THE IMPACT OF TIKTOK SOCIAL MEDIA ON SCIENCE LEARNING OUTCOMES: A STUDY OF 5TH GRADE STUDENTS AT ST. YOSEPH CATHOLIC THREE ELEMENTARY SCHOOL IN KUPANG CITY

Maria Anastasia Rato Kopa[1], Asti Yunita Benu[2], Vera Rosalina Bulu[3]

[1,2,3]*Elementary School Teacher Education Study Program,*
Citra Bangsa University, Indonesia

[1]kopamelan@gmail.com, [2]astiyunitabenu0919@gmail.com, [3]veraros0451@gmail.com

ABSTRACT

This research was conduct to analyze the effectivity of TikTok as a learning media in improving science learning outcome especially at 5th-grade students of St. Yoseph Catholic Three Elementary School of Kupang. The research utilized a quasi-experimental design with an experimental group being taught by TikTok videos and a control group by conventional teaching. Pre- and post-test results were reported as well as observations from the classroom data. Results showed significant change in scale among students of experimental group as compared to control group for respiratory system understanding. It was revealed that the introduction of TikTok made students more interactively engage in content and collective discussions assuring their motivation as well. Although there were a few limitations, differences of opinion on content precision when assessed, and perceptions towards TikTok as an entertainment platform that were prevailing challenges the results from this study suggest that TikTok can enhance learning outcomes in elementary science education. The implications are that educators should start to think about using TikTok as an educational tool, which could lead toward engaging and interactive learning spaces.

Keywords : *TikTok, social media in education, science learning, elementary education, student engagement, digital learning tools*

I. INTRODUCTION

The rapid development of social media channels of recent years are changing the way people connect, find information and learn. TikTok has become hugely popular with younger generations who love the short form content on this platform. With its short-form video content and the interactive nature within which its users put their skills on full display, TikTok has quickly become a popular tool for those interested in being entertained as well as educated. Using social media in educational contexts has produced positive enhancements for student learning, motivation, and engagement with courses. According to Mao (2014), social media provide unique affordances for learning that increase the chances students may interact, be

creative, share knowledge and become more deeply engaged with course content. These findings support the growing body of literature that recognizes social media's role in increasing students' academic performance by facilitating more interactive and engaging learning environments (Selwyn, 2012).

The importantance of digital technology in the field of education is being realized today; especially to improve learning some subjects like science, where as such requires dynamic and new ways which involves a lot innovation approach to make complex abstract concept familiar for easy understanding. Science education, particularly at the elementary level, is concerned with fostering students' critical thinking and problem-solving skills about natural phenomena (Bybee, 2010). But the truth is traditional teaching has a way of not resonating with every student, in turn resulting in low motivation and under performance (Walker, 2021). Studies suggest that outdated educational approaches often fail to meet the learning needs of digital native students, who are more engaged with technology-driven methods (Greenhow & Lewin, 2018).

In response, educators have also started to look into using social media platforms such as TikTok for the sake of enhancing student engagement and learning effectiveness in science education. The format of Tik Tok videos allows for easily consumable educational material that is visually engaging and attractive to students, which may lead to a greater understanding of scientific concepts (Greenhow & Lewin, 2018). Social media, particularly platforms like TikTok, provides opportunities to create educational content that matches students' learning preferences, promoting an active learning experience.

This research was conducted to provide an understanding of how TikTok application is used as learning media and its effects on the improvement of students' learning outcomes in science subjects at St. Yoseph Catholic Three Elementary School, Kupang city, or basically how Tiktok can be using for Learning Media in their daily Classroom based with this situation (COVID-19). This study seeks to understand how the use of TikTok videos in science lessons might enhance science comprehension, motivation for learning and general academic performance among students.

Research Problem

Although some literature exploring the use of social media in education is emerging, research focusing on TikTok as a teaching and learning tool related to science education at the elementary level is minimal. Most research has concentrated on universities, thus neglecting the possibility they could present to younger students. This study attempts to fill that gap by investigating how TikTok can support 5th-grade students in learning science.

Research Objectives

The objectives of this study are as follows:

1. To evaluate the effectiveness of using TikTok as a teaching tool in improving science learning outcomes among 5th-grade students.
2. To assess the level of student engagement and motivation when TikTok is integrated into science lessons.

3. To explore students' perceptions and attitudes toward the use of social media platforms, specifically TikTok, in their learning process.

