



Analysis of the Suitability of Learning Modules with the Implementation of Biology Learning on Ecosystem Material in Grade X of State Senior High Schools in Medan City in the 2024/2025 Academic Year

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Abstract

This study aims to determine the suitability between planning (teaching modules) and the implementation of Biology learning on ecosystem material in Grade X SMAN in Medan. The research population consisted of Biology teachers and students in Grade X from public high schools in Medan that are accredited A and have implemented the Independent Curriculum. The sample consisted of seven Biology teachers and 252 students, selected purposively from SMAN 1, SMAN 5, and SMAN 12 Medan. Lesson planning data were collected through document analysis of teaching modules, while learning implementation data were collected using classroom observation techniques and questionnaires given to students. These data were confirmed and corroborated through teacher interviews. The results showed that the ability of Biology teachers teaching Grade X in public high schools in Medan to develop teaching modules was classified as very good, with an average value of 89.10 ± 4.93 , while their ability to implement learning based on teaching modules was classified as good, with an average value of 85.49 ± 5.92 . The implementation of learning in the classroom was influenced by what was planned in the modules, although some aspects, such as the communication of learning objectives, application of learning models, reflection, evaluation, and assessment, have not been optimal. Both the planning and implementation of learning are governed by the Process Standards outlined in Ministry of Education Regulation No. 16 of 2022.

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INTRODUCTION

Quality education is a benchmark for improving the quality of human resources by prioritizing achievements to advance the nation, educate, and develop human potential. The government continues to strive to improve the quality of education, particularly through curriculum development, namely the independent curriculum. The National Education Standards (NES) serve as a reference to ensure the quality of education in Indonesia (Sukamta & Magfiroh, 2024). The scope of the NES consists of 8 (eight) standards, one of which is the process standard that must be developed (Barlian *et al.*, 2022)

Process standards are the minimum criteria that must be met in the implementation of learning activities to achieve the specified competencies, including planning, implementation, assessment, and supervision to ensure effective and efficient learning processes. Learning planning in Ministry of Education and Culture Regulation No. 16 of 2022 on Process Standards is structured in the form of a flexible, clear, and simple document that must at least include learning objectives, learning steps or activities, and learning assessment or evaluation. However, in reality, not all teachers can carry out planning and learning according to the requirements of the Curriculum Merdeka (Rahmah *et al.*, 2024). Darmawan *et al.* (2024) found that 45% of Biology teachers faced challenges in developing learning modules, including difficulties in mapping students' needs, selecting Pancasila profiles, formulating objectives, organizing materials, choosing learning models, conducting assessments, evaluating, following up, and analyzing learning outcomes. Additionally, Biology teachers do not yet understand the elements that must be included in teaching modules, do not understand the guidelines for developing teaching modules, are unable to write general information, organize core components, and are not competent in developing appendices for teaching modules under the Curriculum Merdeka (Wilda *et al.*, 2024). If the learning module is not well planned, the learning material will not be conveyed systematically to students, which will ultimately cause an imbalance in learning activities between teachers and students (Indarti, 2023). This is evident in learning that is only active on the teacher's side or vice versa and even appears uninteresting because teachers have not prepared teaching modules properly.

The Curriculum Merdeka teaching module is currently considered a very important tool to improve the quality of the learning process in order to improve student learning outcomes (Islamati *et al.*, 2024). Based on current phenomena, teacher competence in using teaching modules is still relatively low. There are still many discrepancies between the teaching modules designed and their implementation in the classroom. Jamhari *et al.* (2023) found that teachers still have difficulties understanding and implementing important components in teaching modules, such as learning objectives, materials, activities, assessments, and feedback. This phenomenon occurs because the teaching module used is not to the teacher's ability and the elements of the teaching module, as well as the teaching technique. The mismatch between the content of the module and its implementation in the classroom has an impact on learning that is unsystematic, not interesting, and not in accordance with the principle of independent learning version of the Ministry of Education and Culture which prioritize fun and meaningful learning (Oliviranti *et al.*, 2024).

