poorly in the pre-test.

Table 2. Level of pre-test of the students in video demonstration.

Teaching strategy	N	Standard Deviation	Mean Score
Video Lesson	35	8.17	18.89

3.3. Level of Post-test of the Students in Video Demonstration

Table 3 shows the result of the performance of students after the use of Video demonstration as an intervention in the class. This study revealed that in the 50-item test given as a post-test, the mean score was 41.06 with a standard deviation of 6.62. This result implied that the means scores of the students in the post-test were above the passing score which is 75%. Thus, the students performed very well in the pre-test. It can be observed that there was a big difference between the pre-test and post-test scores of the students.

Table 3. Level of post-test of the students in video demonstration.

Teaching strategy	N	Standard Deviation	Mean Score
Video Lesson	35	6.62	41.06

3.4. Significant Difference in the Pre-test and Post-test Scores of Students in Video Demonstration

Table 4 shows the result of the t-test computation in determining whether a significant difference is observed between the pre-test and post-test scores of students after the use of video demonstration in the class as an intervention. It was found that the scores were statistically significantly different with its t-value of -49.48 whose p-value is 0.000 ($p < 0.05$), which lead to the rejection of the null hypothesis. This means that the student's performance improved after the use of video demonstration as an intervention. Thus, it can be implied that this teaching was effective, appropriate and fitted, and prescribed to the learning styles of the student in this study. Pre-service teachers' metacognitive skills were excellent and they also showed a positive response to the video, especially in learning stages, and learning strategies, and metacognitive skills. This study suggests that the video can be used as a standardized modeling video to teach metacognitive skills.

Table 4. Significant difference in the pre-test and post-test scores of students in video demonstration.

Video Demonstration		Paired Samples Test					t	df	Sig. (2-tailed)
		Paired Differences							
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre-test - Post-test	-22.171	2.65115	0.44813	-23.082	-21.260	-49.48	34	0.000

This study generally aimed to evaluate the meta-cognitive abilities of the students in learning science subjects by using video demonstrations. Specifically, it was aimed to answer the following questions: What is the level of acceptability of the video in terms of quality and mechanics? What is the level of Pre-test of the Students in Video Demonstration? What is the level of Post-test of the Students in Video Demonstration? Is there a significant difference between the pre-test and post-test on Student's metacognitive skills?

This study is an experimental study. It utilized the pre-test and post-test design or the before and after design. There was one group of students who underwent this study. The pre-test and post-test scores of the students in the study were evaluated using the weighted mean, and the paired sample t-test. All tests were done at the 0.05 level of significance. On the other hand, the total respondents of this study were the thirty (35) total enumerated students who were enrolled for School Year 2020-2021. We selected a subjective technique in selecting the respondents. Based on the analysis of the data, we found:

- (i) The level of acceptability of the video demonstration in terms of quality and mechanics got an overall mean of 3.47 which is described as strongly agree. The students were satisfied with the video demonstration overall which got the highest weighted mean of 3.86 and described as strongly agree. On the other hand, the students perceived that the video demonstration is too long to watch which got the lowest weighted mean of 3.03 and described as agree.
- (ii) In the 50-item test given as a pre-test, the mean score was 18.89 with a standard deviation of 8.17. This result implied that the means scores of the students in the pre-test were below the passing score which is 75%.
- (iii) In the 50-item test given as a post-test, the mean score was 41.06 with a standard deviation of 6.62. This result implied that the means scores of the students in the post-test were above the passing score which is 75%.
- (iv) The scores were statistically significantly different with its t-value of -49.48 whose p-value is 0.000 ($p < 0.05$), which lead to the rejection of the null hypothesis.

4. CONCLUSION

Based on the findings of this study, the following are the conclusions:

- (i) The video demonstration was good and useful as perceived by the students. Thus, this instructional material could be used in teaching to improve the learning of the students in this specific learning area.

- (ii) The students performed very poorly in the pre-test which can be observed in their very low mean score on the test.
- (iii) The students performed very well in the post-test. It can be observed that there was a big difference between the pre-test and post-test scores of the students. Their post-test score was above the passing score.
- (iv) The use of teaching strategies such as the video demonstration was an effective intervention to improve the performance of students. It can be concluded that this teaching strategy was effective, appropriate and fitted, and prescribed to the learning styles of the student in this study.

Based on conclusions, the following recommendations are:

- (i) The use of video demonstration in the class should be maximized by teachers in delivering lessons to the students since it was found to be effective and suitable to the learning styles of the students.
- (ii) The school administrator should conduct training for the teachers to improve their skills in using technology in making more video demonstrations for their classes.
- (iii) Teachers should make more video demonstrations as their instructional materials.
- (iv) The students should find ways to have a gadget for the video demonstrations for them to play with at home, especially during this time of the pandemic.
- (v) Replication of this study using other variables which were not used in this investigation is also recommended.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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