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Developing E-Interactive Report Text Module Based on STEM Integrated Problem Based Learning at Senior High School

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ABSTRACT

This research aimed to produce the final product of an e-interactive module based on problem-based learning integrated with STEM report text materials, to analyze the feasibility of the design and materials in the e-interactive module, to assess the practicality of the e-interactive module based on teacher and student evaluations, and to evaluate the effectiveness of the e-interactive modules in improving creative thinking skills, critical thinking, cognitive learning outcomes, and writing abilities. This research followed a research and development approach, referencing stages in the ADDIE development model (Analysis, Design, Development, Implementation, and Evaluation). The research findings yielded the final product in the form of an e-interactive module, which was considered highly feasible in terms of design with a feasibility value of 96.30% and material with a feasibility value of 93.57%. The trial of the e-interactive module received positive responses from teachers and students, with the module being considered highly practical for learning report text materials with a practicality value of 90.38% according to teachers and a practicality value of 86.9% according to students. The effectiveness test of the e-interactive modules demonstrated their efficacy in improving students' creative thinking skills, critical thinking skills, and writing abilities in learning report text materials.

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1. INTRODUCTION

The existence of the 21st century, marked by the era of the Industrial Revolution 4.0, required current STEM education to prepare students who possess 21st-century skills in order to face increasingly complex challenges in both the present and the future. Within the realm of 21st-century skills, there are four fundamental skills (known as the 4Cs) that learners should possess, namely: (1) critical thinking and problem-solving, (2) creativity, (3) communication skills, and (4) collaborative abilities (Sholika,2021)

Teaching material is one of the factors that affect students' critical and creative thinking skills in writing (Andheka, 2016). To empower critical and creative thinking skills in writing, the content of teaching materials should provide five learning experiences, as mandated in Permendikbud No. 65 of 2013 on the standards of Primary and Secondary Education Process. These experiences are as follows: (1) observing; (2) asking; (3) collecting information; (4) associating; and (5) communicating. These five learning experiences were aimed at developing students' skills in science, which were related to critical thinking and creative thinking skills.

The use of teaching materials in learning report texts should be supported by a suitable approach. One of the approaches related to this activity is STEM (Science, Technology, Engineering,

and Mathematics), which integrates the disciplines of science, technology, engineering, and mathematics. This approach provided students with a holistic understanding of science through the learning experiences of the 21st century. The teaching-learning process using STEM is contextual learning, where students were asked to understand the phenomena that occur around them.

STEM education required an effective learning model that fosters students' critical and creative thinking skills in writing report texts. Problem-Based Learning (PBL) was a suitable model for this purpose. PBL was chosen based on the assertion made by Savery (2006) that it accommodated all aspects of students' creative thinking skills, including fluency, flexibility, originality, and elaboration. The metacognitive activities designed within the PBL model were believed to yield better improvements in students' creative thinking skills compared to traditional learning models. Moreover, there was a correlation between creative thinking and problem-solving skills.

Similar problems also occur at SMAN 1 Bungo, especially in the learning of report text material, where no teaching materials have been developed or compiled by the teachers. Meanwhile, the learning activities for report text material have only used the English textbook for the 2013 Curriculum. The results of textbook review pointed out that in terms of presenting the material, the report text material only directed students to identify elements or components in the example report texts presented and complete words and sentences in the paragraphs from several examples of report texts contained in the questions. There were no questions or instructions that directed students to write a report text based on their observational activities. Hence, the report text material presented in the textbook was not able to develop critical thinking skills and creative thinking because there was no writing activity designed for report texts in the textbook. The absence of writing activities in the report text material was also in line with the results of previous research, as found by Meliawasti and Hamied (2020), where the material in the English textbook entitled "English for Class X SMA/MA/MK/MAK" did not contain exercises that involved writing paragraphs.

Viewed from the aspect of presentation techniques, the textbook used in the learning of report text material at SMAN 1 Bungo was not in accordance with the systematic standards for presenting material in the 2013 curriculum textbook. The presentation of material in the book only included a few pictures as material illustrations, and there was no variation in color. Additionally, there was no explanation of prerequisite material that should be mastered after studying the material. Regarding the organization of the material, the results of the pre-analysis showed that the presentation of report text material in the textbook "X" did not demonstrate conceptual coherence. The presentation of material in the textbook tended to jump around or correspond to the students' thinking abilities. The National Education Standard Agency (BSNP) (2013) explained that when presenting material in textbooks, it should meet to four criteria. Firstly, the approach should focus on the students. Secondly, it should foster student initiative, creativity, and critical thinking. Thirdly, it should cultivate student independence in learning. Lastly, it should enhance students' ability to self-reflect and self-evaluate.

