

Social Media and Primary School Science: Examining the Impact of Tiktok on Year 5 Students' Performance in Light Energy

Amyzee Roberd¹ and Roslinawati Roslan^{2*}

^{1,2}Sultan Hassanal Bolkiah Institute of Education, Universiti Brunei Darussalam, Brunei Darussalam

*e-mail: roslinawati.roslan@ubd.edu.bn

ABSTRACT

Using social media as an instructional option has attracted great attention. Nevertheless, little is known about how social media applications such as TikTok support student learning in science. This action research investigated the impact of TikTok lessons on students' performance in light energy. It also explored students' perceptions of using TikTok in science learning. A total of 14 conveniently sampled Year 5 students from one of the primary schools in Brunei Darussalam participated in this study. Data were collected through a pretest, post-tests, observations, and interviews and analyzed using One-way Repeated Measures ANOVA and thematic analysis. The TikTok interventions improved students' performance in light energy, with post-test higher than pretest scores. The students had a positive perception of the TikTok intervention provided. TikTok is regarded as user-friendly, and the TikTok lessons are collaborative, engaging, and fun. Implications are discussed.

Keywords:

Primary School Science; Light Energy; Social Media and TikTok; Student Performance; Action Research.

ABSTRAK

Penggunaan media sosial sebagai pilihan instruksional telah menarik banyak perhatian. Namun demikian, sedikit yang diketahui tentang bagaimana aplikasi media sosial seperti TikTok mendukung pembelajaran siswa dalam sains. Penelitian tindakan ini menyelidiki dampak intervensi pelajaran TikTok pada kinerja siswa dalam energi cahaya. Selain itu juga menggali persepsi siswa tentang penggunaan TikTok dalam pembelajaran IPA. Sebanyak 14 sampel siswa Kelas 5 dari salah satu sekolah dasar di Brunei Darussalam berpartisipasi dalam penelitian ini. Pengumpulan data dilakukan melalui pretest, posttest, observasi dan wawancara, serta

dianalisis menggunakan One-way Repeated Measures ANOVA dan analisis tematik. Intervensi TikTok meningkatkan kinerja siswa dalam energi cahaya, dengan skor posttest lebih tinggi daripada skor pretest. Siswa memiliki persepsi positif terhadap intervensi TikTok yang diberikan. TikTok dianggap ramah pengguna dan pelajaran TikTok bersifat kolaboratif, menarik, dan menyenangkan. Implikasi dibahas.

Kata Kunci:

Sains Sekolah Dasar; Energi Cahaya; Media Sosial dan Tiktok; Kinerja Siswa; Penelitian Tindakan.

1. Introduction

The 21st century is the era of technological advancement. Education systems worldwide are transitioning to ensure a more technologically enhanced teaching and learning (Hanif et al., 2019). As part of technological development, social media play an important role in communication and have attracted wide attention to be seen as teaching and learning aids (Faizi et al., 2013; Davis et al., 2015; Rijal & Sukmayadi, 2021). Social media is used to denote a computer-based technology that allows information, thoughts, and ideas to be shared among people (Rosenthal, 2020). Since it is an internet-based technology, users can easily access electronic content such as photos, documents, personal information, and videos through their handphones, tablets, or computers (Alabdulkareem, 2015; Rosenthal, 2020). It has been estimated that more than 4.62 billion people use social media, and countries such as Indonesia are among the top list of social media use (Global Social Media Statistics, 2022). The predominant social media applications are Facebook, WhatsApp, YouTube, Instagram, Twitter, and TikTok.

Given the rise in the use of social media, there is an ongoing call for educators to integrate social media and technology in general to improve teaching and learning (Delello et al., 2015; Moll & Nielson, 2017; Alhumaid, 2020). This is because students are attached to social media technologies and see them as entertaining, making learning easier due to their eye-catching features (Baytak et al., 2011; Raut & Patil, 2016). Students use social media to connect with peers, which can serve as a means to engage and motivate them in the learning process (Krygier et al., 1997; Diezmann & Watters, 2002; Guy, 2012; Sivagnanam & Yunus, 2020; Aranego, 2020). Integrating social media into teaching and learning positively impacts student learning (Junco et al., 2011; Akgunduz & Akinoglu, 2016). This positive association becomes stronger when teachers develop better attitudes towards the incorporation of technology and media in student learning (Teo, 2009; Mardiana, 2016) and have the knowledge of technology pedagogy and content knowledge that makes the integration of technology into teaching and learning feasible (Angeli & Valanides, 2008).

