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SCREENCAST AND ITS EFFECT ON IMPROVING LEARNERS' ACADEMIC ACHIEVEMENT AND MOTIVATION IN PHYSICS

Brenda Lyn Amanda Basas Orocio[1], Joji Davila Linaugo[2]

[1]Bacolod City National High School
Bacolod City, Philippines
brendalynamanda.orocio@deped.gov.ph

[2]Carlos Hilado Memorial State University
Talisay City, Negros Occidental, Philippines
joji.linaugo@chmsu.edu.ph

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ABSTRACT

Screencasts are multimedia-based learning which involves multimodal sensory, such as eyes and ears. These are increasingly used as schools transition to blended learning mode. This study aims to describe the screencast and its effect on improving learners' academic achievement and motivation in Physics. This quasi-experimental research determined learners' academic achievement and level of motivation before and after treatment to screencasts focusing on heat, temperature, and electricity. The study was done in a large public secondary school in a highly urbanized city in the central Philippines. Academic achievement was measured through a constructed test while the level of motivation was evaluated using Keller's Instructional Materials Motivation Survey. Results showed that screencasts improved the learners' academic achievement and increased their level of motivation. The use of screencast has a good impact on changing learners' knowledge and skills and is an effective online learning media. Findings also obtained a p-value of 0.00 which showed that there is a significant difference in the learner's academic achievement before and after treatment to screencast. This study discovered that learning using screencasts is engaging to the learners. The screencast provided the learners with the opportunity to learn at their pace and brought them better learning experiences.

Keywords: Central Philippines, Physics, Quasi-Experimental Research, Science Education, Screencast

[2]Corresponding Author

Introduction

Instructional materials are essential in the learning process (Lyimo & Kipng'etich, 2017) making them more engaging, useful, practical, and attractive. Olayinka (2016) described instructional materials as necessary and crucial resources required for teaching and learning school subjects to increase teachers' efficacy and students' performance. They provide students with relatively constant opportunities to practice and gain abilities. On the part of the teachers, they design lessons that are adaptable and diverse enough to accommodate each student's learning style (Akpan & Onoh, 2013; Border, 2019). In addition, they facilitate the acquisition of skills and knowledge, as well as the development of self-confidence and self-actualization (Olayinka, 2016).

In addition, the evolving technology has been mediating many innovations, environments, and agents to get involved in human lives (Yildirim, 2017). The development and improvement of instructional materials can be attributed to the constant upgrading of technology that is increasingly important in people's everyday lives, which will most certainly increase in the coming years (Educational Testing Service, 2007). It is also acknowledged that advancing science instructional materials with digital literacy is a foreseen solution to aid learners' low literacy in reading, math, and Science (Asrizal et al., 2018).

Technology is instrumental in the advancement of instructional materials. As technology advances, it is evident that these sectors adapt to provide learners with new learning opportunities (Arinto, 2016; Bozkurt, 2019; Kristanto et al., 2017). As instructional methods shift due to technological developments, it is helpful to assess the effect and prospect that technology-enhanced methods can have on assessment and feedback (Bissell & Conservatoire, 2017). Using multimedia technologies in the classroom makes studying more enjoyable and improves material comprehension (Ramli et al., 2017). One prominent innovation of multimedia technology as applied in education is the screencast. Since the introduction of digital media players on the market in 2013, screencasting has grown in popularity (Nura et al., 2021; Tabuenca et al., 2018).

Screencast is a digital video and audio recording of what happens on a presenter's computer screen. It can be used to make sophisticated, information-packed multimedia presentations (Ghilay & Ghilay, 2015; Kiliçkaya, 2016). It allows the instructional process to occur while the teacher and the learners are distant (Nura et al., 2021).