Quality education is education that meets or exceeds NES standards. If the NES, especially the Process Standards, are not implemented optimally, the impact can lead to a significant decline in the quality of education. This impact can be seen in the form of low learning outcomes, low graduation rates, low school competitiveness compared to other schools, and decreased public image and trust in schools (Sasongko, 2019). Therefore, the learning process must be able to prioritize effective and efficient learning by the mandate in the process standards according to Ministry of Education Regulation No. 16 of 2022. Without the implementation of good process standards, the goal of national education to produce quality human resources who are ready to face global challenges will be difficult to achieve (Robi'ah & Prihantini, 2024)

Interviews with biology teachers at SMA Negeri 1 Medan, SMA Negeri 5 Medan, and SMA Negeri 12 Medan regarding biology learning revealed that teachers always prepare learning tools, such as modules, in accordance with the requirements of the Curriculum Merdeka. However, at the implementation level, they face various obstacles, particularly in adapting learning modules to the concept of differentiated

learning. The Curriculum Merdeka requires teachers to be creative in applying teaching methods and models that suit students' needs. Additionally, teachers also face difficulties in effectively allocating learning time and addressing differences in students' readiness to learn. The use of learning media included in the learning modules is also hindered by the limited infrastructure available at schools, which does not support the use of interactive learning media. All of this results in learning that does not fully align with the standards required by the Curriculum Merdeka. Baadilla *et al.* (2023) revealed that some teachers were confused about implementing learning modules in the classroom, especially in selecting and applying learning methods and models that were in line with curriculum requirements. This led teachers to often ignore important elements or components of learning modules during classroom learning.

Therefore, it is very important to analyse the suitability of the learning plans in the modules developed by biology teachers and their implementation in the classroom, as well as to identify the obstacles faced by teachers in implementing their learning plans. This study is expected to provide a clearer picture of the accuracy and suitability between the plans (in the modules) and the implementation of learning (in the classroom) based on process standards. This information is invaluable in improving teachers' ability to plan and implement learning, which ultimately leads to improved learning quality.

RESEARCH METHOD

This study used a quantitative descriptive approach. The research was conducted from January to March 2025 at SMA Negeri 1 Medan, SMA Negeri 5 Medan, and SMA Negeri 12 Medan. The population in this study consisted of Biology teachers and students in grade X of public high schools in Medan, which are accredited A and have implemented the Curriculum Merdeka. The research sample consisted of 7 Biology teachers and 252 students, that were purposively selected from the three selected research schools. Teachers were selected based on the criteria of having teaching modules based on the Curriculum Merdeka and being willing to participate in the research. The students selected as samples were those taught by these teachers, with the consideration that they could provide an assessment of the learning process.

Data was collected using document analysis, observation, questionnaires, and interviews. Data related to the completeness of components and quality of learning modules was obtained by analysing learning modules created by teachers using an analysis table instrument. Data on the alignment between classroom learning processes and what was planned in the learning modules was collected using an observation sheet instrument. Student opinions on the learning processes implemented by teachers were collected using a questionnaire. This data was then confirmed by interviewing the seven selected biology teachers using a prepared list of questions.

The research procedure includes three stages, namely preparation, implementation, and data processing. In the preparation stage, the researchers made direct observations at SMAN 1, SMAN 5, and SMAN 12 Medan to obtain information related to the number of Biology teachers and grade X students, as well as identify teachers who have used the Curriculum Merdeka teaching module. Based on the results of this observation, the researcher determined the research sample and then compiled the instruments needed for data collection, which were validated by two experts to ensure the suitability of the content and construction of the statements.

The implementation stage includes data collection through document analysis, non-participatory observation, questionnaire distribution, and interviews. Firstly, the researchers collected learning modules from the seven Grade X Biology teachers involved in this study through the Head of the Curriculum Division. Secondly, learning observations were conducted by the researcher directly in the classroom during two to three meetings in accordance with the learning modules of the teachers at each school. Thirdly, questionnaires were filled out by students in the classroom after the learning process was completed. Finally, face-to-face interviews were conducted individually by the researcher asking questions directly to the teachers and recording their answers.