Previous research in science education has emphasized how the effective use of social media improves teaching and learning. Findings suggest that social media engages students in social interaction, which improves their creative and logical skills. However, previous research has focused largely on the use of Facebook, Twitter, and YouTube as instructional options (Alabdulkareem, 2015; Delello et al., 2015; Thalluri & Penman, 2015; Lundgren et al., 2020; Rosenthal, 2020).

One of the social media applications that have not attracted widespread attention, especially in science education in Brunei Darussalam (henceforth, Brunei), is TikTok (Yunus et al., 2019; Yang, 2020), although there is evidence of increased use of social media in Brunei (Dayani & Chan, 2018). TikTok is multimedia that incorporates and hosts different technological aspects such as dance, jokes, pranks, and videos. The duration of this multimedia is 10 to 15 seconds. It has the potential to enhance teaching and learning due to its worldwide coverage (Hayes et al., 2020), easy accessibility (Hight et al., 2021), sustenance of student interests (Yang, 2020), and helps students develop IT soft skills (Baytak et al., 2011; Cintang et al., 2017). It nurtures student interest in science learning and creates an environment for spontaneous learning inside and outside the classroom (Nwanekezi & Kalu, 2012). Students improved their post-test scores after using social media tools for learning because it exposed them to building correct mental models to apply their prior knowledge to a different context (Ercan, 2014).

Therefore, this study extends the effectiveness of using social media (TikTok) in teaching and learning scientific concepts such as light energy from the Bruneian context. Student conceptions of learning science and mathematics-related disciplines have been described as memorization of facts, which affect student learning and performance (Tsai, 2004; Abbas et al., 2020; Low et al., 2020; Rosli et al., 2020; Shahrill et al., 2021a; Shahrill et al., 2021b). This has been attributed to the lack of student motivation and the overemphasis on exam-oriented teaching and learning (Roslan et al., 2018; Abdul Latif, 2021; Chong et al., 2022), and the inconsistencies in the content of primary science (Semali & Mehta, 2012). This leads students to memorize instructional concepts, which affects their understanding level.

Incorporating multimedia into education allows students to build consequential relations between words and pictures (Sorden, 2013). This is consistent with the cognitive theory of multimedia (Mayer, 2014). The theory emphasizes that student learning occurs in three principal stages: selecting important words and images from narration/text and graphics, respectively. Second, organize the selected words and images to form a coherent verbal and pictorial representation. Third, integrating verbal and pictorial representations and students' prior knowledge (Mayer, 2014). When students go through these processes, they can prepare mental interpretation from learning materials when multimedia technology such as TikTok is used (Mayer & Moreno, 1996). Additionally, these processes improve students' thinking skills, helping them to synthesize and analyze concepts when learning science, given the reductionism in science learning (Moll & Nielson, 2017; Alhumaid, 2017). Reductionism is an initiative to make complex concepts into simple and fragmented facts, enabling students to explore and interpret science in their own way (Hayes et al., 2020).

The advancement of technology continues to change the nature of science teaching and learning (Capello et al., 2013). Consequently, incorporating technology, particularly social media, may be a helpful tool to support student learning in science. Given that TikTok, one of the most widely used social media, has not been associated with the teaching and learning of scientific concepts, particularly in the context of Brunei, this study investigated the impact of TikTok lesson intervention on students' performance in light energy. It also explored students' perceptions of TikTok as an instructional option. The two research questions were formulated: what is the impact of TikTok

lesson intervention on students' performance in light energy? And what perceptions do students have about using TikTok in teaching and learning about light energy?