A teacher chooses topics or outcomes that may require or benefit from screencasts. Next, the individual must consider the technology choices for screencasting and plan for production. It is important to understand the possible application to evaluate the advantages and limitations of screencasting tools. Implementation is related to the employed instructional approach. A teacher must consider pedagogical variables while determining the optimal duration, topic, and distribution platform for content. There is the process of screencast production, in which it is followed by activity when the researchers first identified the topic to be featured in the screencast through the isolation of ideas. Also, the researchers outsourced materials needed for screencast delivery. Identification and utilization of appropriate devices for both hardware and software were done. Scripts were also prepared and reviewed. After acquiring all the necessary resources, the researchers captured the lesson. Thorough editing and trimming were then applied to the material before sending them to the learners.

Screencasts are practical instructional forms that can be used for tutorials, demonstrations, digital storytelling, and narrated presentations, according to Ramli et al. (2017) and Ghilay (2015). Nowadays, teachers in many subjects use screencasting for instructional purposes. Instructional screencasts have been developed to teach topics like chemistry (Seery et al., 2019) and Science (Boughey, 2019). These screencasts are intended to instruct students about a topic and demonstrate specific actions linked with the subject area (Ramli et al., 2017).

There are definite gains and benefits to using screencasts in the teaching-learning process. Screencasts can positively affect learners' understanding and be pedagogically comparable to their in-person class activities (Nagy, 2018; Williams et al., 2016). Screencasts can increase student motivation and achievement (Ghilay & Ghilay, 2015). Screencasts have both visual and aural components, giving the student multiple ways to interact with the content (Bissell & Conservatoire, 2017).

Recognizing Harandi's (2015) assertion that motivation is one of the most significant psychological concepts in education, it is widely acknowledged that fostering motivation to learn is one of the most fundamental principles for effective education (Johnson & Ayers, 2016).

Motivation is crucial in reshaping learners' behavior toward learning (Perks et al., 2019) since lack of motivation is regarded as the most important impediment that blocks students from giving attention to instruction (Putri & Amalia, 2020). Targeting learners' motivation is necessary to hold their satisfaction in an online class.

Using screencast encourages meaningful learning and active cognitive processing, and cognitive load reduction promotes deeper learning (Soden, 2017). However, there needs to be more literature on screencasts as material science pedagogy. Acknowledging this gap and the rich advantage that using screencasts could bring to learning, the researcher developed a collection of four screencasts to address learners' visual and auditory learning styles. Similar studies have been conducted on the effective utilization of learning media in improving the motivation of learners such as simulations (Vakaliuk et al. 2020; Sari et al. 2020) and game-based physics learning (Hussein et al. 2019).

In this study, screencast as a learning media will be utilized. Each screencast discusses topics involving heat, temperature, and electricity lasting 8 to 10 minutes. The screencast served as additional material for Grade 8 learners of one of the public secondary schools in a highly urbanized city in the central Philippines. Grade 8 learners were chosen as the subjects since the learning area in this grading is Physics. These learners, due to affordances, are enrolled in digital offline modality and recognized as fit subjects in the study. The screencast episodes benefited learners who chose an online class and modular (digital) modalities. After treatment to screencasts, the researchers examined their effectiveness in increasing the learners' academic achievement and level of motivation.

Framework

This study is anchored on Richard Mayer's Cognitive Theory of Multimedia Learning (CTML). This theory explains that learning verbally and visually provides opportunities for deeper learning than just through words. It is based on the premise that students strive to construct meaningful connections between words and images and thereby learn more deeply than they might with words or pictures alone (Sorden, 2012). It also supports the idea that learners best acquire knowledge and concepts with the use of pictures and images and further become a factor in learners' academic achievement. This statement termed a multimedia principle, inspires more inclination toward multimedia learning (Mayer, 2014). For millennia, words were the central system for teaching and learning, and this instruction includes spoken and printed words. Due to technological advances, instructions in pictorial forms, including astounding computer-based graphics, are becoming widely available. One of the primary goals of multimedia instruction is to facilitate the development of a coherent mental representation of the material delivered. As an active participant, the goal of the learner is to make sense of the provided content and ultimately generate new knowledge. Moreover, multimedia instructional messages facilitate optimal cognitive processing without taxing the cognitive system of the learner.

