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Producing Digital Biological Generations: Integrating Cinematography Techniques in Problem-Based Biological Environment Investigation Learning Models

Agung Wibowo [1*] , Dwi Sulistiarini [2] , Balqis [1]

[1] Department of Biology, Malang State University, Jl. Semarang, No. 5, Malang City, East Java, Indonesia, 65145
[2] SMA Negeri 3 Malang, Jl. Sultan Agung, No. 7, Klojen, Malang City, Indonesia, 65144
* Correspondence: agungwibowo.fmipa@um.ac.id

Abstract

Background: The need for education cannot be separated from technology as a crucial essential literacy skill for solving problems in the surrounding environment. This research aims to determine the effectiveness of the Problem-Based Biological Environment Investigation model with Cinematography Techniques in improving the digital literacy skills of high school students. **Methods:** Classroom action research was conducted in two cycles. The research subjects are 34 students from class X-A at SMAN 3 Malang. The success indicators of the research are implementing the Problem-Based Biological Environment Investigation model with Cinematography Techniques according to the referenced syntax and the increase in the percentage of students' digital literacy skills. The research instruments include observation sheets for the feasibility of the learning process and observation sheets for the student's digital literacy skills. **Results:** Based on the observation results, implementing the Problem-Based Biological Environment Investigation model with Cinematography Techniques according to the referenced syntax includes problem orientation, organizing students, investigative activities, presenting results with Cinematography techniques, and reflective evaluation. This learning model also effectively improves students' digital literacy skills by 33.85%. especially in the indicator "Uses to Produce Original Works." **Conclusions:** Based on the research findings, it can be concluded that implementing the Problem-Based Biological Environment Investigation model with Cinematography Techniques effectively enhances the digital literacy skills of high school students.

Keywords: Problem-Based Biological Environment Investigation model; Cinematography techniques; digital literacy

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Introduction

In the context of globalization, prominent characteristics include rapid advancements in science and increasingly complex technology (McNicol, 2015). This condition necessitates educators to train generations with superior competencies to face various global challenges. The learning process in Biology subjects should be able to stimulate the adoption of adaptive behaviors toward environmental changes. This emphasis is on the transformation from a resource-oriented learning approach to one rooted in scientific understanding, simultaneously involving improvements in the quality of technology utilization. Despite Indonesia's richness in natural resources, relying exclusively on these resources is deemed inadequate; therefore, human resources that possess scientific understanding and skills in technology utilization are needed.

In 21st-century learning, technology requires learners to demonstrate curiosity, self-confidence, and resilience (Trilling & Fadel, 2009). Additionally, learners must possess innovative, creative, critical thinking, and metacognitive skills to enhance group

communication and collaboration (Whitby, 2007). The goal is to enable learners to apply these skills to society with solid character locally and globally while being personally and socially responsible in the community environment.

After acquiring all the skills and life skills, students will apply them daily. This implementation process is inseparable from foundational literacy, as a person's basic literacy is used to apply knowledge in daily life (Bellanca, 2010). One of the most essential basic literacies students need is digital literacy or ICT (Information and Communication Technology) literacy (Claro et al., 2012; Ferrari, 2012; Meehan et al., 2015). Individuals' interactions with the digital environment among students tend to be more intensive than interactions with teachers. This is due to the digital generation's tendency to engage in activities using digital media from an early age. As educators, there is a need for initiative to integrate digital media into various learning activities so that students can continue to adapt to the increasingly advanced technology. Educators must also be wise in guiding students to develop their skills when interacting in cyber society (Sulistiyarini & Sabirin, 2020). This indicates that students have the highest skills in applying technology as a learning tool, followed by self-directed and collaborative skills (Santos, 2017).

The initial observations of new students in the 10th grade for the Academic Year 2023/2024 at SMAN 3 Malang indicate a lack of sensitivity to the biological environment of the school. The environment is divided into three categories: physical, biological, and social (Syafei et al., 2019). The biological environment encompasses all living organisms, such as plants, animals, and microorganisms. During the School Environmental Introduction Period, the focus tends to be on physical and social activities, such as introducing the entire school community and interacting with other students. Based on this, there is a clear need for an activity to introduce the biological environment of the school. This would enhance students' self-awareness regarding living organisms in their surroundings and serve as an initial foundation for studying biology.

Based on the exposition of the theory and facts, it is indispensable to formulate a new learning model to facilitate students in gaining a deeper understanding of biology (Mashudi, 2021). One of the reformulations of the learning model is to integrate Problem-Based Learning with Group Investigation, creating a new learning model called Problem-Based Biological Environment Investigation. This formulation emphasizes introducing problems in the school's biological environment and conducting in-depth investigations to develop alternative solutions. Digital media will be used to investigate and present students' work and enhance digital literacy skills. According to Johnson (2002) and Djenic & Mitic (2017), real-world experiences in collaborative learning activities provide students with opportunities to construct and organize their knowledge, actively engage in discovery activities, express opinions, write, and effectively communicate with others.