2. Methods

This study was designed based on the spiral of action research cycle (Altrichter et al., 2002). This was suitable because we sought to improve the understanding of students in light energy by providing an alternative teaching and learning approach through TikTok. The cycle included reflecting on the problem, providing intervention, and reflecting on the intervention by providing a post-test to assess the effectiveness of the intervention (Dickens & Watkins, 1999). In the event of no improvement at an intervention stage, the cycle was repeated.

2.1. Research Participants

A total of 14 participants (7 males and seven females) who were Year 5 students were purposively selected for this study. These students were from a primary school in one of the districts in Brunei. They were selected because they had challenges in understanding light energy at the time this research was conducted. Therefore, the need for this intervention. They were made up of different abilities. Their ages ranged from 9-10 years old. The 14 students participated in the intervention and were observed. However, six of them were available for interviews. The interview participants were selected based on their pretest and post-test scores. They consisted of two higher achievers (S1 and S13), two middle achievers (S12 and S8), and two lower achievers (S10 and S9). They were selected to represent the different range of abilities amongst the students.

2.2. Research instruments

Data were collected using pretest, post-test, observations, and interviews. The pretest was conducted to assess student performance prior to interventions. Post-tests were conducted to check the effectiveness of the interventions provided. The observation and interviews were used to explore students' perceptions of the intervention. The questions for the pretest and post-test were adapted from previous examination questions, while the questions for the interviews were self-developed. An observation checklist was adapted from Ishak and Amjah (2015) to determine the student's level of participation, confidence, fun, and excitement in the interventions. It also focused on students' perceptions in terms of attention, clarity of learning, the meaningfulness of work, and performance orientation. The questions for the pretest, post-test, observation checklist and interview were approved by an expert in science education at the Sultan Hassanal Bolkiah Institute of Education, Universiti Brunei Darussalam. This expert judgment aimed to ensure the content representativeness of the questions and evaluate the viability and reliability of the questions to address the research questions (Asamoah et al., 2019).

Before data collection and intervention processes, ethical clearance was obtained from the Sultan Hassanal Bolkiah Institute of Education. Formal permission was obtained from the Department of Schools, Ministry of Education. The consent of the sampled school leaders, parents whose wards were used, and the students themselves were sought by completing informed consent forms. This was

to ensure their voluntary participation and willingness to participate in this study. Student participants were free to leave this study any time they wanted without providing any explanation.

The lesson interventions were carried out within February 2021. Two cycles were carried out. The links of the videos that were made for the purpose of delivering the topic contents can be accessed here: light sources: <https://vm.tiktok.com/ZSJBPKJHV/>; how light travels: <https://vm.tiktok.com/ZSJBPyAL/>; how the shadow is formed: <https://vm.tiktok.com/ZSJBPr4Q/> and reflection of light: <https://vm.tiktok.com/ZSJBsyPv/>. The duration of the lesson intervention and all the processes that were involved can also be found in the videos.

The pretest and post-tests lasted for 30 minutes and were scored. Since we were interested in how the students improved in all the dimensions of light energy, two series of post-tests were conducted. The students were observed while the interventions were ongoing. The interviews were carried out after all the interventions.

2.3. Data Analysis

Scored tests were entered into SPSS for statistical analysis. Before the analysis, data cleaning was done to address all missing values and outliers. A One-Way Repeated Measures ANOVA was used to analyze the data for the quantitative data since the interventions were conducted for the same group of students three times (from pretest to post-test). The statistical tool was also suitable because data for the pretest and post-test scores were normally distributed (pretest; $p=0.3093>0.05$, post-tests; $p=0.6645>0.05$, $0.5626>0.05$). The observation and interview data were analyzed thematically (Braun & Clarke, 2006).

3. Results and Discussion

3.1. What is the impact of TikTok lesson intervention on students' performance in light energy?

To answer the first research question, a One-Way Repeated Measures ANOVA analysis of the performance of students before and after the intervention is presented in Table 1.