Lev Vygotsky's Zone of Proximal Development (ZPD) is another context for this study. This framework holds to using supplementary materials for a learner's development. Vygotsky defined ZPD as the difference between a learner's actual and potential levels of development relative to what the learner can perform independently and with the help of an expert or other agent. Scaffolds, such as the support of teachers and other outward means, build learners' zones of proximal development (Vygotsky, 1966). Vygotsky's Social Development Theory stimulates learning contexts in which students engage in an active part of learning. There is a shift of roles between teachers and learners, and teachers assist and facilitate learners in meaning construction. Learning, thus, becomes a reciprocal experience for the learners and teacher (Vygotsky, 1978).

Lastly, John Keller's Attention, Relevance, Confidence, Satisfaction (ARCS) Model is another perspective to which this study is anchored. In his extensive study, Keller (1987) devised a four-factor hypothesis for measuring the motivational levels of individuals: attention, relevance, confidence, and satisfaction. Attention is the initial factor and approach for fostering and sustaining an individual's interest (Green & Sulbaran, 2006). According to Keller and Suzuki (2002), teaching and learning strategies must establish links between the instructional environment and prior experiences in which it must be relevant. Hence, relevance refers to how well the instruction fulfills the requirements and objectives of the learner. Confidence relates to a student's outlook on success or failure (Bohlin et al., 2000; Cacik & Pratama, 2022). It also includes variables about learners' perceptions of personal control and expectation of achievement (Keller & Suzuki, 2002). Learner satisfaction concludes the ARCS model as the final element. Satisfaction can be described as students' favorable reactions to their

learning experiences (Rodgers & Withrow-Thorton, 2005). To maintain motivation, it is believed that students must be pleased with their learning experiences.

This study aims at describing the screencast and its effect on improving learners' academic achievement and motivation in Physics.

Research Methods

The study is included in the quasi-experimental design, particularly the experimental group only, pre-test and post-test design. It used an intact group since the participants' availability was limited. Quasi-experimental research design examined whether there is a causal relationship between independent and dependent variables (Rogers & Revesz, 2019). The samples were determined using purposive sampling in choosing the subjects of the study. Out of three classes, the the selected one section consisting of 17 males and 28 females in a large public secondary school in a highly urbanized city in the central Philippines enrolled for the academic year 2021 – 2022. This class was chosen since this class is under digital offline modality.

A valid and reliable (KR_{20} = 0.81) teacher-made test based on a table of specifications was used to determine the learners' academic achievement. The 40-item multiple-choice type test covered topics about heat, temperature, and electricity. The difficulty level of the test was also analyzed. Moreover, the pre-test and post-test given to the learners have parallel questions.

For the level of motivation, a standardized instrument or motivation survey entitled "Instructional Materials Motivation Survey" (IMMS) was used. John Keller initially created this instrument in 1987. To precisely measure learners' motivational responses, the instrument was subjected to modification by Bolliger, Supanakorn, and Boggs (2010). There are 36 questions and four subscales on this instrument. Attention (12 items), relevance (9 items), confidence (9 things), and satisfaction make up the four subscales (6 items). Using a 5-point symmetrical Likert scale, it gauges the learners' motivation. The IMMS instrument contains ten reverse questions, such as item 7 of the relevance subscale. The lower the score the learner receives on the reversal item, the greater their motivating score will be. Manually reversing the scores of the reverse elements is required while using this instrument. Each IMMS question corresponds to one of the four subcomponents of the ARCS model: Attention, Relevance, Confidence, and Satisfaction. It has been shown that the instrument is valid and has a reliability coefficient of 0.96. (Bolliger et al., 2010).

