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PROFESI PENDIDIKAN DASAR

STEAM-Inquiry Learning Module Assisted by Liveworksheet for Multiplication Material in Elementary School

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Abstract

Mathematics often poses a daunting challenge for elementary school students, affecting their academic performance. Addressing this issue requires creating more engaging and innovative learning approaches. This research and development endeavour aim to assess the validity and practicality of a STEAM-based inquiry learning module assisted by a liveworksheet for multiplication material in third-grade elementary school. The study employed the Research and Development (R&D) method using the ADDIE model. The research involved 11 third-grade students at Tulip Putih Elementary School, and both quantitative descriptive analysis and qualitative description techniques were applied for data analysis. The validation results affirmed the suitability of the developed module, categorizing it as excellent. Trial results further demonstrated the practicality of the developed tool. Based on data analysis, it can be concluded that the STEAM-Inquiry Learning module assisted by a liveworksheet, developed for third-grade elementary school students studying multiplication, is suitable for implementation. The incorporation of technology within teaching modules enables educators to create interactive learning experiences. This can enhance the understanding of the material and subsequently influence the improvement of learning outcomes. The deployment of this instructional module stimulates students to be more engaged and active in class, nurturing critical, creative, confident, and analytical thinking skills.

INTRODUCTION

Background of the Study

Education holds paramount significance, as the knowledge gained in the educational realm becomes the foundation for students in their real-world applications. Consequently, each student embarks on their educational journey as a cornerstone for their future life. Aligned with the Regulation of the Minister of Education and Culture of the Republic of Indonesia Number 45 of 2015, which amends the regulation of the Minister of Education and Culture of the Republic of Indonesia Number 68 of 2014, it concerns the roles of information and communication technology teachers, as well as computer skills and information management teachers, in the execution of the 2013 curriculum. Since the enactment of this regulation, educators are obligated to employ information technology, tailored to the prevailing circumstances and conditions. Technology, particularly the rapidly advancing internet, proves to be a vital tool for teachers in their capacity as educators, enabling them to develop electronic-based teaching materials. However, the implementation of information technology in learning continues to pose a challenge in elementary schools, especially in the subject of mathematics. The need for a combination of teaching tools with the currently developing technology is essential so that the learning followed by students is relevant to their era (Lestari et al., 2020).

Mathematics is characterized as a body of knowledge within the realm of science and technology (Agustyaningrum et al., 2022). The aim of mathematics education, particularly in elementary schools, is to facilitate the communication of ideas via tables, charts, symbols, or media to elucidate and resolve problems. Mathematics encompasses a variety of topics that necessitate critical thinking for problem-solving (Zakeri et al., 2022). Learning that stimulates students' critical thinking requires appropriate teaching materials and the need for innovative learning to pique students' interest. One method to realize this is by integrating technology into learning, given that elementary school students are now adept at operating gadgets. Advanced mobile phones as gadgets will provide increasingly sophisticated features, which can be used to access learning materials (Satrianawati, 2017). Elementary school mathematics teachers must be professional because they play an important role in providing basic knowledge and skills for mathematical abilities at the next level (Yurniwati & Yarmi, 2020).

Problem of The Study

In elementary schools, the development of mathematics learning is intriguing, considering that elementary school students are in the midst of their learning and cognitive development. The abstract nature of mathematics implies that many students may face challenges (Farhana et al., 2022). The difficulties encountered by students in mathematics learning include their inability to think mathematically, concealed ideas, lack of interest, and inadequate enhancement of their abilities. A majority of students are hesitant to ask questions when they encounter something they do not comprehend, leading them to perceive mathematics as an intimidating subject (Permatasari, 2021). A lack of understanding of mathematics instills a sense of despair in students, resulting in low academic achievement (Zakeri et al., 2022).

Through observations at Tulip Putih Elementary School, it was noted that students faced challenges in their mathematics lessons, particularly when it came to multiplying two or more numbers. Preliminary tests conducted by the researcher revealed that only 3 out of 10 students scored above 70, while the remaining 7 students scored 70 or below. A common error observed was students forgetting the value of the initial multiplication, leading to incorrect final multiplication results. An interview with a third-grade teacher at Tulip Putih Elementary School on September 15, 2023, revealed that some students exhibited more enthusiasm for mathematics lessons than for other subjects. The teacher encountered challenges such as noisy classrooms during lessons, with only three students typically actively participating. Some students harbored fear of mathematics, resulting in very low scores, despite the teacher's efforts in preparing multiplication questions for homework. Another issue

highlighted was the lack of teaching media for mathematics lessons at Tulip Putih Elementary School, contributing to the monotony of the lessons.