Table 1. Performance of students before and after the intervention

Effect	Value	Multivariate Test						F	Hyp. df	Sig.
		Mean				SD				
		Pre test	Post test 1	Post test 2	Pre test	Post test 1	Post test 2			
Wilks' Lambda	.276	9.85	14.92	16.31	3.80	4.89	6.70	14.44	11.0	.001*

SD = standard deviation; * significant at .05; Partial Eta Squared = .724; N=14.

From the results in Table 1, there is a statistically significant mean difference between the pretest and post-test scores; Wilk's Lambda = .276, $F(2, 11) = 14.4$, $p<.0005$. It can be observed that the post-test mean scores, 14.92 and 16.31, are higher than the pretest mean score of 9.85. This

signifies that students' performance improved after the TikTok interventions. The multivariate partial eta squared = .72 signifies a medium effect size (Cohen, 1988). This explains that the provided TikTok intervention accounted for approximately 72% of the student's performance.

3.2. *What perceptions do students have about using TikTok in teaching and learning about light energy?*

To answer the second research question, several themes and sub-themes emerged after analyzing the student's responses to the interview. The summary of the themes after the thematic analysis is presented in Table 2.

Table 2. Summary of themes after the thematic analysis

Main themes	Initial sub-themes
TikTok is user-friendly	Function of TikTok Ways TikTok actually helps Visual effects of TikTok Use of gadget/TikTok educationally Easy to use or manage Knows the application/got the application/ready Resourcefulness or easy to manage
Engaging content and method delivery	Fun learning Focus and engaged The benefit of using TikTok over book The similarity between visual and real-life teaching
Collaborative activities	Peer-driven motivation Collaboration with friends

3.2.1 *Tik Tok is user-friendly*

Several sub-themes emerged under this theme, such as the function of TikTok, Ways of TikTok actually helps, visual effects of TikTok, use of gadget/TikTok educationally, ease to use or manage, knowing the application and resourcefulness of ease to manage. For TikTok being user-friendly, S1 and S13 mentioned that TikTok assisted them in finding the right videos on light energy, and watching them allowed them to learn easily. S8 and S10 stated the same aspect of how TikTok helped in their learning. S13 added that TikTok is easy to use and facilitates effective communication. S12 acknowledged that the use of TikTok helps create teaching and learning content that promotes creativity.

3.2.2 *Engaging content and method delivery*

Several sub-themes emerged under the second theme: fun learning, focus, and engagement, the benefit of using TikTok over the book, and the similarity between visual and real-life teaching. On the second theme that focuses on engaging content and method of delivery, S1, S8, and S9 mentioned that using TikTok is fun, and they were excited to learn science when TikTok was used. S12 uttered that the use of TikTok was more engaging. S10 compared the significant difference between the use of textbooks and TikTok videos in grasping the instructional concepts. She explained that she

understood TikTok videos on light energy compared to learning the concept from textbooks. According to S10, the teaching and learning of light energy looked real, and they were able to apply it in real life and within their environment.

3.2.3 Collaborative activities

Under the third theme, two sub-themes emerged: peer-driven motivation and collaboration with friends. On the third theme that focuses on collaborative activities, two students talked about how TikTok has the potential to promote collaborative learning. S10 mentioned that he would be excited to do the project with his friends if TikTok must be used. S8 also recalled her experience using TikTok in the classroom, which allowed her to learn with her friends. To validate these perceptions and students' performance after the TikTok intervention, students were given two pictures and asked to describe anything scientific about the pictures. S1, S8, S9, and S13 mentioned that light helps us to see. This is the main objective of the lesson we expected the students to demonstrate. S9 and S10 added the types of light: natural or artificial lights. S8 uttered one property of light. He explained that light travels in a straight line. Lastly, S10 was the only one who talked about shadow and how it was formed. From our observation, the student was found to exhibit positive body language, a high level of focus, participation, and confidence. They were also attentive and demonstrated a better understanding of instructional tasks.