The audio and video recording evaluation rating sheet was used to evaluate the researcher's screencast. The rating sheet is a 20-item evaluation sheet used in assessing materials as to content, format and technical design, presentation and organization, and accuracy and up-to-datedness of information. This evaluation sheet was a standardized form used in appraising learning resource materials.

Permission from the school's division superintendent was needed to conduct the study. Along the same lines, the screencast was produced. Screencasts were subjected to quality assurance regarding content, format and technical design, presentation and organization, and accuracy and up-to-datedness of information. Moreover, the learners were given a pre-test of heat, temperature, and electricity lessons and a motivation survey. The pre-test is the 40-item multiple choice test which has undergone validity and reliability. The data gathered in this study with initial data in comparing learners' academic achievement and motivation before and after the treatment to screencast. Screencast episodes were developed by identifying concepts to feature. After identifying concepts, the located materials, selected appropriate hardware and software combinations were selected for the lesson. Then, the lesson was captured and edited to make it more enticing to the learners.

The lessons on heat, temperature, and electricity were discussed during the synchronous class with the learners. During the learners' asynchronous class, they viewed the screencast forwarded to them by their teacher in their group chat. Four screencasts were forwarded to the learners. Learners were exposed to screencast for four weeks as instructional materials to complement their synchronous online classes.

After the intervention, a post-test and survey were administered to the learners to measure their academic achievement and level of motivation after treatment to the screencast. Post-test and motivational surveys were conducted online. The pre-post experimental test scores were subjected to appropriate statistical analysis.

Numerical data gathered from the instruments were subjected to specific descriptive and inferential statistical treatment. Mean and standard deviation was used to answer descriptive

questions. For inferential questions, Wilcoxon signed-rank test was used.

In this study, the general principles of respect for persons, beneficence, and justice were addressed to ensure the ethical soundness of the study. These principles include social value, informed consent, the vulnerability of the research participants, risk and benefits, privacy and confidentiality, justice, transparency, adequacy of facilities, and community involvement.

Result and Discussion

The screencast is a collection of four episodes that deal with topics involving heat, temperature, and electricity. Each screencast episode lasts approximately 8-10 minutes. It discusses the topics: Heat and Temperature; Current, Voltage, and Resistance; Parallel and Series Circuits; and Electrical Safety Devices. All four screencast episodes created by the researchers satisfied the evaluation and quality assurance regarding content, format and technical design, presentation and organization, and accuracy and up-to-datedness of information.

The data presented in Table 1 revealed that before the treatment to screencasts, the learners obtained a mean of 29.95. The standard deviation of 5.69 suggests dispersed scores. On the other hand, after treatment to screencasts, learners achieved a mean score of 37.18 and a standard deviation of 1.91. There is an increase in the mean score of learners. Moreover, the scores obtained by each learner tend to be closer to the mean. This degree of closeness of scores obtained by the learners shows understanding towards the learner.

Table 1. Learners' level of academic achievement before and after treatment to screencast

Academic Achievement	Mean	SD	Interpretation
Before Treatment	29.95	5.69	Very satisfactory
After Treatment	37.18	1.91	Outstanding

A manifestation that the screencasts utilized aided learners' more robust understanding of the concept. Results also imply a symmetrical distribution of scores. It has been noted that screencast is one of the technologies attracting educators' attention. The main reason is that the screencast allows the instructional process to occur while the teacher and the learners are at a distance. The result of the increased academic achievement of learners is well supported by the study of Malhotra (2021).

According to the study, learners have been demonstrated to benefit from screencast videos to comprehend the curriculum better and increase their engagement with the course content. Asynchronous screencasts were appreciated by students because the materials suit their convenience and adaptability. The time and space restrictions have been removed, and the video speed can be altered (S. Yildirim, 2021). Learners may review things they believe are missing or have forgotten as often as they like (Cheng & Li, 2020). This feature of using screencasts allows the learner to obtain mastery of a specific topic or lesson. The screencast positively impacts changing student knowledge and skills and can be a useful online learning material to improve learners' knowledge and skills. The positive impact of the screencast is manifested in the increased level of motivation and the increased level of academic achievement of learners before and after the intervention. Furthermore, Susanti et al. (2021) also mentioned in their study that screencasts can motivate learners and help them learn activities independently.