Lesson plan data was obtained through analysis of 7 (seven) teacher teaching module documents using an analysis table instrument. The score scale used in this instrument is 1 (not good enough), 2 (good

enough), 3 (good), and 4 (very good). The scores obtained were then calculated and presented using the formula (Arikunto, 2010):

$$\text{Percentage} = \frac{\text{Total score obtained}}{\text{Total ideal score}} \times 100\%$$

Data on classroom learning implementation is compared with planning data based on learning modules. Implementation data (in percent) reflects the degree of conformity between planning in learning modules and their implementation. The percentage of conformity between learning modules and their implementation is calculated using the following formula (Arikunto, 2010):

$$\text{Percentage} = \frac{\text{Data collection score}}{\text{ideal score}} \times 100\%$$

Table 1. Criteria for evaluating teaching module documents and learning implementation

| Score % | Criteria |
|----------|---------------|
| 86 - 100 | Very Good |
| 71 - 85 | Good |
| 56 - 70 | Enough |
| 41 - 55 | Less |
| 25 - 40 | Not Very Good |

Source: Sudijono, 2014.

Data on learning planning and implementation were analysed descriptively by calculating the average percentage and standard deviation (SD). Linear regression analysis was used to determine the suitability (relationship) between planning in the module and learning implementation. To determine the significance of the relationship between the two variables, Pearson's product-moment correlation test was performed. The relationship between variables is considered significant if the significance value (Sig. 2-tailed) < 0.05.

RESULTS AND DISCUSSION

The results of this study include learning plan data (from the analysis of learning modules), learning implementation data (from observations of the learning process), and the suitability between learning planning and implementation in the classroom on ecosystem material.

Learning Plan (Teaching Module)

The learning planning data, as a result of analysis of seven Biology learning module documents related to ecosystems, is shown in Table 2.

Table 2. Learning Planning Scores Based on Learning Module Documents Developed by Biology Teachers at the Three Selected Public High School Teachers in Medan

| No. | Indicator | Average Score (%) | Categori |
|-----------------------------------|-------------------------------|---------------------|-----------|
| I. General Information | | | |
| 1 | Identity teaching module | 97.22 | Very Good |
| 2 | Initial competence | 100 | Very Good |
| 3 | Pancasila Student Profile | 100 | Very Good |
| 4 | Facilities and infrastructure | 100 | Very Good |
| 5 | Target Students | 63.88 | Enough |
| 6 | Learning Model | 100 | Very Good |
| | Mean ± SD | 93,51 ±14,56 | Very Good |
| II. Main Component Section | | | |
| 7 | Learning Objectives | 100 | Very Good |

| | | | |
|--------------------------------|--|-------------------------------------|------------------|
| 8 | Meaningful understanding | 100 | Very Good |
| 9 | Trigger Questions | 100 | Very Good |
| 10 | Introduction, core, and closing activities | 100 | Very Good |
| 11 | Guided assignments related to the material | 100 | Very Good |
| 12 | Explorations of material understanding in groups | 100 | Very Good |
| 13 | Preparation of group discussion and presentation reports | 100 | Very Good |
| 14 | Assesment | 91.66 | Good |
| 15 | Enrichment and remedial | 87.5 | Very Good |
| 16 | Reflections of students and educators | 94,44 | Very Good |
| | Mean \pm SD | 97.36 \pm 4.55 | Very Good |
| III. Appendices section | | | |
| 17 | Student Worksheets | 87.5 | Very Good |
| 18 | Reading materials for educations and students | 45.83 | Less |
| 19 | Glossary | 25 | Not Very Good |
| 20 | Bibliography | 88.88 | Good |
| | Mean \pm SD | 61.80 \pm 31.63 | Enough |
| | General Mean \pm SD | 89.10 \pm 20.55 | Very Good |

The ability of biology teachers at three public senior high schools in Medan to plan lessons, as outlined in the learning modules, can generally be classified as Very Good, with an average score of 89.10 ± 4.93 . This finding indicates that biology teachers at three public senior high schools in Medan have a good understanding of how to develop learning modules, particularly in terms of fulfilling basic elements such as learning objectives, learning activities, and learning media. This aligns with Wilda *et al.* (20204) opinion that learning modules should at least include learning objectives, learning activity steps (including learning media), assessment (along with assessment instruments and rubrics), supporting information, and references. The interview results revealed that most Biology teachers develop learning modules independently by considering students' prior knowledge and characteristics through cognitive and non-cognitive diagnostic tests. Students' prior knowledge is crucial to ensure the learning process runs optimally, neither too easy nor too difficult (Prastowo and Elvi, 2023)

The teaching module component consists of 3 main components, namely general information, core components, and attachments. Teachers must understand these 3 components to compile the teaching module. In line with the research of Prastowo and Elvi (2023) stated that teachers need to learn the content in learning planning, this is important because it will be consideration in the teaching process, as well as selecting good instructional methods in learning.

