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Integrating Collaboration and Communication Skills: Development of Discovery Learning-Based Science Module

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Abstract

This research is a development study with the final outcome being a discovery learning-based science module as an alternative to integrate collaboration and communication learning skills. The development of the integrated science module aims to create innovative teaching materials that can be applied as an alternative for learning and support independent or student-centered learning. The integrated science module is developed based on discovery learning. The goal of discovery learning is to provide students with practice in various skills, particularly collaboration and communication skills. The development research method used is the ADDIE design development method. This method was chosen because it is a fundamental development method that is easy to apply. The stages of the ADDIE design development process include Analyze, Design, Development, Implementation, and Evaluation. The product feasibility test involved 30 students from MTs Miftahul Ma'arif Pelambik, with assessments conducted by media and content experts. The media feasibility test resulted in a score of 92.7%, categorized as very feasible. The content feasibility test resulted in a score of 96.4%, also categorized as very feasible. The student response score to the development of the integrated science module ranged from 3.7 to 3.9 out of a maximum score of 4. The results of this study imply that the module is valid and feasible for use in teaching, particularly as an alternative for collaboration and communication learning skills.

INTRODUCTION

Learning activities are not merely a process of transferring knowledge from the teacher to the students, but in this process, the teacher has a responsibility to provide guidance and assist students in mastering the material thoroughly, ensuring that it is well-understood and accepted by the students[1], [2], [3]. The teaching and learning activities carried out in the classroom are closely related to communication skills, involving interactions between the teacher and students, as well as among students themselves. The strategy to establish effective communication during the teaching process becomes an important point to ensure the learning process is effective. Meanwhile, collaboration skills are equally crucial in fostering cooperative interactions among students, both individually and in diverse groups, as they work together to find solutions to a problem with the same ultimate goal [4], [5], [6], [7], [8].

The issues observed in several schools at the junior high school/MTs level in the Praya Barat Daya, Central Lombok, reveal that teachers primarily use textbooks as the main learning resource for students. Another issue is the lack of modules and their development, which could serve as supplementary teaching materials. This is further supported by interviews with integrated science teachers in several schools in the Praya Barat Daya subdistrict, including at MTs Miftahul Ma'arif, where it was revealed that the school only uses textbooks and there has been no research on the development of modules based on discovery learning.

At the junior high school/MTs level, the issue of students' lack of communication and collaboration skills has become an increasingly urgent concern. This is in line with the results of observations and interviews with teachers at MTs Miftahul Ma'arif Pelambik. Many students still struggle to express their opinions or interact effectively with their peers, both orally and in writing. This was evident during classroom observation, where there was a lack of active participation in class discussions or group presentations, with most students preferring not to speak or only listen. These skills are crucial in building self-confidence and critical thinking abilities.

In addition, during project-based learning activities or group tasks, students often work individually and fail to fully optimize teamwork. They tend to complete their assigned portions of the task without communicating or sharing ideas with their group members. This situation highlights that students' collaboration skills are still quite limited. Collaboration skills are essential in various aspects of life and are increasingly needed in many fields.

To address the issue of insufficient communication and collaboration skills at the junior high school/MTs level, particularly at MTs Miftahul Ma'arif, the use of learning media in the form of modules can be an effective solution[9]. A well-designed module as a learning medium can provide clear guidance for students to develop these skills. Modules that focus on collaborative activities, such as group tasks or discussions, can encourage students to interact more and collaborate effectively[10], [11]. In the module, students can be given instructions that require them to communicate and collaborate, such as through joint projects that involve discussions, negotiations, and team-based problem-solving.

This interactive and activity-based learning module can also include simulations or communication exercises, such as public speaking practice, presentations, or debates, which can enhance students' confidence in expressing their opinions clearly and in a structured manner.[12]-[14]. In addition, a module designed with collaborative elements, such as group tasks that challenge students to share ideas and listen to the perspectives of their peers, will encourage students to understand the importance of teamwork in achieving common goals[7], [10], [11].