Before the treatment to the screencast, learners were provided digital learning modules which were their basis in the discussion. Table 2 revealed the value of motivation after treatment to screencast, which is 4.50 and interpreted as Very High.

Table 2. Learners' level of motivation before and after treatment to screencast

Level of Motivation	Mean	SD	Interpretation
Attention			
Before Treatment	3.87	0.29	High
After Treatment	4.45	0.26	Very high
Relevance			
Before Treatment	3.86	0.59	High
After Treatment	4.40	0.33	Very high
Confidence			
Before Treatment	3.82	0.34	High
After Treatment	4.55	0.24	Very high
Satisfaction			
Before Treatment	3.85	0.53	High
After Treatment	4.60	0.33	Very high
Motivation			
Before Treatment	3.85	0.32	High
After Treatment	4.50	0.20	Very high

The mean score after treatment to screencasts is relatively higher than the mean score obtained

before the treatment. The data also revealed an increase in all the subscales of motivation. From a mean score of 3.87 and interpreted as High, attention improved to a mean score of 4.45 and interpreted as Very High. A similar result was obtained in the relevance subscale from a 3.86 mean score with a 'High' interpretation to 4.40 and interpreted as Very High. The mean score in the confidence subscale was also magnified from a value of 3.82 and interpreted as High to 4.55 and Very High. Lastly, the satisfaction subscale also escalated from a mean score of 3.85, which acquired a 'High' interpretation, to a mean score of 4.60, which attained a 'Very High' interpretation.

Based on the obtained results on learners' motivation level, learners learned concepts with less stress using screencasts. The study by Nura et al. (2021) agrees that screencasts make lessons more fascinating, and learners feel the presence of a teacher when learning via screencasts. In addition, learning with screencasts integrates several media, such as audio and video, to give a novel learning experience for students and to engage multimodal senses, including the eyes and ears. Consequently, multimodal sensory affords better options for comprehension than video text or narrative (Susanti et al., 2021). These results make the screencasts' display design attractive and capture learners' attention. When a screencast contains both auditory and visual components, it offers the student multiple ways to interact with the content (Bissell & Conservatoire, 2017), making learners relate the lesson's content to things they have observed, worked out, or imagined. The study by Ranellucci and Bergey (2020) also stated that screencasts could motivate learners to put more effort into their learning. As presented in Table 3, there is a significant difference in the learner's academic achievement before and after treatment to screencast.

Table 3. Significant difference in the learners' level of academic achievement before and after treatment to screencast

Academic Achievement	Mean	SD	*p*-value	Significance	Decision
Before Treatment	29.95	5.69	0.00	Significant	Reject H_0
After Treatment	37.18	1.91			

The screencast materials were focused during learning process for pedagogical purposes (Yildirim, 2021). A large cohort study on high school learners by Border (2019) reported that learners' academic performance was significantly correlated with screencast use. A study by Boughey (2019) was consistent with this report. Research implies that learners positively perceive screencasts and can support learning and performance (Ranellucci & Bergey, 2020). According to a study by Yahya et al. (2018), the use of screencast video as a teaching approach and, consequently, as a viable teaching resource that helps the teaching and learning process is becoming more prevalent. Utilizing a screencast can enhance student learning effectiveness, with students believing that using a screencast is highly effective and efficient for learning (Ghilay & Ghilay, 2015; Seery et al., 2019). In addition, students responded positively to screencasts because they were clear, encouraging, personalized, and engaging. Moreover, in Table 4, it is seen that screencasts generate learners' motivation. The mean for each domain in motivation increased after exposure to the screencast.