Another reason underlying the urgency of developing e-interactive modules for report text material was the potential problems identified from the results of the needs analysis (Appendix 4), including: (1) students still had difficulty understanding the characteristics, structure, social function, and use of language features in report texts; (2) students had difficulty selecting appropriate topics for their report texts; (3) students needed exercises to enhance their report writing skills; (4) students lacked vocabulary; (5) students required teaching materials that could be used for self-study to master report text material and practice their report writing abilities; and (6) students needed practical teaching materials with visually appealing elements to prevent boredom while reading activity.

The development of an e-interactive module in report text material certainly required certain conditions for learning activities using the e-interactive module to run effectively. The required conditions were as follows: (1) students having a good level of technology adoption, and (2) readiness of supporting facilities and infrastructure for electronic learning at school. Furthermore, in terms of the readiness of supporting facilities and infrastructure for electronic learning in

school, SMAN 1 Bungo already had adequate technology such as LCD projectors, speakers, and computers. The school also has Wi-Fi facilities that were useful as an internet connection. By fulfilling the two required conditions for the use of the e-interactive module, as well as referring to evidence from the results of previous research, the advantages of the e-interactive module, and the potential problems that have been described, the urgency of the need for the e-interactive module in learning report text material was strengthened. Therefore, it was necessary to develop an E-Interactive Module of report text based on STEM integrated problem-based learning to improve students' creative thinking skills and critical thinking skills as well as students' learning outcomes in writing report texts both in terms of knowledge competence and skill competence.

2. REVIEW OF LITERATURE

STEM (Science, Technology, Engineering, and Mathematics)

The integration of the STEM approach in learning report text material could be implemented in the following learning forms: (1) General learning, where the STEM approach was integrated into the content of the report text material. For example, when students were given an example of a report text based on observation about a flood, all STEM elements (science, technology, engineering, and mathematics) in the report text example were presented. Another example could be material on the application of the STEM approach in writing report text. (2) Embedded learning, where the STEM approach was integrated into the teaching and learning process activities. In this case, the STEM approach was combined with a learning model, meaning that STEM content or elements should be incorporated into the steps of the chosen learning model by the teacher. Sharma (2018) stated that the STEM approach could be combined with the PJBL (Project-Based Learning) or PBL (Problem-Based Learning) learning models. Thus, all STEM elements should be integrated into the steps of these learning models. (3) Mixed learning, where the STEM approach was integrated into the learning material as well as the teaching and learning process activities. This meant that the learning material in this form contained not only all STEM elements but also aligned with the steps of the applied learning model.

Problem-Based Learning (PBL)

During the application, Problem-Based Learning was initiated by the teacher presenting an authentic problem to the students. Thus, they did not only have one answer, but also multiple possible answers or solutions. This approach aimed to stimulate students to investigate and analyze potential solutions collaboratively. To successfully solve a problem, students were required to utilize their thinking, analytical, and problem identification skills. The stages involved in presenting the problem to students were as follows: (1) Problem definition; (2) Problem analysis; (3) Formulation of hypotheses; (4) Identification of learning issues (Ani, 2015).

Electronic Interactive Module

To produce a good module, the preparation had to comply with the established criteria by the Indonesian Ministry of National Education Regulation No. 2 (2008), as follows:

a) Self-instructional: It should be able to teach students independently. Through this module, individuals or participants learn to teach themselves without depending on other parties.
b) Self-contained: All learning materials from one competency unit or sub-competencies being studied had to be contained in one complete module. The purpose of this concept was to provide opportunities for students to study complete learning material since the material was packaged into a unified whole. If it was necessary to divide or separate material from one unit of competence, it should be done carefully.
c) Stand-alone: The module developed did not depend on other media or have to be used together with other learning media. By using the module, learners did not depend on and should not use other media to study or complete assignments on the module. It means

that if students were still using and depending on other media besides the module used, then the media was not categorized as stand-alone.