By integrating communication and collaboration into the learning module, it is expected that junior high school students can gradually develop these skills. Module-based learning that facilitates interaction will support the development of students' soft skills, in addition to academic knowledge, to prepare them for a world that increasingly prioritizes teamwork and effective communication. Discovery learning-based modules can optimize students' intelligence and skills, enhancing their ability to think critically and solve problems collaboratively[13], [15], [16] by combining communication and collaboration skills[17]-[19] and tailoring them to the characteristics and needs of the students. The availability of learning media facilitates students in engaging with the learning process, thereby ensuring that the learning objectives are achieved. [20], [21].

Based on the described issues, the researcher will develop an Integrated Science module based on multiple skills (collaboration and communication skills) integrated with discovery learning. This module will be systematically organized as a comprehensive teaching material, with planned learning experiences designed according to students' needs, aimed at helping them achieve specific learning objectives. It is expected that students will be able to independently understand and discover concepts related to the problems they face, initiate new knowledge through simple experiments, and uncover the fundamental principles from their experimental results, with the module serving as a learning reference[22]. This module will not only enhance students' ability to communicate their findings but also encourage them to collaborate in reaching a consensus on their understanding of the concepts discovered. Therefore, by integrating discovery learning exploration into the design of the Integrated

Science module, it is hoped that it will stimulate the development of students' multiple skills in science learning..

EXPERIMENTAL METHOD

This type of research is development research. The research and development model used in this study adapts the ADDIE model with a qualitative approach for product testing. This development model was chosen considering that it is simpler, with steps that are not overly lengthy or complex, yet still orderly and systematic. This development model consists of five stages analyze, design, develop, implement, and evaluate[23]. A qualitative approach was chosen with the aim of descriptively assessing the feasibility of the module. The goal of this research is to develop an alternative learning media in education, resulting in a product in the form of an Integrated Science Module Based on Multiple Skills.

This module is developed based on the results of a needs analysis in the form of a survey questionnaire . The validity test was given to a team of experts using a validation sheet instrument addressed to 4 validator experts, namely 2 media expert validators and 2 material expert validators. Meanwhile, for interviews, interview sheets were used by interviewing teachers at MTs Miftahul Ma'arif, and product trials using questionnaires were given to teachers and students to find out students' and teachers' responses to the practicality of the science module. The next step in data collection occurs during the implementation phase. The module is implemented or tested in the learning process with students at MTs Miftahul Ma'arif. In this implementation phase, data in the form of qualitative descriptions will be obtained. Qualitative descriptive data will be gathered using questionnaire scores, as well as suggestions, critiques, or feedback provided in the response sheets. The research sample for testing science module products was 30 MTs Miftahul Ma'arif students. MTs Miftahul Ma'arif students were chosen because in their daily learning in class they only use textbooks, and they are not yet familiar with other learning media, such as modules. especially science modules based on discovery learning that is integrated with collaboration and communication skills.

Qualitative data on the product feasibility, collected using a questionnaire instrument, will be analyzed using the product feasibility equation with the following criteria[24].

$$P = \frac{The\ total\ score\ obtained}{The\ maximum\ total\ score} \times 100\% \quad (1)$$

The percentage of the obtained score is used to determine the feasibility of the product. Once the percentage score is calculated, it is interpreted based on the Likert scale used in the questionnaire. Below is the interpretation based on the product feasibility criteria.

Table 1. Product Feasibility Criteria

Interval	Feasibility Criteria
0%-20%	Not Suitable
21%-40%	Not Feasible
41%-60%	Less Feasible
61%-80%	Feasible
81%-100%	Very Feasible

(Adapted from Sanjaya., et. al, 2021)

RESULT AND DISCUSSION

The development of the Integrated Science module for junior high school students (MTs) in this study uses the research and development method with the ADDIE model. The stages are as follows.

Analyze

In this phase, before developing the module, the researcher analyzes the needs required by the students to support the learning process. The needs analysis conducted by the researcher involves data triangulation from interviews, observations, and questionnaire responses. This approach is used

to ensure that the analysis provides comprehensive insights that will effectively support the optimal development of the module.