Table 4. Significant difference in the learners' level of motivation before and after treatment to screencast

Level of Motivation	Mean	SD	*p*-value	Significance at $\alpha = 0.05$	Decision
Attention					
Before Treatment	3.87	0.29	0.00	Significant	Reject H_0
After Treatment	4.45	0.26			
Relevance					
Before Treatment	3.86	0.59	0.00	Significant	Reject H_0
After Treatment	4.40	0.33			
Confidence					
Before Treatment	3.82	0.34	0.00	Significant	Reject H_0
After Treatment	4.55	0.24			
Satisfaction					
Before Treatment	3.85	0.53	0.00	Significant	Reject H_0
After Treatment	4.60	0.33			
Motivation					
Before Treatment	3.85	0.32	0.00	Significant	Reject H_0
After Treatment	4.50	0.20			

How the information is arranged in the episodes helped keep the learners' attention. It also manifests relevance to the concept. Relevance was also deemed to be the factor that stirs the attention of learners, which leads to learners' confidence and satisfaction, which significantly contributes to the high motivation of learners. While relevance is a partial mediator in the relationship between attention with interest and ease of use, the results imply that even if relevance is a crucial element, attention with interest still influences predicting the ease of use of the screencasts.

This lesson's material and presentation give the sense that it is material worth learning. After listening to the introductory information, the learners felt confident they knew what they should learn from each lesson. Afterinvolving themselves in screencasts, the learners gained much confidence, which affected their motivation.

Furthermore, the data also reveals that learners were satisfied with the material and the undertakings in the discussion. While completing the exercises in each lesson, they felt a sense of success. In the paper of Susanti et al. (2021), they agree that screencasts can motivate learners and can help them learn activities independently. Grebe (2021) also emphasizes the total mediation of significance in the relationship between vital focus and self-confidence variables. In addition, while relevance is again a partial mediator, the results imply that although relevance is an essential aspect, attention to interest still influences the prediction of students' self-confidence. The study results also agree with Nura et al. (2021) and Jelita (2021) that screencasts make lessons more fascinating and that learners feel the presence of a teacher. The screencast episodes can attract learners' attention, enticing them with the material provided and encouraging their motivation, interest, and memory.

The results denote the potentiality of the screencast as an additional learning resource material for learners. In providing learning material to students, learners' motivation is deemed to be necessary as it may be one of the prevailing factors that can hold learners' attention. There were items intentionally reversed by the researcher to make the statements negative. Those statements obtained either 'not true' or 'slightly true' statements indicated that the learners read each statement. Utilizing screencasts as instructional resources is beneficial because it maximizes the use of technology, boosts learner motivation, and facilitates learning.

According to the study findings, screencast satisfied the motivational design process, which consists of a synthesis of motivational principles and theories organized into four categories: attention (A), relevance (R), confidence (C), and satisfaction (S). Differences in gender, learning style, class performance, and previous experience with online classes can affect a learner's motivation. The challenge for the school would be the implementation and creation of screencasts since it is acknowledged that not all teachers are digital natives. Moreover, integration activities that would address the kinesthetic aspect of learners may be added to the learning dynamics in the screencast.

Conclusion

This study aims at describing the screencast and its effect on improving learners' academic achievement and motivation in Physics. Findings of the study indicated that screencasts improved the learners' academic achievement and increased their level of motivation. The use of screencast has a good impact on changing learners' knowledge and skills and is an effective online learning media. Findings also obtained a p-value of 0.00 which showed that there is a significant difference in the learner's academic achievement before and after treatment to screencast. This study discovered that learning using screencasts is engaging to the learners. The screencast provided the learners with the opportunity to learn at their pace and brought them better learning experiences.

The learners who participated in the study had a turn out of high academic achievement in the lesson about heat, temperature, and electricity as measured by their high scores in the post-test. There was also an increase in the learners' level of motivation as evaluated by their high results in the Instructional Material Motivational Survey. Learners highly accepted the use of screencast in the lesson.

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