d) Adaptive: The module should have a high adaptive power to the development of science and technology. It was considered adaptive if the module could adapt to the development of science and technology and was flexible to use. Additionally, by considering the acceleration of the development of science and technology, the development of the digital literacy module should remain "up to date." An adaptive module was one in which the content of the learning material could be used for a certain period of time.

e) User-friendly: The module should be user-friendly. Every instruction and display of information should be helpful and friendly to the user, including the ease of the user in responding, accessing desired information. The use of simple language, easy-to-understand instructions, and commonly used terms was one form of user-friendly presentation. Likewise, the appearance of images and the format of the presentation should be adjusted to the preferences of the students.

Creative Thinking Skill

Gilhooly (2015) outlined four stages in the creative process that had to be navigated to achieve a creative outcome. The first stage was preparation, which involved gathering relevant information and data necessary to understand and address the problem at hand. The second stage was incubation, where the problem-solving process began in the unconscious mind. The duration of this stage could vary and occurred in an uncertain timeframe. The third stage was illumination, in which inspiration or ideas emerged, providing new insights and potential solutions. The final stage was verification, also known as evaluation, where the new idea or creation was tested against reality. This stage required critical and convergent thinking to assess the feasibility and effectiveness of the proposed solution. In summary, creative thinking was a dynamic cognitive process that encompassed engaging in various mental activities, exploring diverse perspectives, and generating innovative ideas. It necessitated perseverance, personal discipline, and an open mindset. Through the stages of preparation, incubation, illumination, and verification, individuals could cultivate and harness their creative thinking skills to effectively solve problems and create valuable solutions

Critical Thinking Skills

Critical thinking is a purposeful and clear process used in mental activities such as problem-solving, decision-making, persuading, analyzing assumptions, and conducting scientific research (Johnson, 2009: 183). Mok (2009) stated that the core of critical thinking is a more detailed description of several related characteristics, including analysis, inference, explanation, evaluation, self-regulation, and interpretation. Critical thinking is important in education because it encompasses the entire process of obtaining, comparing, and analyzing information.

3. METHODS

The researchers applied the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) due to its simplicity and comprehensibility. This model followed a systematic structure, requiring sequential and non-random research activities. The ADDIE model was chosen for several reasons: (1) It is a procedural and descriptive model that provides clear steps for product development, (2) The development stages in this model align with standard development stages, (3) The ADDIE model has been widely used and proven to yield positive outcomes. Additionally, the ADDIE model incorporates an evaluation stage that is interconnected with the other four stages (Analysis, Design, Development, and Implementation), prioritizing product evaluation based on compatibility throughout the entire development process. In contrast, the 4D model lacks an evaluation stage. The research on the development of the E-Interactive module for report text started with a needs analysis through field surveys to determine the fundamental

requirements for e-Interactive report text modules based on STEM integrated problem-based learning.

The description of the steps involved in this needs analysis was as follows:

Step 1: Analysis (A)

At this stage, several activities were carried out, with the details as follows:

1. Analysis of English textbooks used
2. Analysis of the curriculum implemented in the school
3. Analysis of the learning condition
4. Analysis of student characteristics
5. Analysis of educational technology

Step 2: Design (D)

The second stage involved the development of the design for the E-interactive report text module based on STEM integrated problem-based learning materials. This stage consisted of the following steps:

1. Schedule
2. Development Team:
3. Product Specification:

Step 3: Development (D)

During this stage, the prototype of the E-interactive report text module based on STEM integrated problem-based learning was validated to gather data regarding its feasibility in terms of design and material, as adapted from Kemp (2007). Meanwhile, the criteria for evaluating the material aspect in this validation included: (1) material feasibility, assessing the conformity of the material with the scope of competence, accuracy of the material, linkage of learning material, presentation of learning, novelty of the material, ability to encourage students' curiosity, and ability to develop students' soft skills; and (2) language feasibility, considering indicators such as conformity with student development, language simplicity, understanding of messages or information, adherence to language rules, use of terms and symbols, and coherence. The suggestions, inputs, and assessments provided by experts served as evaluation materials to determine whether the module needed revision. This revision aimed to enhance the module's appeal and feasibility for field testing.