The challenges in 21st-century learning need to accommodate the needs of learners to apply their knowledge and skills in various contexts and issues. Success in the learning process is assessed based on the learners' ability to adapt and integrate existing knowledge with new ones and present alternative solutions to address emerging problems in their surroundings (Wijaya et al., 2016). Learning is not confined to the school environment alone; it can be conducted collaboratively with peers, involving intergenerational communities, and interacting directly with society (Prianto & Qomariyah, 2021). Furthermore, various activities outside the school environment can be used as alternatives for learning, such as visiting public libraries, museums, community centers, local businesses around the school environment, nearby plantations, and so on (Mashudi, 2021).

As a professional, educators must continually commit to encouraging students to actively participate in generating new ideas in any environment. The essential foundation provided to students to face the challenges of the 21st Century should be based on educational principles, including independence, participation, and productivity (Noah, 2018). Therefore, in addition to enabling students to construct their knowledge, they should also contribute to creating solutions using any media, mainly digital technology (Sahito & Vaisanen, 2017). The selection of Cinematography techniques as a pedagogical method is necessitated by the

future educational needs of students, which are inherently intertwined with the role of digital technology. Cinematography techniques are employed to engage students in conducting investigative reports. Through this activity, students become creative and innovative in developing their investigative outcomes.

Methods

This is classroom action research that adopted the Kemmis and Taggart model. The Classroom Action Research process consists of four stages in one cycle, namely: (a) planning, (b) action implementation, (c) observation and evaluation, and (d) reflection. The research design consists of two cycles. This research was conducted at SMA Negeri 3 Malang, located at Jl. Sultan Agung, No. 7, Klojen, Malang City, 65144, Indonesia. The subjects in this study are the X-A class, with 34 students.

The data collection technique in this research is observation, the results of which are used to obtain data on students' digital literacy skills during the learning process. The analysis technique employs descriptive analysis, where data is collected and presented in percentages or distribution tables (Madya, 2007). The success criteria for this research are the alignment of implementing the Problem-Based Biological Environment Investigation model with Cinematography Techniques.

The learning activity starts with problem orientation related to the conditions in the school environment conducive to supporting learning activities. Next, in the organizing student stage, learners prepare activities for investigating the biological environment of the school. In this stage, learners in groups discuss the cinematography techniques, starting from determining the investigation location, selecting recording equipment, and choosing cinematography formats such as Story Video, News Video, Documentary Video, Blog Video, Cinematic Video, and the like. In the investigation stage, learners document all living organisms and their roles in the school environment ecosystem, including species names, roles, and the benefits of these living organisms. In the next stage, learners present the results as edited cinematography media using VN and Capcut applications. Kinemaster, or Power Director. In this stage, each group explains their cinematography recording results using media and showcases them to all participants. The final stage is reflection.

Result

The research takes place over two cycles, with one meeting conducted in each cycle. The data on the conformity of the feasibility of implementing the Problem-Based Biological Environment Investigation model With Cinematography Technique are as follows.

Table 1. Suitability of Implementation of Learning Model Stages

Stage	Cycle 1	Cycle 2
Providing orientation on the problem to students	100 %	100 %
Organizing students for learning	100 %	100 %
Guiding the investigation	100 %	100 %
Develop and present work results in the form of cinematography	90 %	100 %
Reflecting and evaluating the problem-solving process	96 %	100 %

Based on the data from the observer's observation of conformity, it is indicated that in cycle 1, the implementation of the syntax of the learning model is less than optimal, especially in the stages of developing and presenting works results in the form of cinematography with percentages of 90%. This is due to the dominance of a group of students in the presentation of works, resulting in other learning groups not receiving an equal proportion. This also impacts less than optimal performance in the next stage, namely the reflection and evaluation stage of the problem-solving process. In this second cycle, the implementation of the learning model runs according to the scenario with a percentage of 100%. All students have participated in the learning process to the fullest.

The observation data of students' digital literacy skills is conducted by calculating scores according to the measured indicators. Parameters measured in digital literacy include six

indicators involving the ability to find information, use various sources, select appropriate sources, evaluate the reliability of information, consider sources and the impact of messages, and use this information to produce works (Greenstein, 2012). The data on the results of observations of students' digital literacy abilities in cycle one are presented in the following figure.