Based on the triangulated data, it can be concluded that the developed module should be interactive, easy to understand, and support communication and collaboration skills. From this conclusion, the researcher decided to create a module based on multiple skills. Multiple skills were chosen as the foundation for the module development because this approach incorporates more than one skill, namely communication and collaboration skills. It is believed that this will help students enhance their communication and collaboration skills, which are valuable for their future lives in society.

In this phase, the researcher also developed a research instrument in the form of a module feasibility questionnaire. The questionnaire assesses the feasibility of the learning media as well as the relevance of the content. This research instrument was also validated, with each instrument and criterion being reviewed by two expert validators in their respective fields.

Design

After the Analyze phase, the researcher created a design framework that includes the layout of the module and the content to be included. The content consists of material in the form of text, images, or graphics, organized using a Brain Simultan approach. In addition to the material, the researcher also developed tasks, which are designed to Task Of the Day (ToD) so that communication and collaboration skills can be developed during the classroom learning process. Evaluation questions are also included in the module to allow students to independently enhance their multiple skills (collaboration and communication)

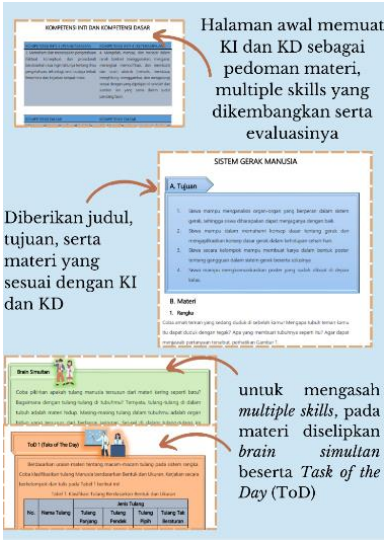

Figure 1. Integrated Science Module Design (Layout of Core Competencies, Basic Competencies, and Content)

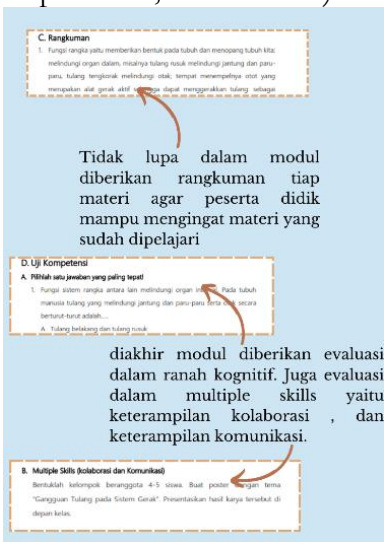

Figure 2. Integrated Science Module Design (Layout of Summary and Evaluation)

Development

The purpose of the Develop stage is to create the Integrated Science module product that has been designed and validated. After the development stage, the Integrated Science module product for Grade VIII junior high school students is obtained. This product is then tested through a small group trial and later implemented on a larger scale.

The product produced in this research and development is the Integrated Science module. Below is the appearance of the module, as shown in Figure 3.

(a) **(b)**

Figure 3. The appearance of the Integrated Science module is as follows (a) Cover view (b) Content view of the module

The content included in the Integrated Science module consists of the following topics: Human motion system; Motion of objects; Motion of animals; Motion of plants.

Table 2. The results of the validation by content experts and media experts.

No	Indicator	Validator scores	Maximum Score
Content	Content Relevance Clarity of Material Appearance	3.8	4
Media	Usability Language Use	3.7	4

Implement

The implementation stage or field trial is the phase conducted to assess the effectiveness of the Integrated Science Module that has been developed. This stage is crucial to further test the module and ensure its applicability. The implementation of the module is carried out by conducting lessons using the Integrated Science Module. During the implementation, students are provided with printed copies of the module, and instructions on how to use it are given. This is done to ensure that students can properly utilize the module, which in turn aims to enhance their multiple skills, particularly in collaboration and communication.