Step 4: Implementation (I)

During this stage, the E-interactive report text module based on STEM integrated problem-based learning was implemented in actual learning situations. The implementation took place at SMAN 1 Bungo, involving tenth-grade students as participants. The researcher provided students with opportunities to utilize the module in their independent learning activities, following the instructions provided during the module trial. At the end of the lesson, both students and teachers were asked to rate the module's effectiveness through a questionnaire.

Step 5: Evaluation (E)

This stage was an integral part of the ADDIE development model and was closely related to the previous four stages. Its purpose was to assess whether the STEM-Based E-interactive module integrated problem-based learning (PBL) for report text material aligned with each stage/procedure of the ADDIE model. The evaluation process included the following aspects: (1) evaluating the alignment of the E-interactive module with the outcomes of the needs analysis, specifically the learning competencies and student characteristics; (2) evaluating the alignment of the E-interactive module with the development design of the E-interactive module; (3) assessing the feedback and improvement suggestions provided by design experts, material experts, and linguists during the development stage; (4) evaluating the response and improvement suggestions from teachers and students regarding the E-interactive module during the implementation stage;

and (5) assessing the effectiveness of the E-interactive module in enhancing critical and creative thinking skills based on testing results.

4. RESULTS AND DISCUSSION

Results of E-Interactive Module Needs Analysis

The details of the results from the needs analysis that had been carried out were as follows: According to BSNP, the feasibility of textbooks was assessed based on aspects such as content, language, presentation, and graphics. In this study, the analysis of English textbooks focused on three aspects: content, presentation, and graphics. An analysis of the curriculum was conducted to identify the Core Competencies (KI) and Basic Competencies (KD) specified in the content standards of the 2013 curriculum. Based on the findings of the curriculum analysis presented, it was determined that the E-Interactive Module based on STEM Integrated Problem-Based Learning for the report text material should have included comprehensive learning materials and activities aimed at achieving all the basic competencies and indicators of competency achievement outlined. The integration of the STEM approach into the report text material was reflected in the indicators "analyzed the STEM (Science, Technology, Engineering, and Mathematics) elements present in the report text example" and "applied the STEM (Science, Technology, Engineering, and Mathematics) approach in writing report text."

Based on the observations of the learning process of report text material, potential problems were identified in terms of student attention. These included: (1) most students showed less focus when the teacher delivered the material, with some students not paying attention to the front of the class and engaging in distractions such as chatting with classmates, daydreaming, and using smartphones, (2) students displayed reduced focus when determining the topics for their report texts, often feeling confused about what to write, and (3) students lacked understanding of the characteristics, structure, social function, and use of language features in writing report texts, indicating a need for further instruction and support in these areas.

In the technology analysis, the readiness of the school to support the implementation of the E-Interactive Module was assessed. This included evaluating the availability of an internet access network within the school premises. Based on observations at SMA Negeri 1 Bungo, the selected trial location for the E-Interactive Module had adequate technological resources. The school had nine LCD projectors, five sets of speakers, twenty personal computers (PCs), ten laptops, and WiFi facilities for internet connectivity. Additionally, it was observed that 75% of the students owned laptops and demonstrated proficiency in operating computers. They also had smartphones, enabling them to stay connected to the internet. With these resources available, it was determined that the E-Interactive Module resulting from the research and development process could be effectively implemented in both face-to-face and distance learning settings for report text materials at SMAN 1 Bungo.

Results of E-Interactive Module Design stage

The E-Interactive Module prototype, which was developed during the design stage, included three parts: introduction, content, and closing. Each component of the module was described in detail:

1. Introduction

   The introduction section of the E-Interactive Module consisted of several components, namely the cover, preface, table of contents, instructions for using the e-module, and concept maps. Here is a breakdown of each component:

   a. Cover

      The E-Interactive Module had a two-page cover, featuring an outer cover and an inner cover. The design of the outer cover utilized a dominant light blue color with dark blue text to ensure legibility. It displayed the title of the e-interactive module, the names of the researchers, and the name of their educational institution.

b. Preface

The preface provided a brief overview of the E-Interactive Module, explaining its purpose, significance, and target audience. It aimed to give readers an understanding of the module's content and its relevance to their educational needs.

c. Table of Contents

The table of contents outlined the structure and organization of the E-Interactive Module. It listed the chapters, sections, and subsections, along with their corresponding page numbers.

d. Concept Maps

Concept maps visually represented the interconnections and relationships between key concepts and topics within the E-Interactive Module. They helped students visualize the module's structure and understand the underlying conceptual framework.

e. Core competencies, basic competencies, indicators and learning objectives

Pages of core competencies, basic competencies, indicators and learning objectives were created to show the core competencies, basic competencies, indicators and learning objectives used in this E-Interactive Module based on the 2013 curriculum which was specifically specified for report text material.