Research's State of the Art

A teaching module is a learning resource crafted based on the curriculum to attain competency standards. The role of the teaching module is to assist educators in lesson planning (Maulinda, 2022). Serving as self-learning material for students, the teaching module enables them to acquire fundamental skills and abilities during the elementary education stage (Sidik, 2020). As per Fitri et al., (2023) the utilization of teaching modules facilitates students' comprehension of learning materials and streamlines the presentation of systematic materials for teachers. Educators can develop teaching modules employing diverse learning strategies, models, and methods, resulting in innovative teaching modules. According to Yuanita & Kurnia, (2019), teaching materials developed in accordance with the needs of teachers and students are capable of enhancing the quality and standard of learning.

STEAM, an evolution of the STEM approach, incorporates "art" to stimulate artistic creativity in students (Nurhidayat & Mohammad Asikin, 2021). The STEAM approach, encompassing Science, Technology, Engineering, Arts, and Mathematics, engages students in a sequence of creative and analytical processes. This approach extends beyond mere content exposure, involving students in practical activities or experiments (Sari & Sutihat, 2022). STEAM imparts critical thinking skills to students, along with additional competencies such as problem-solving, collaboration, creativity, communication, and innovation. It enables students to perceive problems or design processes from various real-world perspectives (Bertrand & Namukasa, 2020). The strategies of the STEAM approach can be amalgamated with other learning models to enhance their complexity and attractiveness to learners.

Inquiry learning is a pedagogical approach that actively involves students in the learning process. Students engage in investigative projects in a logical, critical, systematic, and analytical manner until they can confidently articulate their findings, a strategy employed in inquiry-based learning (Farhana et al., 2022). Research by Asiah (2021) indicates that inquiry learning positively impacts students' critical thinking. Despite its advantages, inquiry learning presents challenges for educators due to the difficulty in controlling students' success. Therefore, innovative solutions, such as the use of technology-based or tangible learning media, are required to facilitate this type of learning.

Liveworksheet is a learning platform that has demonstrated its efficacy in enhancing learning through the use of e-modules, as evidenced by research conducted by Sudarman et al. (2022). Liveworksheet offers a variety of features, including short-answer questions, multiple-choice questions, matching questions, and true/false questions (Prabowo, 2021). Selain itu dalam situs dapat mengaplikasikan penggunaan video, Figure, audio, dan jenis soal evaluasi yang bervariasi (Hariyati & Putri Rachmadyanti, 2022). The use of the Liveworksheet site can be integrated into learning strategies and models that align with the teacher's capabilities. This study aims to develop teaching modules using the STEAM approach and the inquiry learning model, combined with the use of technology in the form of Liveworksheet. The focus will be on developing teaching modules on multiplication for third-grade elementary school students.

Gap Study & Objective

Teaching modules are traditionally constructed around a singular approach. However, as time progresses, there has been a shift towards developing and implementing teaching modules that integrate various learning models, such as STEAM with the PBL model, which has demonstrated effectiveness in mathematics education (Asyari & Zakir, 2023). Research conducted by Sari & Sutihat (2022) on the creation of a STEAM-based E-Module using software like Canva and Flipbook Html5 has indicated improvements in critical thinking skills. Sudarman et al., (2022) discovered that the application of a Liveworksheet-based e-module can enhance learning outcomes. Previous studies have demonstrated that the development of Inquiry learning teaching materials through the Seesaw

platform is effective in enhancing high school students' thinking skills, particularly in the context of online learning (Fatma & Sulisworo, 2022).