Research Significance

This study illustrates the opportunities in extending social media as an educational tool for elementary classrooms, especially with regard to science education. The results will provide insights into how our e-learning platforms may be better utilised to increase learning success, and represent informed advice for educators looking to implement more modern teaching methodologies in their courses.

II. LITERATURE REVIEW

This section presents a review of the existing literature on the use of social media in education, the significance of digital technologies in science education, and the application of TikTok as a tool for enhancing student engagement and learning outcomes. Thus, the literature supports a theoretical foundation explaining not only how these concepts interact in learning processes, but also at the elementary level.

1. Social Media in Education

In recent years, social media use has been increasingly common in an educational setting. Social media platforms like Facebook, Instagram, and TikTok come with distinct affordances that can foster different learning activities including communication, collaboration, and knowledge sharing (Otchie & Pedaste, 2020) (Mao, 2014). This is supported by the research that suggests integrating social media into classroom activities can improve student engagement and motivation as students get a chance to interact with course content, more actively (Lottering, 2020). Social media thus is a new learning space and students in an online environment, particularly non- local remote students highly appreciate this informal structure where they can work with peers, ask questions and share resources (Greenhow & Lewin, 2018).

Additionally, the convenience and immediacy of social media means both formal (like this one) and informal learning can also continue our communities. Greenhow and Lewin (2018) suggest that social media porous the boundary between formal classroom instruction, and informal self-assembly learning which allows students to access contents at their own time and in more personal ways. As students are learning which style of learning suits them, it can become significantly beneficial to have this kind of flexibility in elementatry education.

2. Digital Technologies and Science Education

Digital technologies in science education have been discussed extensively in the literature. Science education at all levels is important, but it is particularly important in the elementary level where key ideas of science include developing a sophisticated understanding of the nature and processes to be successful thinkers, problem solvers, and decision makers as students address real-world situations or problems involving natural phenomena (Bybee, 2010). Yet, most traditional methods of teaching are usually not good at simplifying these

complex scientific ideas that are meant for young students to grasp in a more appealing and interesting manner. Consequently, teachers have turned more and more to technology materials, such as different kind of educational iprograms, abd once eh are talking about that curriculum word you say ‘discovery’ or concept learning programs; hands on simulation, to social media platforms.

According to Walker (2021), students of today or the ‘digital natives', have unique learning wants and preferences compared to generations past. Since school-going children grow up in a digital environment, where they interact and learn from multimedia sources, traditional approaches to text-based learning or instruction through lectures are not as effective. Therefore it has become increasingly important to also weave into this higher ed landscape digital technologies that feel native for these students used to a visual, interactive and social information diet.

Using digital tools in science education makes abstract notions more concrete and is certainly a student friendly way to approach the subject. Bybee (2010) emphasizes that, in learning experiences where students can test scientific concepts through virtual hands-on experimentation. The spirit of this is supported by overarching characteristics of instructional goals in academic study, including developing an understanding of how to learn through inquiry and demonstrate scientific principles meeting real-community challenges.

3. The Use of TikTok in Educational Settings

TikTok has emerged as a really strong educational content tool among all the other social networks, because it is centered over short enjoyable videos. The format of TikTok makes it easy for students to consume educational content (Abdul Aziz & Mohd Dali, 2023) as it combines audio with video and text. Given the user-interface and robust level of content, it is a type delivery mechanism that can successfully communicate to the way individuals learn in today's day-and-age.

While many academic-focused research on the potential of TikTok for higher education has been conducted, TikTok's use in elementary and secondary level contexts are also becoming a topic of interest. In a manner of speaking, one can use TikTok videos to deliver a brief lesson on specific scientific concepts, display an experiment or describe abstract thoughts in a fun way that is comprehensible too. This not only makes perfect sense to students who are already natural media consumers, but also caters to their short-attention spans by delivering information in bite-sized, easily digestible chunks.

Given the COVID-19 environment and a shift to more virtual classrooms of remote and online learning, TikTok emerged as an incredibly useful tool to keep students engaged and motivated even in an online classroom setting. With an interactive approach, students can make their own educational content to consolidate their learning and help others in the process with peer-to-peer learning. TikTok is little more than a new-age informational playground; it serves as both an agent in processing information, as well too provides individuals a platform to produce and share multimedia knowledge via the practice of subtitling each other's work (MacKinnon et al., 2021).

