Implementation of TPACK-based Liveworksheet Approach on Students' Learning Motivation and Critical Thinking in Science Learning at Elementary School

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Abstract. In the current educational world, TPACK (Technological Pedagogical Content Knowledge) is essential to enhance learning motivation. The aim of this research is to analyze the influence of the Liveworksheet approach based on TPACK on elementary school students' learning motivation and critical thinking. A qualitative approach was chosen using observation, interviews, and documentation as data collection techniques. The subjects of the study were fifth-grade students of SD Negeri 03 Kuta. Data validity was ensured through source triangulation and data triangulation. The results showed that the implementation of the Liveworksheet approach based on TPACK significantly affected students' motivation and critical thinking in science learning at the elementary level. Based on these findings, the application of Liveworks based on TPACK in science education can enhance learning motivation and strengthen critical thinking among students. This approach can be an alternative to improve science education in elementary schools.

Keywords: Liveworksheet, learning motivation, critical thinking

1   Introduction

The rapid advancement of science and technology in the era of the Fourth Industrial Revolution has had a significant impact on the field of education. In order to enhance the effectiveness and efficiency of learning, technology-based learning management systems and instructional materials platforms are increasingly being utilized [1]. The advancement in technology also requires teachers and students to adapt teaching methods to the needs of 21st-century learning [2]. TPACK (Technological Pedagogical Content Knowledge) is a conceptual framework that integrates three crucial components in education: technology (T), pedagogy (P), and content (C). TPACK assists teachers in understanding and effectively integrating technology into the teaching process. Technology (T) refers to the knowledge of tools and technological applications used in education. Pedagogy (P) involves effective teaching strategies that utilize technology. Content (C) is related to knowledge of the subject matter. The TPACK framework helps teachers design learning strategies that effectively integrate technology to enhance students' understanding of the content, learning motivation, and critical thinking skills [3].

According to the Regulation of the Minister of National Education Number 16 of 2007, teachers are required to have adequate knowledge of computer and communication technology. Depending on their abilities and talents, ICT can help students develop advanced and sustainable learning interests. Due to the availability of various digital teaching materials on the internet, teachers and textbooks are no longer the sole primary sources of information in the learning process. Students' ability to meet their learning needs can grow when teachers effectively integrate technology into every classroom [4].

One crucial component of learning is assessment. Assessment is carried out to measure the achievement of learning objectives and how well students master the content and skills after the learning process. The implementation of assessment using traditional paper and pencil can cause students to easily get bored, lack enthusiasm, and be less motivated in completing their assessments. This can negatively impact students' academic achievement. One platform that can be used for assessment is Liveworksheet. Liveworksheet is an application used to create interactive worksheets for students, which can motivate their learning and critical thinking [5]. In this application, various materials such as images, sentences, sounds, videos, and other symbols can be added to make it more engaging for students. There are several features available in Liveworksheet, including multiple-choice, matching, drop-down, open-ended questions, checkmarks, drag and drop, and other task formats [6].

Learning motivation is a crucial factor in achieving optimal learning outcomes. Individuals with high learning motivation have greater enthusiasm in engaging in learning activities and attain better learning results [7]. Without strong intrinsic willingness from the students themselves, learning motivation will not naturally increase. However, learning motivation can be enhanced through appropriate efforts. It is important for teachers to possess skills in encouraging students to increase their learning motivation, as the role of teachers significantly influences students' learning outcomes [8]. A student with high learning motivation is more likely to be motivated to engage in learning activities, thus achieving maximum learning outcomes. Three indicators of a student's high or low motivation in learning include: (1) the quality of their involvement, (2) their feelings and engagement in interests, behavior, attitude, and character (affective aspects), and (3) their willingness to consistently maintain and sustain their motivation [9].

Critical thinking is a cognitive activity that involves the use of thinking and learning to think critically, analytically, and evaluatively, which means utilizing mental processes such as attention, categorization, selection, and assessment [10]. Critical thinking skills are essential intellectual assets for students when facing problems in their daily lives [11]. Operationally, critical thinking can be observed through students' ability to ask deep questions, question assumptions, draw conclusions based on evidence, and solve problems. It is advisable to cultivate critical thinking skills starting from elementary school, especially for upper-grade students, as this will impact their memory and understanding of various subjects.

Science, which is one example of a scientific subject, is defined as knowledge about a field that is systematically organized according to specific procedures and can be used to apply certain phenomena within that field (knowledge) [12]. The 2013 science curriculum outlines the goals and skills that students should possess after completing their learning activities.