Building on the existing research, this study aims to develop an innovative and creative teaching module, specifically a STEAM (Science, Technology, Engineering, Art, and Mathematics) Inquiry learning teaching module. The developed module integrates STEAM elements with the syntax of Inquiry learning, focusing on multiplication materials to enhance the learning outcomes of third-grade elementary school students. The objectives of this developmental research are (1) to assess the validity of the STEAM-based Inquiry learning teaching module assisted by Liveworksheet in teaching multiplication to third-grade elementary school students in mathematics, and (2) to evaluate the practicality of the STEAM-based Inquiry learning teaching module assisted by Liveworksheet in teaching multiplication to third-grade elementary school students in mathematics.

METHOD

Type and Design

This study utilises the Research and Development (R&D) method, specifically the ADDIE model, with a focus on the creation and testing of new products. In an educational setting, the goal of research and development is to produce products that can be applied in learning. The ADDIE model encompasses five stages: Analysis, Design, Development, Implementation, and Evaluation Hidayat & Nizar (2021).

The analysis phase is designed to gather and collate information pertinent to the research objectives (Udayani et al., 2021) . As outlined by Hidayat & Nizar (2021) the initial step of the analysis involves scrutinising the lesson plan to ascertain the anticipated goals. During this phase, the researcher undertakes an analysis by collecting data through observations and interviews. This process encompasses all third-grade students and the class teacher at Tulip Putih Elementary School, providing insights into student characteristics and the pedagogical approaches typically utilised in teaching multiplication in mathematics. The data gathered are subsequently evaluated to ensure their alignment with the research objectives.

In the design phase, the researcher engaged in the meticulous planning of the envisioned product. This stage provides an initial portrayal of the product. The researcher's activities in assembling and planning involve: (1) researching journals related to STEAM-Inquiry learning modules for reference, along with exploring journals and videos elucidating the creation of live worksheets, (2) obtaining supplementary media materials such as images, videos, background sounds, and animations from online sources, and (3) searching for tutorials on crafting visually appealing designs using the Canva application.

The development phase is the stage at which the STEAM-Inquiry learning module, based on live worksheets, is constructed, drawing from the design established in the preceding phase. Following its creation, the teaching module is subjected to a validation process conducted by designated experts, which is then followed by a revision phase. The experts entrusted with the validation of the teaching module typically include a media specialist, often a lecturer, and a subject matter expert, commonly a third-grade class teacher. Upon completion of the validation and revision processes, the product advances to the subsequent phase - the product testing stage.

Data and Data Sources

This research and development study utilises both qualitative and quantitative data. The qualitative data, encompassing comments, suggestions, revisions, and observations from the testing

process, undergoes a descriptive qualitative analysis. The quantitative data, derived from validation forms filled by media and subject matter experts, practicality sheets from teachers, and student attitude surveys towards learning, is subjected to descriptive statistical analysis. The data for the research and development of the instructional module is sourced from experts.

A. Media experts
   The media experts involved in this study are two university lecturers from the Elementary School Teacher Education program, referred to as Mr. MA and Ms. N. These two lecturers, who serve as media experts in this research, possess expertise in the creation of technology-based learning media and have educational backgrounds relevant to the material being taught. They offer corrections and suggestions on the instructional module being developed, particularly regarding the learning media utilized, such as liveworksheets and educational videos.
B. Subject Matter Expert
   In the process of assessing the suitability of the material, two educators, namely Mrs. NM and Mrs. SS, who are experienced third-grade teachers, undertake the evaluation of the content of the developed instructional module. These two teachers, who are subject matter experts, have demonstrated mastery of the module's content, as evidenced by their relevant educational background and current career trajectory, specifically teaching third-grade students. These experts provide insightful feedback and suggestions on the material that has been integrated into the researcher's module.
C. Teachers
   Teachers are responsible for assessing the practicality of the researcher's product. In this study, the participating teachers are two third-grade educators from Tulip Putih Elementary School.
D. Students
   All third-grade students at Tulip Putih Elementary School, totaling 11 pupils, participated in the trial implementation.

Data Collection Technique

The effectiveness of the learning tool is evaluated by assessing its validity and practicality during usage. Data for research and development are collected using various instruments, including validation sheets for media and content, practicality sheets, student response questionnaires, and knowledge tests. A five-point rating scale is used to categorise the product's validity: excellent (5), good (4), adequate (3), less good (2), and not good (1). Upon validation, experts determine whether the developed learning tool is fit for use, requires revisions, or is unfit.