The general information component in the teaching module includes the author's identity, initial competence, Pancasila Student Profile, facilities and infrastructure, target students, and the learning model applied. Overall, the completeness of general information in the teaching module obtained an average score of 93.51 ± 14.56 , with a very good category. However, based on the results of the analysis, it was found that the aspect of the target students addressed by the teaching module was explained unclearly with an average score of 63.88, including the sufficient category. Only two of the seven teaching modules contained all three categories of learners, namely regular, learning difficulties, and high achievers (Salsabilla *et al.*, 2023).

The core components that include learning goals, meaningful understanding, lighter questions, learning activities, assessment, enrichment, remedial, and reflection obtain an average score of 97.36 ± 4.55 , classified as very good. Almost all indicators on the core components obtain perfect value, showing highly optimal learning planning and in accordance with the principles of the Curriculum Merdeka.

The attachment components contain components such as learners' worksheets, educator and learner reading materials, glossary and library list. Overall, the completeness of the Appendix in the teaching module earned an average of 61.80 ± 31.63 with enough category. Based on the results of the analysis of the attachment components found that only two teaching modules included reading materials for educators and learners, so it is classified into less categories with a value of 46.42. Meanwhile, none of the modules include a glossary, so this aspect is classified in the very poor category with an average score of 25.

In general, the component whose value is still low compared to other components, namely the attachment component. These results are in line with research conducted by Mulyani & Insani (2023) who found that the ability of teachers to compile teaching module attachments is not as good as the ability to compile other parts such as general information. Only 55% of teachers were considered capable of compiling attachments well, while 42% were quite capable, and 3% were not capable at all. The preparation of attachments is often ignored because it is considered the last job and requires more diligence, so the quality of the attachments is less than optimal.

Based on the results of interviews with teachers, the main obstacle in preparing teaching modules lies in choosing the right learning model and strategy. The diversity of learner characteristics is a challenge in the teaching module design process, considering that each individual has a different level of motivation, learning style, and ability. Teachers are also constrained by the lack of time to prepare teaching modules. In addition, limited school facilities, such as the unavailability of Wi-Fi access in all classes, are also an obstacle in choosing the right learning media. To overcome these obstacles, educators need to understand the suitability and completeness of the teaching module components based on the Curriculum Merdeka standards. This effort can be done through independent literacy, training, seminars, and discussions with peers (Nellitawati *et al.*, 2022). Training and technical assistance by experts are also needed to improve teacher competence (Sanjaya *et al.*, 2022).

In general, the teaching modules prepared by teachers of public high schools in Medan are by the demands of the curriculum, but their implementation requires a strong commitment in order to run optimally.

Learning Implementation

The data from observations of the implementation of learning carried out by biology teachers on the subject of ecosystems at the three public senior high schools where the research was conducted is presented in Table 3.

Table 3. The Learning Implementation Score in the Classroom by Biology Teachers at Three Selected Public High Schools in Medan

| No. | Indicator | Average Value | Interpretation |
|-----------|--|-------------------------------------|------------------|
| I | General Information | | |
| | Initial competencetor | 100 | Very Good |
| | PancasilaStudent Profile | 90.27 | Very Good |
| | Facilities and infrastructure | 87.5 | Good |
| | Target Students | 79.86 | Good |
| | Learning Model used | 71.52 | Good |
| | Mean \pm SD | 85.83 \pm 10.76 | Good |
| II | Main Component Section | | |
| 1. | Introduction Activities | | |
| | Prepare learners psychically and physically | 100 | Very good |
| | Conveying the benefits of learning the material | 72.22 | Good |
| | Ask Lighter questions | 100 | Very Good |
| | Conveying learning objectives | 78.47 | Good |
| | Mean \pm SD | 87.67 \pm 14.46 | Good |
| 2. | Main Component Section | | |
| | Suitability of the material to the teaching module | 93.74 | Very Good |
| | Implementation of educational learning strategies | 89.58 | Very Good |
| | Differentiated learning | 86.80 | Very Good |
| | Classroom atmosphere management | 95.83 | Very Good |
| | Utilization of learning resources/media | 95.51 | Very Good |
| | Student involment | 93.05 | Very Good |
| | Mean \pm SD | 92.41 \pm 3.54 | Very Good |
| 3. | Closing Activities | | |
| | Teacher and student reflection | 65.97 | Enough |
| | Faciliating conclusions | 71.52 | Good |
| | Giving assignments (evaluations) according to learning obbjectives | 65.97 | Enough |