4. Challenges and Opportunities in Using TikTok for Science Education

Although TikTok has countless possibilities in terms of being a learning device, there are also challenges and costs to implementing it within the scientific education sector at an elementary school level. A first challenge is that in order to be useful as a resource for learning, the content shared on TikTok must at least match with educational standards or goals. In such a scenario where the teachers are not guiding well the students, they musta g incorrect information is more likely to come in contact with them. Here, it becomes important for the teachers to collect and vet the content that is in use inside a class.

A second major challenge is that the platform is thought of primarily as entertainment and not education which means that some educators can be sceptical of the educational value. Conversely, some research indicates that social media has the potential to support student development and learning if used effectively (Selwyn, 2012). But the creativity and community aspects of leading TikTok toward social good makes this type of digital media a unique means to capture grade-schoolers interest around common core themes.

Many literatures indicated that TikTok can be used as an effective pedagogical tool to engage, motivate and enhance learning outcome of students in science education. Using the interactive and multimedia capabilities of the platform, these teachers are able to create rich student-centered learning experiences tailored for a generation of digital learners.

III. METHODOLOGY

1. Research Design

In this study, we used a quantitative experimental design in a quasi-experimental type which has been performed using both experimental and control groups. It was selected as the design for examining the effect of TikTok platform on students-science learning achievements. In the present study, we sought to explore if teaching using TikTok was effective relative to conventional learning methods. A quasi-experimental design was fitting as it permitted the comparison of two different instructional approaches while controlling for the uncontrolled variables which couldnot be managed in reality classroom.

2. Participants

This study used 25 fifth grade students in St. Yoseph 3 Kupang Elementary School as the subjects. This sample was divided into two groups ? The Experimental Group and Control Group, Each Group are 13 students and 12 students respectively. The experimental group was taught with the help of TikTok videos and a control group learned science using the usual teaching technique.

3. Instruments

The primary data collection instruments were tests and documentation:

1. Pre-Test and Post-Test

Students were given a pre-test for evaluation of the initial understanding about human and animal respiratory systems. After instruction, a post-test was administered to judge the development of useful knowledge. The exam was 20 multiple choice questions matching the curriculum.

2. Documentation
   The data were obtained through students' scores of science lesson plan (LP), minimal completeness criteria (MCC) and photos that documented teaching process during classroom observation.

4. Data Collection Procedures

The study was conducted over the course of several weeks, during which the experimental group was exposed to TikTok videos as part of their science lessons. These videos covered the topic of the respiratory system, with content designed to be engaging and accessible to students. The control group, meanwhile, received traditional instruction without the integration of TikTok or other digital tools.

a) Experimental Group.
   In this group, TikTok videos were integrated into the lessons as a learning tool. Focus of these videos were on respiratory system and the content was delivered mostly in animated format to make it easier and interesting for students to follow. The students were encouraged to watch the videos, interact with the content, and participate in discussions about the lessons.
b) Control Group.
   The control group was taught using conventional teaching methods, which involved lectures and textbook-based instruction without the use of TikTok or any digital media.

5. Data Analysis

Data from the pre-test and post-test were processed using SPSS to calculate descriptive statistics, including the mean, median, mode, standard deviation, and variance. Additionally, inferential statistical tests such as the T-test, normality test, and homogeneity test were conducted to determine the significance of the differences between the experimental and control groups.

a) Normality Test.
   A normality test was conducted to ensure that the data distribution met the assumptions required for further statistical analysis.
b) Homogeneity Test.
   The homogeneity test assessed whether the variance between the experimental and control groups was similar.
c) T-Test.
   An independent samples T-test was performed to compare the mean post-test scores between the experimental and control groups, testing the hypothesis that the use of TikTok has a significant effect on student learning outcomes.

6. Ethical Considerations

The study was approved by the school for ethic justifications. All students and their parents gave verbal informed consent that they were willing to participate. Anonymized student data were used and all results that could potentially be linked to a single individual reported in the aggregate so as not to violate the confidentiality of any individual.

IV. RESULTS

This section presents the findings of the study, which aimed to investigate the impact of using TikTok as a learning tool on the science learning outcomes of 5th-grade students. The results are based on the data obtained from pre-test and post-test scores, analyzed using both descriptive and inferential statistical methods. The results are also discussed in relation to the engagement levels observed in both the experimental and control groups.

1. Pre-Test and Post-Test Results

A pre-test were given to both the experimental and control groups in order to evaluate the initial knowledge of the students on the respiratory system. Students were assessed on a post-test after the instruction to measure their increased comprehension. The descriptive statistics for the two testing are included below.