Tin Rustini (2023) conducted research that showed that many teachers still lack understanding and mastery of teaching skills using TPACK. The implementation of TPACK in schools is lacking, primarily due to limited resources and facilities. Not all schools have sufficient availability of laptops and projectors for the number of teachers. In terms of

teaching and mentoring, there is a lack of training to enhance teachers' abilities in integrating these skills into the classroom.

In contrast, a study by Afifah Widiyani (2022) demonstrated that the use of TPACK-based Liveworksheet in Civic Education (PKn) learning is more efficient as it does not require paper, and students feel happier and less bored. Liveworksheet was found to improve students' learning outcomes and facilitate their understanding of the subject matter.

Based on interviews with fifth-grade teachers, even though they use engaging learning media, the evaluation process is still manual using paper or conventional methods. Consequently, some students are still not motivated enough to complete their tasks well. These observations motivate researchers to analyze the impact of implementing TPACK-based Liveworksheet on students' learning motivation and critical thinking in science learning at the elementary level.

2   Research Methods

The method used in this research is descriptive qualitative research. The researcher obtained primary and secondary data. Primary data is the research information obtained directly from the homeroom teacher through interviews. Secondary data is the research information provided directly or indirectly through books, recent evidence, or reports [13].

The data used in this research consists of observations, interviews, and documentation regarding the use of TPACK in science learning. Data collection techniques were employed to describe the implementation of TPACK-based Liveworksheet approach in fifth-grade science learning at SD N 03 Kuta. The research subjects were fifth-grade students at SD Negeri 03 Kuta. The study utilized observation, interviews, and documentation as data collection techniques. The instruments used included interviews, observations, and documentation.

The data analysis method employed in this research is interactive data analysis according to Miles and Huberman (1992) [14]. The data analysis process includes data collection, data reduction, data presentation, and drawing conclusions/verification. In this research, the researcher employed triangulation of sources and technical triangulation techniques. According to Sugiyono (2015:273), technical triangulation is a credibility testing technique conducted by verifying information from the same sources using different techniques, while source triangulation is a credibility testing technique by verifying the accuracy of information obtained from multiple sources [15].

3   Results and Discussion

In the 2013 curriculum, there is a difference in the presentation of science materials between upper grades and lower grades. Science learning in the upper grades includes basic science literacy, while in the lower grades, there is no basic science literacy. However, some science content is integrated into other core competencies such as Bahasa Indonesia (Indonesian language). The goal of science education in schools is for students to have knowledge management, scientific attitudes, and process competencies [16]. Science (Ilmu Pengetahuan Alam) is a study of the natural world and its contents through careful observation and scientific activities such as observation and experimentation [17].

Assessment utilizing technology can motivate students to work on it by incorporating attractive features such as visuals or interactive elements. Additionally, interactive worksheets also utilize technology in education, allowing for the inclusion of audio, video, multiple-choice questions, and other engaging features during the evaluation process. Liveworksheet is an online-based platform that allows for the creation of interactive worksheets with self-correction, enabling students to receive immediate feedback without the need for the teacher to manually correct their answers [18].

There are several advantages to using Liveworksheets: (1) Interactivity: Liveworksheet allows students to actively participate in learning. They can directly answer questions by matching statements with answers, selecting from available choices, or writing detailed responses, making the learning experience more engaging. (2) Flexibility: Liveworksheet can be accessed from any device connected to the internet, enabling students to learn from anywhere and at any time. (3) Attractiveness: Liveworksheet offers a wide range of worksheets that can also be downloaded as PDFs if granted permission by the worksheet owner. (4) Speaking practice: In addition to various types of questions, students can practice speaking using the microphone feature, allowing for interesting interactions between teachers and students as well as among students [19].

There are several commonly used question models in Live Worksheet, including: (1) Drag and Drop: This feature allows students to drag and drop objects as answers to corresponding questions. It provides question variations to prevent students from getting bored with a single pattern. (2) Join with Arrows: This is one of the most commonly used features. The question format consists of words on the left and right sides, which can also include images. Students need to match and connect the appropriate items to obtain the correct answer. (3) Multiple Choice Exercise: This is similar to the typical multiple-choice question format for assessment. Students need to choose the correct answer from several options accompanying the question, with only one answer being correct. (4) Drop Down Select Box: This question type requires students to select an answer from a box that appears when they click or press on the box or arrow next to it. The correct answer is displayed as an option in the selection box. (5) Open-Answer Questions: This question type requires students to provide more detailed and in-depth answers. It is used to test students' ability to analyze problems and express opinions [20].