Data collection techniques include distributing evaluation sheets to teachers and students. Student evaluation sheets assess the developed teaching module and the learning process, while teacher assessment sheets collect opinions regarding the learning components. Validation data for the product are collected using validation sheets provided to expert validators in media and content.

Data Analysis

The examination of research and development data employs both qualitative and quantitative methodologies. Qualitative analysis of data, encompassing revisions, recommendations, and observational outcomes, will serve as a foundation for subsequent product refinements. The acquired data, comprising validation assessments from media and subject matter experts, practicality evaluations from teachers, and student attitude surveys towards learning, along with pretests and posttests, will undergo descriptive statistical analysis on a 5-point scale, subsequently transformed into qualitative data.

Originally appraised on a 1 to 5 scale, the data will be transmuted into qualitative information, preserving the same 5-point scale. The criteria for this conversion, as per Widoyoko's Table 1. (Rusnilawati, 2016). will be pivotal in evaluating the validity and practicality of the developed product.

Table 1 presents the Likert scale criteria for transforming quantitative data into qualitative data in the validity analysis of the learning tools.

Table 1. Criteria for Converting Quantitative Data to Qualitative Data

Value	Score Interval	Category
A	$X > \bar{X}_i + 1{,}8\ sb_i$	excellent
B	$\bar{X}_i + 0{,}6\ sb_i < X \leq \bar{X}_i + 1{,}8\ sb_i$	good
C	$\bar{X}_i - 0{,}6\ sb_i < X \leq \bar{X}_i + 0{,}6\ sb_i$	satisfactory
D	$\bar{X}_i - 1{,}8\ sb_i < X \leq \bar{X}_i - 0{,}6\ sb_i$	poor
E	$X \leq \bar{X}_i - 1{,}8\ sb_i$	very poor

Notes:

$\bar{X}_i$ = ideal mean score
= $\frac{1}{2}$ (maximum score + minimum score)

sb_i = ideal standard deviation
= $\frac{1}{6}$ (maximum score - minimum score)

X = actual score

Table 2 presents the Likert scale assessment for the analysis of the validity of instructional devices.

Table 2. Criteria for the Validity Assessment of Instructional Devices

Score Interval	Category
$X > 83{,}94$	excellent
$67{,}98 < X \leq 83{,}94$	good
$52{,}02 < X \leq 67{,}98$	satisfactory
$36{,}06 < X \leq 52{,}02$	poor
$X \leq 36{,}06$	very poor

Notes: X = actual score

The teacher's assessment will be analyzed both quantitatively and qualitatively. Quantitative data consists of answer scores, with 5 responses: excellent, good, satisfactory, poor, and very poor. The quantitative score results will be converted into qualitative data based on Table 1. The Likert scale assessment table, which shows the practicality criteria of teacher assessments, is presented in Table 3.

Table 3. Practicality Criteria for Teacher Assessment

Score Interval	Category
$X > 42$	excellent
$34 < X \leq 42$	good
$26 < X \leq 34$	satisfactory
$26 < X \leq 26$	poor
$X \leq 18$	very poor

Notes: X = actual score

The outcomes of the student survey on attitudes towards learning manifest as quantitative data, delineated through response scores categorised into five groups: excellent, good, satisfactory, poor, and very poor. The Likert scale assessment table, which indicates the criteria for evaluating student attitudes towards learning, is presented in Table 4.

Table 4. Criteria for Assessing Student Attitudes Towards Learning

Score Interval	Category
X > 25,2	excellent
20,4< X ≤ 25,2	good
15,6< X ≤ 20,4	satisfactory
10,8< X ≤ 15,6	poor
X ≤ 10,8	very poor

The validity of the developed instructional material is substantiated when it reaches a minimum validity level categorized as at least 'good.' Practicality is affirmed through the evaluation by teachers and student response surveys, which should attain a minimum rating of 'good.' Additionally, there should be an improvement in the average class scores in both pretest and posttest results.