Table 1. Mean Scores of Pre-Test and Post-Test for Experimental and Control Groups

Group	Pre-Test Mean Score	Post-Test Mean Score	Improvement (%)
Experimental	52.4	78.9	26.5
Control	51.7	66.3	14.6

As observed in the table, both groups improved after the instructional period. But the group that used TikTok videos as part of their learning Registered a 26.5% increase, compared with only 14.6% for the control group (no use of TikTok videos). This indicates that the integration of TikTok videos had a beneficial impact on student learning for the respiratory system.

2. Descriptive Statistics

The pre-test and post-test data were analyzed using descriptive statistics, including the mean, standard deviation, and variance for both groups. The results are summarized in the table below:

Table 2. Descriptive Statistics for Experimental and Control Groups

Statistic	Experimental Group	Control Group
Pre-Test Mean	52.4	51.7
Post-Test Mean	78.9	66.3
Standard Deviation	8.3	9.1
Variance	68.9	82.8

From these descriptive statistics, it can be observed that the mean post-test score of the experimental group was higher compared to the control group; however, standard deviation and variance with a larger spread of assessment outcomes in a control group. This suggests that students in the experimental group not only performed better overall but also had more consistent results.

3. Inferential Statistics

To determine whether the differences between the experimental and control groups were statistically significant, inferential tests were performed, including the normality test, homogeneity test, and T-test.

a) Normality Test

A normality test was conducted to test the data distribution of pre-test and post-test scores which should be achieved for statistical analysis, furthermore. The results showed that both the pre-test and post-test scores for the experimental and control groups were normally distributed, as indicated by a p-value greater than 0.05 in the Shapiro-Wilk test.

b) Homogeneity Test

A homogeneity test was performed to assess whether the variances between the experimental and control groups were similar. The results indicated that the variance between the two groups was homogenous (p-value > 0.05), allowing for the use of parametric tests such as the T-test.

c) T-Test Results

An independent samples T-test was conducted to compare the post-test scores between the experimental and control groups. The results are as follows:

T-value: 3.24
P-value: 0.002

T-test results showed that the difference of the post-test scores between the experimental and control groups is significant ($p < 0.05$). This suggests that, the science learning effect of using TikTok videos as a teaching medium is apparently far better than that of traditional resources.

4. Classroom Observations

Qualitative information were also derived during the lessons alongside with the quantitative data. These results were consistent with the observation that students in TikTok classes were more engaged and participatory during lessons. The wards asked many more questions, engaged with the videos and participated in discussions far more dynamically than did the control group. The teachers also commented that the students in the experimental group showed more curiosity and enthusiasm toward learning.

On the other hand, students in the control group were less active throughout the lessons and had fewer opportunities to actively participate or to interact. The TikTok lessons led to more excitement and engagement than the control group that used traditional teaching methods.

5. Student Feedback

Interviews with experimental group students indicated that most of them found the TikTok videos in facilitating comprehension of science concepts. They especially love that the videos are visual and animated; giving learners another way to remember the material. A few students also said they found the lessons to be interactive and were more engaged in learning. Meanwhile, students in the control group thought that traditional lessons were less interesting and more difficult to understand.

V. DISCUSSION

The intention of this research was to analyze the effect of utilizing TikTok for science learning on the acquisition in comprehending about the respiratory system among 5th-grade students. The results exposed a plethora of insights related to TikTok and how it can reinvent the learning, engagement, and motivation levels among students. In this discussion we will respond to the research questions, interpret the results with respect to existing literature, and finally discuss the implications of these findings.

1. Effectiveness of TikTok in Improving Science Learning Outcomes

The results of the study showed that students in the experimental group who were taught using TikTok videos had significantly higher post-test scores compared to the control group. We found that performance of the experimental group improved by 26.5% in comparison with 14.6% improvement in the control group. The results indicate that TikTok can be a useful teaching resource to help students learn complex scientific ideas.

The efficacy of TikTok in enhancing academic achievement agrees with the research that video enhances concepts specially for abstract and complex points (Clark & Mayer, 2016). Visual aids and animations have been used in science education to assist students in visualizing processes that are simply too complex to be understood solely by text (Bybee, 2010). And as the videos were interactive, students could deal with the content in terms of dynamism and thus had a deeper understanding of what was being addressed. This bolsters the notion that incorporating digital media in science education can serve as a bridge from traditional ways of teaching to learning patterns adopted by present-day, digitally native students (Walker, 2021).