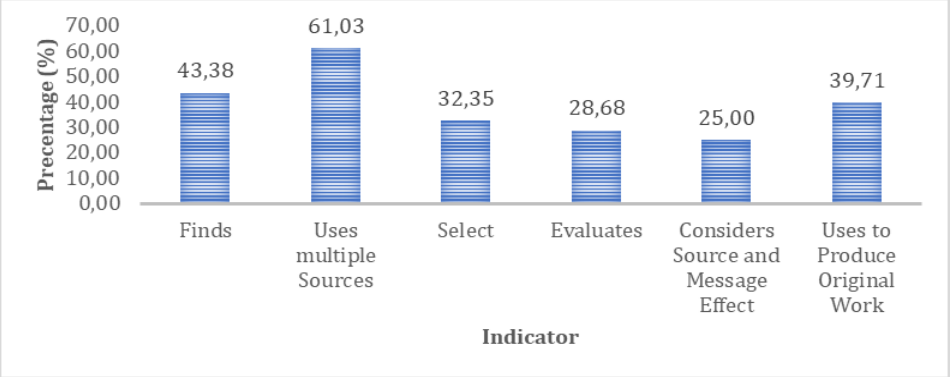

Figure 1. Data Presentation of Digital Literacy Skills of Students in Cycle 1.

The data in Figure 1 indicates that the participants have not been able to achieve the maximum score in digital literacy skills. The highest score was obtained for using various information, reaching 61.03%. This condition is evident in participants with good basic skills in searching for and accessing learning resources and expressing them in digital media such as video stories, news videos, documentaries, blogs, and cinematic videos. Participants already appear skilled in using various supporting applications to explore information sources. The lowest indicator is when considering sources and the effects of messages. Participants only received a percentage of 25%. Participants tend to be unable to choose suitable information sources and do not understand how to reference sources accurately.

Observation data on digital literacy skills for cycle two will be conducted through observation in the next meeting. The percentage data of the observation results will be presented in Figure 2 below.

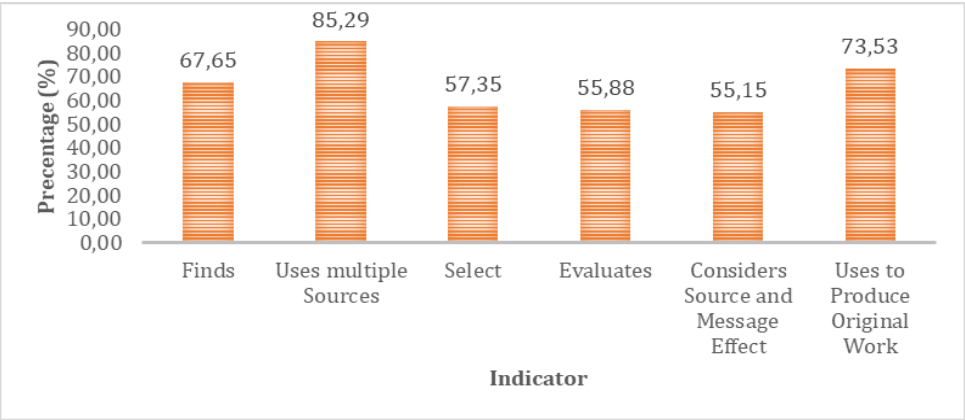

Figure 2. Data Presentation of Digital Literacy Skills of Students in Cycle 2.

Based on the data in Figure 2, it is evident that the students have shown an increase, although not significant enough. The highest increase is in using various information, reaching 85.29%, while the other indicators also experienced an increase. This is related to Table 1, which shows the alignment of learning stages, indicating that all stages of the learning model were maximally implemented, thus influencing digital literacy skills, which also tend to increase. The results of comparing digital literacy skills data in cycles 1 and 2 are presented in Figure 3 below.

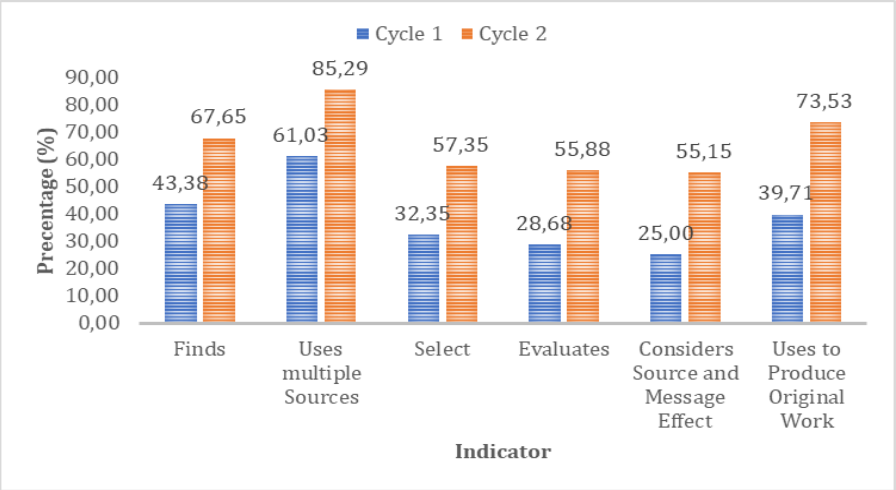

Figure 3. Comparison Data of Digital Literacy Ability Percentage for Participants in Cycle 1 and Cycle 2

Based on Figure 3, it shows that all indicators of digital literacy skills have experienced an increase. The percentage difference in the rise for each indicator is presented in Table 2.