RESULTS

The instructional module developed by the researcher is a STEAM-Inquiry learning module assisted by liveworksheet designed for the multiplication topic in the third-grade curriculum of elementary school. This module, meticulously crafted by the researcher, serves as a comprehensive teaching aid for educators and a self-directed learning resource for students. Embracing the STEAM approach, the module encompasses diverse subject areas, including mathematics, natural sciences, and art. The trial materials incorporated in the module span multiplication, the life processes of living organisms, and visual arts. The instructional module is structured into two sessions, each comprising 6 teaching hours. The design of the STEAM-Inquiry learning module assisted by liveworksheet has undergone rigorous validation by 2 media experts and 2 subject matter experts. The research findings are presented through the data derived from expert validations and trial results. The developed teaching module's appearance is shown in Figures 1 through 6. Figure 1 displays the initial view of the developed teaching module.

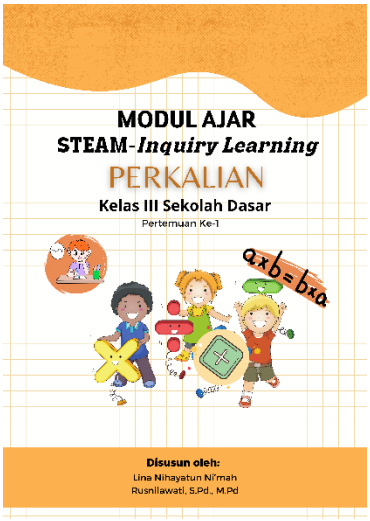

Figure 1. Display of the Initial Teaching Module Menu

Figure 2 shows the material and projects within the teaching module, which encompass science, technology, engineering, art, and mathematics. The material and project assignments can be scanned to reveal learning videos.

Figure 2. Display of the Content and Projects in the Teaching Module

Figure 3 displays the view of one of the multiplication materials presented in the teaching module. Meanwhile, the view of one of the materials on the growth and development of living creatures can be seen in Figure 4.

Figure 3. Display of One of the Multiplication Topics in the Teaching Module

Figure 4. Display of One of the Topics on the Growth and Development of Living Organisms in the Teaching Module

Figure 5 shows the content of the teaching module regarding the view of one of the art materials being taught.

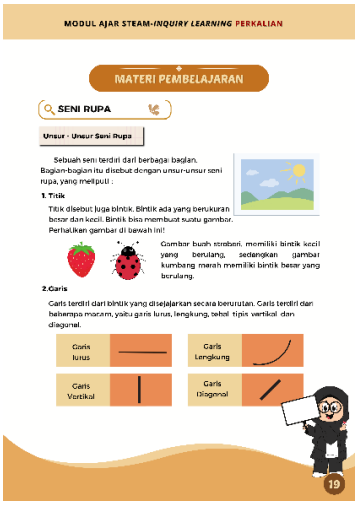

Figure 5. Display of One of the Visual Arts Topics in the Teaching Module

The developed teaching module is equipped with technology in the form of a Liveworksheet. The contents of the Liveworksheet include a cover, learning videos that can be played directly, instructions for students, and there are 15 multiple-choice questions consisting of three materials, namely multiplication, growth and development of living creatures, and art, which can be seen in Figure 6.

Figure 6. Display of the Student Worksheet on the Liveworksheet

Analysis of Validation Results

Through an examination of the validation outcomes by both media and subject matter experts, the viability of the instructional module crafted by the researcher becomes apparent. This viability is anchored in the data, encompassing total scores and their averages derived from the overall scores.

Table 5. Actual Scores from Validation Results

Validation Expert	Product	Total Score	Average Score	Category
Media Expert	Teaching Module	183	91,5	Excellent
Subject Matter Expert	Teaching Module	211	105,5	Excellent

Table 5 illustrates that the average total score of the developed instructional module falls within the category of at least good. This suggests that the instructional module developed is valid and suitable for testing after incorporating revisions and feedback from each validator.

Analysis of Trial Results

The analysis of trial results encompasses practicality data, entailing an examination of the assessment/evaluation data from the class teacher and students regarding the suitability of employing the STEAM-Inquiry learning teaching module assisted by liveworksheet. Figure 7 illustrates the classroom situation during the implementation of the STEAM-Inquiry Learning module assisted by a Liveworksheet.

Figure 7. Classroom Learning Process

Analysis of Student Practicality Assessment Data

Data collection was undertaken by students involved in the trial, who gathered information following the conclusion of the learning process. Table 6 presents the results of the student response questionnaire from the trial.