| | | | |
|------|--|-------------------------------------|-------------|
| | Presenting the lesson plan at the next meeting | 88.88 | Very Good |
| | Mean \pm SD | 73.08 \pm 9.39 | Good |
| | Average Core Components | 85.53 \pm 12.29 | Good |
| III. | Appendices section | | |
| | Student Worksheets | 84.02 | Good |
| | Reading materials for educations and students | 68.05 | Enough |
| | Glossary | 52.08 | Less |
| | Bibliography | 95.83 | Very Good |
| | Mean \pm SD | 74.99 \pm 19.05 | Good |
| | General mean \pm SD | 83.76 \pm 13.30 | Good |

The data in Table 3 shows that the implementation of learning by teachers can be categorized as good with an average score of 83.76 ± 13.30 . The general information component in the teaching module has been implemented a good interpretation with a score of 85.83 ± 10.76 , characterized by the implementation of initial competencies, selection of appropriate teaching tools and materials, and adjustment of learning approaches to the needs of students. In addition, the integration of the Pancasila Student Profile in learning obtained an average score of 90.27, reflecting the teacher's success in instilling the values of character and responsibility of students through learning Biology (Karlina & Hindriana, 2023). This success is greatly influenced by the quality of planning and integration of the components of the learning modules designed by teachers based on the indicators of the Curriculum Merdeka (Anggrella *et al.*, 2023). Kollmayer *et al.* (2020) state that the success of teachers in preparing learning modules will determine the success of learning implementation. By creating a good learning plan, teachers will be able to perform well in teaching, which will certainly increase students' motivation and interest in learning, and even overcome the learning difficulties they experience. Rijal & Valen (2024) reported that well-designed learning modules can support teachers in delivering lesson material in a more interesting way and in line with students' needs.

Learning implementation is the implementation of the teaching module that has been designed, which contains learning activities including introductory activities, core activities, and closing activities. In the introductory activities, teachers have carried out activities such as orientation and apperception well with an average score of 87.67 ± 14.46 although the delivery of learning benefits and objectives has not been fully carried out consistently by all teachers. The delivery of learning benefits and objectives plays an important role in providing direction and motivation to students. In line with the opinion of Turhusna *et al.* (2020), teachers should explain the benefits and learning objectives at the beginning so that students understand what they will get after participating in the learning process.

The core learning activity are the most important aspect in the implementation of learning, with excellent mastery of the material by the teacher with an average score of 93.74. The learning strategies used are also educational with an average score of 89.58. Based on the analysis of teaching modules, problem-based learning or case studies have been facilitated in three schools, encouraging contextual learning and encouraging students to think critically and creatively based on the problems presented. This strategy is supported by the utilization of student worksheet, discussions, and presentations, as well as the use of technological media. The dominant learning models designed by teachers include Problem-Based Learning (PBL), Project-Based Learning (PjBL), and Discovery Learning, with an average score of 100, a very good category. However, observation results show that not all teachers are consistent in applying the designed learning models. Some teachers design learning with PjBL, but in practice apply PBL or only use lectures, so that learning activities are not fully by the teaching module and pay less attention to the diversity of learning styles of students. In line with the opinion of Karlina & Hindriana (2023) Biology learning that is only delivered through one approach, such as lectures or readings, then the learning is not in accordance with the diversity of learning styles. Interviews with teachers revealed that not all components of the teaching module could be optimally implemented in the classroom due to time constraints and the varying characteristics of the students. Limited time risks preventing the learning sequence from being implemented optimally, therefore PBL is rarely used by teachers.