2. Content

The content section of the E-Interactive Module included sheets describing the material and sheets for student activities. The two components were explained in detail as follows:

a. Material Description

The material presented in the E-Interactive Module was designed in a straightforward, concise, and clear manner, adapted to the specified indicators. The material was systematically presented on each sheet, starting from the most basic to more complex topics. The language used in the material aimed to facilitate quick understanding of the report text content by students. Each material sheet was supplemented with several examples of report texts, accompanied by sources or references. In this section, the material was presented in the form of important points, making it easy for students to remember and understand, eliminating any difficulties in comprehending the material or when attempting to write a report text. Moreover, the material description sheet included relevant pictures to enhance students' interest in reading the material. The presentation of report text material in this E-Interactive Module also incorporated STEM elements, particularly in module 2, providing students with an understanding of how to apply STEM in writing report texts.

b. Student Activity Sheet

The activity sheet was structured based on the stages of the problem-based learning model, including problem orientation, organizing students for learning, guiding individual investigations, developing and presenting problem-solving results, and analyzing and evaluating problem-solving processes. The purpose of implementing these problem-solving steps was to provide students with exercises to write report texts based on their problem-solving activities. The problems presented on the activity sheet were related to environmental pollution issues occurring in the students' environment, helping them easily determine the topic or idea for their report text.

3. Closing

The closing section of the E-Interactive Module included a summary of the report text material, formative evaluation sheets, and summative evaluation sheets.

a. Summary

The summary, which was placed before the summative evaluation sheet, encompassed all the material descriptions from the first module to the third module.

b. Formative Evaluation Sheet

The formative evaluation sheets designed for the E-Interactive Module were intended to assess the students' mastery level of report text material in modules 1, 2, and 3. These sheets consisted of an objective test with ten questions, each offering five alternative answer choices.

c. Summative Evaluation Sheet

The E-Interactive Module included a summative evaluation sheet to assess students' overall mastery of the report text material. The sheet consisted of an objective test with twenty questions, each providing five alternative answer choices. These questions were designed to align with the competency indicators for report text material covered in modules 1, 2, and 3. The summative evaluation sheet also offered feedback to help students understand their performance, similar to the formative evaluation sheet.

Results of the E-Interactive Module Development Stage

The design validation results for the E-Interactive Module prototype indicated a highly favorable overall design. The assessment score obtained was 96.30%, falling within the range of 81 to 100, which confirmed that the design was considered "very feasible." Based on the validation results, it could be concluded that the interactive prototype of the E-Interactive Module, which was based on STEM Integrated Problem-Based Learning for report text material, successfully fulfilled all the functions of the E-Interactive Module design in the KEMP learning design model.

The validation results of the e-interactive module prototype interactive indicated that the overall material of the e-interactive module prototype was highly satisfactory. The assessment score of 93.57% with the range of 81≤score≤100, with the criteria of "very feasible". It validates that the material in the e-interactive module prototype interactive met all the indicators of material eligibility and language proficiency, as well as the standards for presenting material and language in learning modules required by the National Education Standards Agency. The fulfillment of these indicators demonstrated that the prototype e-Interactive Module had a self-contained character, ensuring coherent and comprehensive coverage of all competency aspects, adapted to student development.

The Results of the E-Interactive Module Implementation Stage

The implementation stage trials were conducted after the prototype E-Interactive Module had been validated, revised, and deemed suitable for empirical testing.