Table 6. Categories of Student Response Survey Results in the Trial

Respondent	Product	Total Score	Average Score	Category
Students	Teaching Module	504	45,8	Excellent

The outcomes of the student response survey regarding the STEAM-Inquiry learning teaching module, supported by liveworksheet, and the learning process are categorized as at least good. The developed product adheres to practicality standards and is perceived by students to yield excellent results.

Analysis of Teacher Practicality Assessment Data

The collection of data involved soliciting assessments from class teachers who oversaw the implementation of the learning. Teachers submitted their evaluations upon the completion of the learning process. The results of the practicality assessment of the learning implementation by the teachers are presented in Table 7.

Table 7. Assessment of the Practicality of Learning Implementation

Respondent	Product	Total Score	Average Score	Category
Teachers	Teaching Module	137	68,5	Excellent

The assessment by teachers of the STEAM-Inquiry learning teaching module assisted by liveworksheet and the learning process suggests a minimum good rating. The findings indicate that the developed product, presented in the form of a teaching module, meets practical criteria and is perceived by teachers to produce excellent results.

Analysis of Learning Outcome Test

The analysis of the learning outcome test is crucial to ascertain whether the STEAM-Inquiry learning teaching module, with the assistance of liveworksheet, meets the criteria for practicality. The knowledge test comprises multiple-choice questions covering multiplication topics. The test sheet was administered twice to students. The graph depicting the average scores for students' knowledge test performance is presented in Figure 8, while the graph showing the percentage of student test completion can be seen in Figure 9.

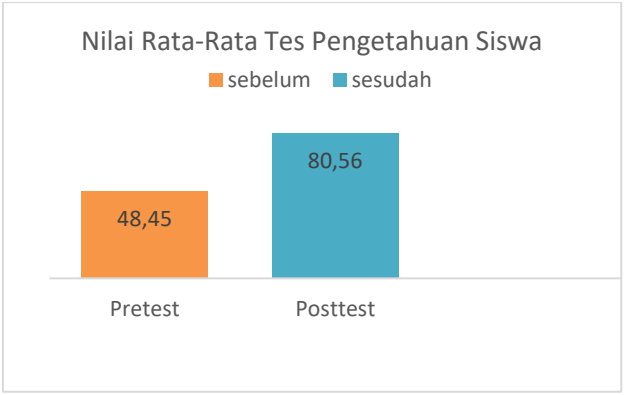

Figure 8. Graph illustrating the average scores of students' knowledge test

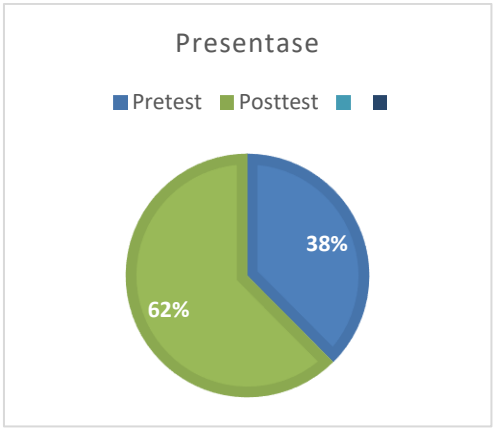

Figure 9. Graph of the Percentage of Students' Knowledge Test Mastery

Based on the average scores graph and the percentage of students mastering the knowledge test, the pretest score was 48.45, representing 38%, before the implementation of the STEAM-Inquiry learning teaching module assisted by liveworksheet. Following the module's implementation, there was an improvement in understanding, reflected in an average score of 80.56, equivalent to a percentage of 62%. The average score indicates an enhancement reaching a value of 60.

DISCUSSIONS

The product under development is a STEAM Inquiry learning teaching module, augmented by a liveworksheet, tailored for third-grade elementary school pupils. This teaching module is instrumental in aiding educators in lesson planning (Maulinda, 2022). The research and development activities adhered to the ADDIE model's procedural framework. The process encountered several hurdles, particularly during the instructional module design phase, which necessitated an extended duration. This was attributed to the need for the developed teaching module to be engaging, with the instructional sequence aligning with the components of STEAM, incorporating technology. During the implementation phase, an unforeseen circumstance arose when a student fell ill on the final day of the posttest administration, resulting in a rescheduled posttest the subsequent day.