Table. 3 Results of the Large Group Trial

No	Indicator	Score	Maximum Score
Media	Module Appearance Module Usage	3.8	4

Contents	Clear Title Clear Language Relevance of Images Instructions for Multiple Skills	3.9	4
Advantages	Support for Multiple Skills Student Independence	3.7	4

Evaluate

The evaluation stage is conducted at every phase of the module development process, starting from the analyze, design, development, implementation, and evaluate stages. The purpose of the evaluation is to ensure that any issues encountered during each development phase can be addressed promptly. In the analyze phase, after collecting the data on students' needs, it is evaluated through data triangulation. This is done to ensure the validity of the student needs data. Based on the results of the analyze phase, it was concluded that the developed module must be interactive and easy to understand. Therefore, a multiple skills-based module was developed. In the design stage, the evaluation involves determining the framework and layout of the module, focusing on its appearance. The layout is designed to be as engaging as possible, including the arrangement of images, daily tasks, summaries, and practice questions. This approach ensures that the module does not appear monotonous. In the development phase, the evaluation involves revising the module based on feedback and suggestions from experts. The content of the module includes material, images, daily tasks, summaries, and practice questions designed to foster multiple skills. After these revisions, the module is further developed and tested.

The evaluate stage during the implementation phase involves applying the Integrated Science Module in lessons to shift the focus toward student-centered learning[22]. Several activities are carried out during this stage, including a socialization session where the use of the Integrated Science Module based on multiple skills is explained to students. Additionally, a demonstration of how to use the module in the classroom is conducted, ensuring that students are able to use the module correctly.

Based on the data presented on the development of the module, it can be concluded that the purpose of developing this module is to enhance the learning process and foster multiple skills (collaboration and communication). By developing this module, the learning process can also shift from teacher-centered to student-centered[22], promoting active participation and critical thinking among students[11], [12]. The Integrated Science Module was developed into a printed module based on multiple skills to support 21st-century skills.[10], [11], [13], [25], [26] which is capable of providing a fresh atmosphere in the Integrated Science learning process at MTs/SMP.

Survey of Student Responses and Discussion

After the development of the Integrated Science Module was completed, the researcher conducted a survey to assess the effectiveness and student responses to the module used. The survey aimed to gather insights into students' opinions regarding the development and use of the module, covering various aspects such as appearance, media usage, learning context, challenges faced, and benefits gained. The results of the survey indicated a positive response to the use of the module in learning. The average score ranged from 3.7 to 3.9 out of a maximum score of 4, suggesting that, overall, the response to the development of the Integrated Science Module was very good. The module was seen as an innovative and engaging tool, providing valuable additional learning resources for students. The varied presentation of the material successfully motivated students to be more enthusiastic about learning, as the development of this module was based on multiple skills, specifically communication and collaboration skills.

Multiple skills refer to the presentation of material in various forms that support the development of a range of skills, including 21st-century skills that are essential for every student, such as communication and collaboration skills[4], [7], [10], [17]-[19]. This diverse presentation of material is designed to link scientific concepts with real-life situations, allowing students to more easily understand and apply the knowledge they acquire in practical contexts[12], [18], [19], [27].

In addition to enhancing knowledge of natural sciences, the use of the Integrated Science Module also has a positive impact on the development of students' communication and collaboration skills[4], [12], [18], [28], [29]. Through various activities such as group projects, class discussions, collaborative problem-solving, and scientific presentations, students are given opportunities to practice their ability to clearly articulate ideas, listen actively, and work together to achieve common goals[5], [6], [10], [16], [30], [31]. This approach to learning is not only beneficial in the context of science education but also helps prepare students for future social and professional challenges.

CONCLUSION

This research successfully developed a science module based on discovery learning, integrated with collaboration and communication skills, supporting self-directed and student-centered learning, and relevant to 21st-century skills. Based on feasibility tests by media and content experts, as well as positive student feedback, the module was deemed suitable for use as teaching material. The main contribution of this research is the creation of content that not only focuses on knowledge acquisition but also on developing skills essential for the workforce. However, the study has limitations, such as the small sample size (30 students) and being conducted in only one school, making the results not easily generalizable. The module also requires further evaluation in terms of long-term implementation. For future research, it is recommended to involve a larger and more diverse sample and apply the module in various schools with different conditions. Educational practitioners are advised to implement this module in their teaching to enhance students' communication and collaboration skills, while also integrating technology to create a more engaging and relevant learning experience aligned with current developments.

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