Practicality assessment was carried out by two English subject teachers for class X SMA Negeri 1 Bungo. Based on the results of the teacher's assessment regarding E-Interactive Module used during the learning process, it was found that overall E-Interactive Module were stated to be "very practical", both in terms of the suitability or relevance of e-modules, ease of use of e-modules, and benefits of using e-modules. This could be seen from the average percentage of obtaining an assessment score of 90.38%, where this score was in the percentage range of 81%.≤score≤100% with the criteria of "very practical". Based on the assessment of the two teachers, it was explained that the E-Interactive Module developed had fulfilled practicality for use in learning activities on report text material. Based on the assessment of the three practical aspects of the E-interactive module, it was known that the aspect of the usefulness of using the e-interactive module has the highest average score, namely 3.75. It meant that the highest level of practicality felt by teachers when using E-Interactive Module was from the aspect of the benefits of using e-modules. Based on the results of students' responses to the use of E-interactive modules,

it was found that as a whole the e-interactive modules based STEM integrated problem based learning of report text material was very practical to use in individual scale learning, both in terms of the ease of use of e-modules, the attractiveness of using e-modules, and the benefits of using e-modules. It could be seen from the average percentage of obtaining an assessment score, which was 87.22%, where the average percentage was in the range 81%≤score≤100% with the criteria of "very practical". Based on the percentage score obtained, it explained that the E-Interactive Module that has been developed fulfills practicality to be used as a guide for independent learning at the individual learning level.

The level of practicality of the e-interactive module obtained at this trial stage was evidenced by the average percentage of obtaining an assessment score, which was 88%, where the average percentage was in the range 81%≤score≤100% with the criteria of "very practical". Based on the percentage score obtained, it explained that the E-Interactive Module that has been developed fulfills practicality to be used as teaching material at the group learning level. Based on the assessment of the three practical aspects of E-interactive modules, it was known that the attractiveness aspect of using e-modules gets the highest average score, namely 3.55. Based on the data from the large group trials, it showed that overall E-Interactive Module were very practical to use at the large group (class) learning level, both in terms of the ease of use of e-modules, the attractiveness of using e-modules, and the benefits of using e-modules. This could be seen from the average percentage of obtaining an assessment score, which was 85.48%, where the average percentage was in the range 81%≤score≤100% with the criteria of "very practical". Based on the percentage score obtained, it explained that the E-Interactive Module developed has fulfilled practicality for use as teaching material at the classroom learning level. Based on the assessment of the three practical aspects of the E-interactive module, it was known that the attractiveness aspect of using the e-interactive module has the highest average percentage score, namely 87.12.

The Result of Evaluation Stage

The evaluation at this stage also assessed the effectiveness of using e-interactive modules in enhancing creative thinking skills, critical thinking skills, learning outcomes of cognitive competence, and student writing skills in learning report text material.

The results of measuring the distribution of critical thinking skill levels based on pretest and posttest results showed that before using the e-interactive module, the pretest results showed that the majority of students had a low level of creative thinking skills, with a frequency distribution of 78.60%. Then after students used the e-interactive module in learning report text material, the posttest results showed that the majority of students had a high level of creative thinking skills, with a frequency distribution of 71.40%. From the results of this measurement, it proved that the use of e-interactive modules in learning report text material could improve students' creative thinking skills.

The results of assessing the distribution of critical thinking skill levels based on the pretest and posttest outcomes showed that before using the e-interactive module, the majority of students had a low level of critical thinking skills, accounting for 78.60% of the frequency distribution. However, after students used the e-interactive module in learning report text material, the posttest results revealed that the majority of students had a very high level of critical thinking skills, representing 64.30% of the frequency distribution. These measurements confirm that the integration of e-interactive modules in learning report text material effectively enhances students' critical thinking skills.

The results of measuring the distribution of writing skill levels based on pretest and posttest results showed that before using the interactive e-module, the pretest results showed that the majority of students had a low level of writing skills, with a frequency distribution of 57.10%. Then, after students used the e- interactive module in learning report text material, the post test results showed that the majority of students had a high level of writing skills, with a frequency distribution of 64.30%. From the results of this measurement, it proved that the use of interactive e-modules in learning report text material can improve report text writing skills.

Based on the results of obtaining pretest and posttest scores of student cognitive learning outcomes on the report text material, it showed an increase in students' cognitive learning

outcomes scores from before (pretest) to after the use of interactive e-modules (posttest), with an average gain value of 9,41. The data also showed the calculation of average n-gain of 0.65, which means the level of effectiveness of interactive e-modules in improving students' cognitive learning outcomes in the report text material, namely in the "medium" category. The results of measuring the distribution of knowledge competency levels based on pretest and posttest results showed that before using the interactive e-module, the pretest results showed that the majority of students had a low level of knowledge competence, with a frequency distribution of 78.60%. Then after students used interactive e-modules in learning report text material, the posttest results show that the majority of students have a high level of knowledge competence, with a frequency distribution of 50%. From the results of this measurement, it proved that the use of interactive e-modules in learning report text material could increase the competence of students' knowledge about report text.