2. Student Engagement and Motivation

The study showed that the experimental group of students were rather more attentive and participatory when TikTok videos were used while teaching. They asked more questions, engaged with the videos, showed a greater sense of curiosity and excitement. In contrast, students in the control group, who were taught using traditional methods, exhibited less engagement and were more passive in their learning.

This is in line with previous literature, which has indicated how social media can be used to intertaining and rewarding students short attention spans viewing contents thought the lens that best way of appealing to younger learners (Abdul Aziz & Mohd Dali, 2023; Mao, 2014). Combining auditory, visual, and textual elements in TikTok videos capitalizes on this opportunity to immerse students in an entertaining learning environment, which is crucial for sparking student interest and engagement with topics often perceived as challenging or unexciting (Greenhow & Lewin, 2018).

Quick 1-minute videos also resonate with the characteristics of today's learners, often described as digital natives — those who have grown up in an age where everything happens on screens and have shorter attention spans (Lottering, 2020). This style facilitates a fast understanding of concepts by students, it forces developers to actively follow the course and they can return to view the video at any time for revision. Higher engagement in the experimental group shows the power of TikTok as a gamification tool that can change how learners interact with learning materials.

3. Collaborative Learning and Problem-Solving Skills

The results, furthermore, revealed that students from the control group practiced lesser problem solving skills and required more teacher intervention during the classroom discussions. Students used TikTok videos to uniquely tackle scientific problems and discourse over the content they did watch. The videos were a jumping-off point for collaborative learning that allowed students to discuss with each other how they interpreted the information and bear in on its deeper meaning.

This is corroborated by the research which outlines that social media platforms such as TikTok are stimulating peer-to-peer learning amongst students, and promoting cooperation and collaboration (Dasoo, 2022; Regasa & Lemmi Ettisa, 2023). TikTok made students share scientific concepts together, do their homework, and group solve parameters. By drawing up this learning together, not only did this increase both of their knowledge as learners, but it also increased their ability to verbally communicate dynamically with each other as well as work in a team setting — all necessary 21st century learner skills (Bybee, 2010).

4. Challenges and Considerations for TikTok in Education

Although the results of one study illustrate TikTok regarding on how it may be beneficial in science education, this form of social media presents challenges to instructors when integrating it into their classrooms. Among those is making sure TikTok content complies with curriculum standards and educational objectives. As previous literature suggested, it is possible that with less careful curation of content students might end up reading incorrect or false information (Selwyn, 2012).

Furthermore, many teachers may be dubious of using TikTok for educational purposes due to its association with entertainment rather than education. Such a perception may chain down the widespread adoption of TikTok in schools even when there is plenty of data to show that the platform has effectively driven up student engagement and learning outcomes. In order

to tackle this, further research and teacher training are required to investigate the potential of TikTok based learning curricula that will keep up with the pedagogical demands.

5. Implications for Science Education

The results of this study imply that TikTok can be an effective platform used for enhancing elementary science education. Our analysis indicates that these strengths benefit learning outcomes, engagement and problem-solving and suggest that TikTok has a clear role in teaching scientific concepts beyond the pandemic providing unique access to content for students creatively exploring science. Teachers interested in using TikTok for educational purposes should identify ways to use the app's multimedia functionality for teaching and learning, while also identifying barriers and risks related to its implementation.

VI. CONCLUSION

An Experimental Study on the Utilization of TikTok as a Learning Tool to Improve Science Learning Outcomes of 5th graders at St. Yoseph Catholic Three Elementary School Kupang. The results suggest that using short and engaging TikTok videos within science teaching, in this case the respiratory system, significantly enhances learning outcomes in addition to students engagement and motivation as compared to the traditional methods of teaching.

Students who were introduced to the app Tik-Tok as part of the process of learning in the experimental group outperformed those in the control groups on post-test and showed higher engagement and participation within a classroom setting. The interactive TikTok videos enabled students to grapple with scientific information in a different light, leading to a holistic understanding of the topics and aiding them remember the standards better. Moreover, the learning environment using TikTok promoted teamwork and collaboration that are both required for a 21st-century student.

Although TikTok represents a novel and innovative avenue to improve how science is both taught to and learn by learners, the study also identified several challenges such as the importance of curating content that is relevant to educational goals or curricular standards. On the other hand, it is also likely that the fact that in user´s minds TikTok is still strongly associated with entertainment may be one of the reasons why its usefulness as an educational platform has not been more widely debated. However, the study showed that when used correctly TikTok can play an important role in engaging students and could provide a clarity of instruction that helps to develop the learner experience which then might lead towards enhancing student's performance.

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