The STEAM-Inquiry learning teaching module, supplemented by a liveworksheet, was well-received by the students. As per Negara et al., (2019) the appeal of a module can be evaluated based on its content, alignment with students' competencies, conveyance of information through visuals and text, and relevance to contemporary trends. The learning implementation incorporated an inquiry learning syntax amalgamated with STEAM at each stage, thereby fostering a heightened enthusiasm for learning among students. The deployment of STEAM strategies offers students experiences in science, technology, engineering, arts, and mathematics concurrently. Furthermore, this approach can inspire students to construct knowledge about the real world through observation, questioning, and investigation (Munawar et al., 2019). As suggested by Mejias et al., (2021) STEAM holds the potential to introduce novel methods of performing and comprehending both arts and STEM fields. The critical thinking skills cultivated through STEAM projects encompass fluency, flexibility, and originality, derived from the process of discussion, project execution, and analysis of project outcomes (Felitasari & Rusmini, 2022). The application of STEAM learning strategies in conjunction with inquiry learning will equip students with critical and logical thinking skills. Prior research by Farhana et al., (2022) on inquiry learning strategies thoroughly engages students' abilities in logical, systematic, analytical, and critical investigation.

Pembelajaran dengan modul ajar STEAM inquiry learning yang dikembangkan, siswa lebih The adoption of STEAM inquiry learning modules has been demonstrated to enhance student participation by offering more practical experiences. Thuneberg et al., (2018) found that students are more likely to enjoy and retain lessons when they engage in direct practice, thereby increasing the efficiency of this learning method. The introduction of 'Liveworksheet' in education has elicited enthusiasm among students, as this is not typically found in conventional school environments. Moreover, the incorporation of technology in teaching significantly aids educators. Information and Communication Technology (ICT) has been validated to effectively facilitate the execution of inquiry-based learning (Williams et al., 2017). Research conducted by Felitasari & Rusmini (2022), revealed that the application of electronic worksheets, particularly Liveworksheet, augments students' abilities in the scientific process. The utilisation of Liveworksheet during instructional periods simplifies tasks for both learners and educators. Teachers are relieved from manually grading students' work as scores are automatically computed (Retno, 2022). In addition, teachers can diversify question formats and incorporate images, videos, and audio, thus preventing students from becoming easily disinterested (Hariyati & Putri Rachmadyanti, 2022). This is consistent with a study by Ha Le & Prabjandee (2023) asserting that Liveworksheet can aid teachers in saving time on task design and assessment.

Additionally, the utilization of Liveworksheet is environmentally friendly, as it reduces paper consumption.

CONCLUSION

The integration of the STEAM (Science, Technology, Engineering, Art, and Mathematics) pedagogical approach with inquiry-based learning, facilitated by Liveworksheet, has the potential to significantly improve learning outcomes at the primary school level. This innovative combination, although relatively unexplored in existing literature, promises to deliver a more effective learning experience. The fusion of STEAM with inquiry-based learning can aid students in developing analytical skills, promoting critical and systematic thinking, and fostering confidence as they engage directly in projects encompassing science, technology, engineering, art, and mathematics. This method transcends the mere delivery of content to students. Moreover, the inclusion of technology through Liveworksheet can pique students' interest and augment their comprehension of the role of technology in learning. Nevertheless, this study is not without its limitations, such as the disparate levels of technological proficiency among students. The successful implementation of the STEAM-inquiry learning teaching module, supported by Liveworksheet, is contingent upon internet access and the availability of learning devices. Moreover, the use of this teaching module requires a considerable amount of time and meticulousness in teaching, which could pose challenges for older classroom teachers. Future research could focus on the development of similar instructional modules for other subjects. Suggestions for subsequent research include the development and identification of differences in the use of teaching modules with different models and strategies. This could serve as a reference for the most effective teaching materials in enhancing student learning outcomes. The integration of technology into the STEAM inquiry learning module enables teachers to design more interactive learning experiences, potentially improving comprehension of the material and positively impacting overall learning enhancement. The deployment of this instructional module stimulates students to be more engaged and active in class, nurturing critical, creative, confident, and analytical thinking skills.

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