5. CONCLUSION

Conclusion of the Development of Interactive E-Report text module based on STEM Integrated Problem-Based Learning

The development of the e-interactive module based on STEM integrated problem-based learning on report text material was carried out in several stages, namely Analysis, Design, Development, Implementation, and Evaluation. In the Analysis stage, the researcher conducted a needs analysis to explore potential problems underlying the urgency of developing the interactive e-module. The needs analysis included a review of English textbooks, curriculum analysis, analysis of the learning conditions for report text material, analysis of student characteristics, content analysis, and educational technology analysis. In the design stage, the researcher prepared the necessary components, formulated the formative evaluation design, and developed testing strategies.

In the development stage, the e-interactive module, which had been validated by design expert and material expert, was further developed until it was stated suitable for testing in the next stage. During the implementation stage, practicality assessment was carried out by English language teachers. After the e-interactive module was stated highly practical for use in teaching activities, it was tested in three phases: individual testing, small group testing, and large group testing. During these tests, pre-tests and post-tests were conducted to assess the improvement in students' creative thinking skills, critical thinking skills, cognitive learning outcomes, and writing skills in relation to report text material. The results of these tests showed positive feedback from students, indicating that the interactive e-module was perceived as highly practical for use in individual, small group, and large group learning settings. The Evaluation stage aimed to improve the interactive e-module at each stage, referred to as formative evaluation. This process resulted in an e-module that was stated suitable for use in teaching report text material. The overall evaluation focused on perceptions, knowledge, and skills, also known as summative evaluation. The e-module was assessed through formative and summative evaluations to determine its effectiveness. The e-interactive module was considered effective if it achieved the learning objectives, namely the improvement of students' creative thinking skills, critical thinking skills, cognitive learning outcomes, and writing skills in relation to report text material.

Feasibility of Interactive E-Report text module based on STEM Integrated Problem-Based Learning Based on Design Validity and Content Validity

The feasibility of Interactive E-Report text module based on STEM Integrated Problem-Based Learning, based on design validity, indicated that the overall design of the interactive e-module was highly feasible, with a score rating percentage from the instructional design expert reaching 96.30%. The level of feasibility and the ratings given by the design expert confirmed that the problem-based learning integrated STEM interactive e-module. The feasibility of Interactive E-Report text module based on STEM Integrated Problem-Based Learning, based on content validity, indicated that the overall content of the interactive e-module was highly feasible, with a score rating percentage from the material expert reaching 93.57%. The level of feasibility and the ratings

given by the material expert confirmed that the content of the interactive e-module met all the indicators of content feasibility and language feasibility, as required by the National Education Standards. With the fulfillment of all these indicators of content feasibility and language feasibility, it could be stated that the prototype of the interactive e-module met the characteristics of self-contained materials, meaning that the content in the e-module was presented in a logical and comprehensive manner, covering all aspects of competency and tailored to the students' developmental level.

Practicality of Interactive E-Report text module based on STEM Integrated Problem-Based Learning Based on Teacher and Student Responses

The practicality assessment of interactive e-report text module based on STEM Integrated Problem-Based Learning conducted by the English language teacher of 10th grade at a high school resulted in an overall declaration of "highly practical." This was based on the aspects of suitability or relevance of the e-module, ease of use of the e-module, and usefulness of the e-module, with a score rating percentage of 90.38%. The level of practicality and the ratings provided by the teacher indicated that the developed interactive e-module met the requirements for practical use in teaching report text material. Interactive e-report text module based on STEM Integrated Problem-Based Learning, which was stated practical based on the teacher's assessment, was then tested with Tenth grade students at the high school to determine the practicality of its use in individual, small group, and large group learning settings. Based on the results of individual testing with three students, it was found that the problem-based learning integrated STEM interactive e-module was highly practical for use as a guide in individual learning, considering the aspects of ease of use, attractiveness, and usefulness of the e-module, with a score rating percentage of 87.22%.