Table 2. Percentage Increase Difference Values for Each Indicator of Digital Literacy Skills of Students

Indicator	Cycle 1 (%)	Cycle 2 (%)	Data Discrepancy (%)
Finds	43,38	67,65	24,27
Uses Multiple Sources	61,03	85,29	24,26
Selects	32,35	57,35	25,00
Evaluates	28,68	55,88	27,20
Considers Source, Message Effect	25,00	55,15	30,15
Uses to Produce Original Work	39,71	73,53	33,82

The difference in the increase of digital literacy among students in cycles 1 and 2 indicates the highest growth in the sixth indicator, which is using it to create works, at 33.82%. Increases in other indicators range from 20-30%.

Discussion

The results of the data analysis on implementing the Problem-Based Biological Environment Investigation Learning Model Based on Cinematography Techniques indicate an improvement in the student's digital literacy. The enhancement of students' digital literacy cannot occur significantly due to various factors, such as suboptimal learning scenarios caused by unexpected events in the classroom. The characteristics of new students who are still adapting to the school's social environment also serve as one of the hindering factors for the less-than-optimal learning process.

Forming positive character and behavior in students certainly requires considerable time. The implementation of character education in students should focus on three main aspects: knowledge, awareness, and willingness to apply these character values. These values involve obedience and good behavior towards God, oneself, others, the environment, and the nation. The goal is for students to become well-rounded individuals in terms of physical and intellectual aspects. Success in achieving this undoubtedly requires cooperation among various supportive elements, including the active role of teachers in the learning process (Doni, 2007).

After going through the learning process using Problem-Based Biological Environment Investigation With Cinematography Techniques, students will automatically possess quality characteristics, including collaboration and communication skills. The collaborative method of learning can provide challenges for students. Students can convey, express, defend with logical evidence, and generate ideas independently (Laal & Laal, 2012). Through

collaborative activities, students are equipped with the skills to address and solve more significant problems and projects in the future (Arisanti, 2015).

Learning that focuses on problem-solving and is supported by investigative activities also has the potential to enhance students' problem-solving skills. When implementing a problem-based learning approach, students can manage activities effectively and efficiently (Chiang & Lee, 2016). This is evident during investigative activities where each group discusses before investigating to formulate plans and strategies to manage time well and accurately.

In this learning process, students' interest in mobile technology is also utilized by presenting investigative data by editing biological environment videos around the school. The United Nations Educational, Scientific and Cultural Organization (UNESCO) notes that using mobile phones as a learning tool can be a solution for students to overcome aspects that cannot be accessed directly in the classroom. The use of mobile phones is also recognized to address modern education challenges based on technology (Training, 2020). Digital technology, especially smartphones, provides students with easy access to various learning sources (Correos, 2014; Digby & Bey, 2014). This facility uses multimedia through websites and media to create and disseminate learning materials incorporating text, images, audio, and video. With this condition, it is expected that teachers can take the opportunity to integrate technology and digital media into the learning and assessment processes.

The learning process that has been conducted and utilizing the surrounding (biological environment) has become one alternative to enhance students' motivation, especially at the beginning of the new academic year. Applying the principle of learning anytime and anywhere can be implemented in biology. The intention is to encourage students to engage in a learning process not limited by space and time. The challenge is that students must identify their learning methods and styles to continue learning, even when not taking place directly (Fraenkel et al., 2018).

Conclusions

Based on the research findings, it can be concluded that implementing the Problem-Based Biological Environment Investigation model with Cinematography Techniques effectively enhances the digital literacy skills of high school students. The highest improvement in students' digital literacy skills occurs in the use of creating works, with an increase of 33.82%, followed by other indicators such as finding, using, writing, evaluating digital sources, considering sources, and the effects of messages with an increase of 20-30%.

Implementing this learning model contributes to education development, particularly in integrating biology learning with the utilization of digital tools. In addition to engaging in the scientific process skills during learning, learners can also showcase investigative outputs aligned with their talents, interests, and attractions. Such teaching methods can present a differentiated learning design per the demands of the 'Merdeka Curriculum.'

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