3.3. Discussion

The results of this study indicate that the use of TikTok as a teaching and learning option has the potential to improve student performance in light energy, given its medium effect size. This is consistent with previous studies that found that social media applications such as Facebook and Twitter positively impact students' performance in scientific concepts (Junco et al., 2011; Akgunduz & Akinoglu, 2016). This result is not surprising given the perceptions of students after learning through TikTok. They saw the lessons as fun, collaborative, and engaging and largely described TikTok as user-friendly, which confirms previous studies (Ivala & Gachago, 2012; Tess, 2013).

Syah et al. (2020) stressed that in this technological age, students are attached to social media such as TikTok due to the compelling features that make it easy to be used. Therefore, using different videos and photos from other cultures encourages users to be completely immersed, which boosts their interest, collaboration, and motivation to learn (Zhou, 2019; Aranego, 2020). Students' interests have also been associated with their desire to know and with what a teacher could offer in a classroom setting (Escamilla-Fajardo et al., 2021). TikTok has the potential to be a channel to provide knowledge and, at the same time, learning and assessment feedback that can be used to improve student learning (Rijal & Sukmayadi, 2020; Asamoah et al., 2022).

According to Hayes et al. (2020), students were highly interested in the visual appearance of TikTok, which attracted their attention to master instructional concepts. The music and information incorporated into the TikTok videos made the students happy. Approximately 96.5% of the students agreed that they improved their level of understanding of science when learning through TikTok (Hayes et al., 2020). Given this analysis, TikTok serves as a good platform for providing interesting

teaching and learning. Students are not forced to learn since the integration of videos or audio into learning content can attract students to learn.

It is also not surprising that TikTok encourages students' engagement in this study. Mitra et al. (2010) reported that the use of videos in learning encourages active and deeper learning. Moreover, Hight et al. (2021) found that using chemistry-themed videos helped students retain instructional concepts. Since TikTok is used by most older children, incorporating it into education has the potential to motivate them to learn. It makes learning interesting and promotes innovation and creativity. This could have happened in the case of the participants used in this study.

Moreover, the findings of this study provide satisfactory evidence that students have a good perception of the use of social media, particularly TikTok, in the teaching and learning of science, as evidenced in the literature. For example, Yang (2020) found that students positively perceived the incorporation of TikTok in their learning. We also observed that the use of TikTok helps increase students' confidence. Using TikTok encourages student participation (Gikas & Grant, 2013; Mao, 2014; Al-rahmi et al., 2015; Selwyn & Stirling, 2016), although it can be expensive (Omar & Dequan, 2020). Therefore, the collaboration, inquiry, and excitement accompanying the use of TikTok in the teaching and learning of science, as confirmed in this study, can contribute to self-directed and responsible student learning (Hamdan et al., 2022). Students will eventually develop self-understanding that will facilitate their interpretations of instructional concepts.

4. Conclusion

This study sought to assess the effectiveness of TikTok as a social media option in improving the performance of Year 5 students in the teaching and learning of light energy. We found that the performance of students improved after introducing them to TikTok lesson interventions. Generally, the students had a positive perception of the use of TikTok as an instructional option. They saw the lessons as fun, collaborative, and engaging. TikTok as a user-friendly teaching and learning tool improved students understanding of light energy, which made them prefer to be taught using TikTok compared to traditional teaching and learning and through textbooks.

The results imply that the use of social media has such versatility that it could engage students in their learning and can be used to provide a more enjoyable learning environment. Taking advantage of something relevant to the current generation of students, for instance, TikTok, students' interest can be generated and sustained in the teaching and learning science. This has a cumulative positive effect on student motivation toward self-directed learning. Therefore, using social media, particularly TikTok, for educational purposes can benefit student learning in science education. It is hoped that this research could inspire educators to use TikTok and manipulate all the features available to improve student learning in science and other related subjects. It is also recommended that teachers give students a chance to develop TikTok videos of their own as a class project and allow them to work collaboratively with their peers to improve student learning. Despite our results, we are emphatic that its effectiveness and associated benefits may depend on how the teacher implements it. Given this research's geographical and methodological limitations, future studies can replicate this study in other local and international contexts using mixed-method approaches.

5. References

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