After establishing the high practicality of the interactive e-module based on individual testing, the next stage involved small group testing with five students. Based on the results of small group testing, it was found that the problem-based learning integrated STEM interactive e-module was highly practical for use in small group learning, considering the aspects of ease of use, attractiveness, and usefulness of the e-module, with a score rating percentage of 88%. Once the level of practicality of the e-module was determined from the small group testing, it proceeded to large group testing. Based on the results of large group testing, it was found that of Interactive E-Report text module based on STEM Integrated Problem-Based Learning was highly practical for use in large group, considering the aspects of ease of use, attractiveness, and usefulness of the e-module, with a score rating percentage of 85.48%.

The Effectiveness of Interactive E-Report text module based on STEM Integrated Problem-Based Learning in Enhancing Students' Creative Thinking and Critical Thinking Skills

The effectiveness of Interactive E-Report text module based on STEM Integrated Problem-Based Learning in enhancing students' creative thinking and critical thinking skills was evaluated by examining the improvement in these skills before and after the use of the interactive e-module. Referring to the N-Gain test results, there was an increase in students' scores for creative thinking and critical thinking abilities from before (pretest) to after the use of the interactive e-module (posttest), with average N-Gain values of 0.52 and 0.66, respectively. This indicated a moderate level of effectiveness of the interactive e-module in enhancing students' creative thinking and critical thinking skills in the report text material. The highest improvement in creative thinking skills was observed in the aspects of original thinking skills and evaluation skills. Meanwhile, the highest improvement in critical thinking skills was observed in the aspect of constructing skills, particularly in organizing data obtained from observations, systematically and communicatively expressing observation data, organizing the result of data analysis, analyzing observation data, initiating discussions based on the result of data analysis, interpreting the result of observation, copying information from relevant literature or references, and posing critical questions regarding the problem-solving solutions presented by other students.

The result of the paired sample t-test showed a significant difference in creative thinking abilities between before the use of the interactive e-module (pretest) and after the use of the

interactive e-module (posttest). The significant difference, along with the improvement in creative thinking scores (gain), demonstrated that the of Interactive E-Report text module based on STEM Integrated Problem-Based Learning was effective in enhancing students' creative thinking abilities in writing report texts. The result of The Wilcoxon Signed Rank Test showed a significant difference in critical thinking abilities between before the use of the interactive e-module (pretest) and after the use of the interactive e-module (posttest). The significant difference, along with the improvement in critical thinking scores (gain), proved that Interactive E-Report text module based on STEM Integrated Problem-Based Learning was effective in enhancing students' critical thinking skills in writing report texts.

The Effectiveness of Interactive E-Report text module based on STEM Integrated Problem-Based Learning in Enhancing Report Writing Skills and Cognitive Learning Outcomes

The effectiveness of Interactive E-Report text module based on STEM Integrated Problem-Based Learning in enhancing students' report writing skills and cognitive learning outcomes was evaluated by examining the improvement in students' writing skills before and after the use of the interactive e-module. Referring to the N-Gain test results, there was an increase in students' scores for writing skills and cognitive learning outcomes from before (pretest) to after the use of the interactive e-module (posttest), with average N-Gain values of 0.57 and 0.65, respectively. This indicated a moderate level of effectiveness of the interactive e-module in enhancing students' writing skills in the report text material. The highest improvement in students' writing skills was observed in the content aspect, particularly in their ability to develop descriptions of the reported objects and write report texts according to the text structure, social function, and encompassing all STEM elements within the text. Meanwhile, the highest improvement in cognitive learning outcomes was observed in the domains of understanding and evaluation.

The result of The Wilcoxon Signed Rank Test showed a significant difference in report writing skills between before the use of the interactive e-module (pretest) and after the use of the interactive e-module (posttest). The significant difference, along with the improvement in report writing skill scores (gain), demonstrated that the problem-based learning integrated STEM interactive e-module on report text material was effective in enhancing students' report writing skills. Then, the result of The Wilcoxon Signed Rank Test also indicated a significant difference in students' cognitive learning outcomes between before the use of the interactive e-module (pretest) and after the use of the interactive e-module (posttest). The significant difference, along with the improvement in cognitive learning outcome scores (gain), proved that the problem-based learning integrated STEM interactive e-module on report text material was effective in enhancing students' cognitive learning outcomes in the report text material.

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