Figure 1. Liveworksheet initial display

Steps to use the Liveworksheet application: (1) Register or sign up for a teacher account on www.liveworksheet.com by providing the required data, (2) Log in to the registered

email and click on the activation link sent to you, (3) Go to https://www.liveworksheets.com and click on "teacher access." Enter your email/username and password, (4) If you want to create your own evaluation questions, click on "make interactive worksheet" in the menu and then click "get started.", (5) Upload the file in PDF or JPG format, with a maximum file size of 5 MB, (6) Once finished, you can preview your interactive questions by clicking on the "preview" option at the top. There are two options for saving: saving and sharing it publicly or saving it for your own use with your students. If you choose to save and share it publicly, you will be prompted to provide related information such as subject, topic, class, estimated age, and question type, (7) Copy the HTML code provided by Liveworksheets and share it with your students [21].

TPACK (Technological Pedagogical and Content Knowledge) refers to a teacher's knowledge of how, when, and where to use technology in specific subjects. In the implementation of technology in the fifth-grade class at SD Negeri 03 Kuta for the topic of heat transfer, the steps are as follows: the teacher starts the learning activity by opening the lesson and reading a prayer together, checking the attendance of students, communicating the learning objectives, and guiding the learning process. During evaluation or assessment, the teacher shares the link in a WhatsApp group, directing students to click the given link on their mobile phones. Students can then fill in their personal information and answer the questions on Liveworksheets. Once the students have completed their work, they submit their results to the teacher's email or directly share their achieved scores by taking a screenshot and sending it to the WhatsApp group
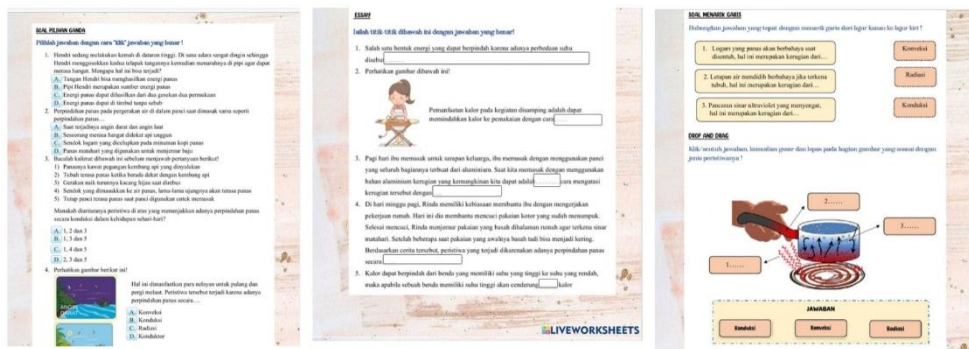

Figure 2. Display of sample questions on liveworksheets

The TPACK-based Liveworksheet approach in teaching science (IPA) can help students integrate technological knowledge. Moreover, the use of this application can enhance students' motivation to learn and their critical thinking skills. This is evident from the positive response and enthusiasm of students towards using Liveworksheet. They find it enjoyable and interactive, and they are able to provide simple explanations and apply problem-solving in their learning.

4   Conclusion

The use of Liveworksheet as an integrated learning tool with the TPACK (Technological Pedagogical Content Knowledge) approach can enhance students' motivation to learn and their critical thinking skills. This research concludes that student motivation can be observed through their willingness to learn and their engagement in the learning process, while critical thinking can be seen through their ability to provide simple explanations and apply problem-solving. The utilization of Liveworksheet in science (IPA) education proves to provide an enjoyable learning experience for students by utilizing their smartphones not only for entertainment but also for learning purposes. By using Liveworksheet, it offers an alternative solution to meet the challenges of rapid technological advancements. The implementation of Liveworksheet in science education also has several impacts: (1) It facilitates teachers in assessment, as Liveworksheet utilizes automatic assessment features. (2) It saves time and costs as an online learning platform, allowing teachers to create and provide learning materials quickly and easily without the need for physical printing or distribution. (3) The results of interviews and observations with students regarding Liveworksheet-based science education indicate that students become more motivated to learn as it provides a new learning experience.

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