The specific indicator that distinguishes the Merdeka Curriculum from previous conventional curricula is its differentiated approach. The implementation of differentiated learning is rated very well with

an average score of 86.80, with adjustments to teaching strategies based on the learning styles, interests, and ability levels of learners (Amalia *et al.*, 2024; Paraniti *et al.*, 2024). The teaching modules used have been adapted to learners' learning preferences, such as videos, images, and exploration-based tasks. The utilization of learning resources and teaching media is considered very good with an average score of 95.51. The use of visual and digital media such as infocus, video, and animation is proven to help learners understand abstract material and increase interest in learning (Irawati *et al.*, 2022). Finally, the active involvement of students in the learning process scored very good with an average score of 93.05, indicating that Biology learning has created a participatory space that supports exploration, discussion, and collaboration between students.

Mislinawati & Nurmasyitah (2018) stated that teachers play an important role in overseeing the learning process and discussions conducted by learners. In addition, teachers are also expected to be able to innovate in providing learning stimuli to create an active and meaningful learning atmosphere. Interestingly, researchers are some of the teachers who apply Emotional Social Competence (ESC), where this emotional social learning aims to give learners the ability to manage their emotions, achieve goals, empathize, take responsibility, and build positive relationships with their surroundings. Jones *et al.* (2017) evaluated the impact of social-emotional learning and showed that participants experienced improvements in communication skills, empathy, and the ability to work together in groups.

The learning implementation process will not be separated from the supporting tools contained in the attachment section. However, in the attachment component, it was found that not all aspects of the attachment were well implemented. Based on observations, some teachers still do not use student worksheet during the learning process. The existence of student worksheet is essential because it encourages students to participate actively and deepen their understanding of the concepts they have learned (Distrik *et al.*, 2024). The reading materials used in the teaching module consist of independent reading materials that have been designed with attractive designs. Some reference sources, such as YouTube links, have also been utilized in the learning process.

The last variable that affects the success of the Curriculum Merdeka learning is the closing activity, with an average score of 73.08 classified as a good category. At the end of the lesson, not all teachers consistently reflect on the learning and provide formative tasks or testing according to the learning objectives. In observation, only two of the seven teachers conducted a learning reflection, in which the teacher asked learners to conduct self-evaluation through oral tests. The assignment aspect earned an average score of 65.97, category enough, with not all teachers consistently providing evaluation through questions or post-tests. In the aspect of attachment in the teaching module, it is found that there are still teachers not including student worksheet which should be an important part in strengthening the understanding of the concept of learners. The reading material in the module only obtains the category Enough at a value of 68.05, while the glossary falls into the category Less at a value of 52.08. This shows that the supporting aspects of learning have not been optimized in the teaching modules compiled.

In implementing the Curriculum Merdeka Education Process Standards in public high schools in Medan, learning implementation is complete and well implemented. This can be seen from the achievement of the aspects of learning implementation in Ministry of Education Regulation No. 16 of 2022, namely the implementation of interactive learning (shown in the student-centered pattern), challenging (shown in discovery-based and problem-based learning), fun (shown in active and multi-directional learning). The observation results show that learning takes place in an atmosphere that supports active interaction. Teachers use group discussion methods, provide opportunities for students to discuss, and give appreciation for group achievements. The teacher also provides role modeling, mentoring, and facilitation, helps learners who are having difficulties and keeps the class condition conducive. The questionnaire results show that this strategy helps students understand the material through discussion and exploration. Learning in the independent curriculum requires teachers to be more creative and innovative, not to make themselves the only source of learning, and to place students as subjects of learning, not just objects.

Conformity of Teaching Modules with Learning Implementation

Data on the alignment between planning and implementation of learning carried out by biology teachers at the three senior high schools where the research was conducted is presented in Table 4. The data shows that the alignment between planning in the learning modules and their implementation in the classroom is categorised as good, with a score of 85.49%.

Table 4. The Compatibility Score between Learning Planning in Modules and Its Implementation in Classroom Learning by Biology Teachers at Three Selected Public High Schools in Medan.

| No. | School | Teacher Code | Suitability Score (%) | Criteria |
|---------|---------------------|--------------|-----------------------|-----------|
| 1. | SMA Negeri 1 Medan | A1 | 84.92 | Good |
| | | A2 | 86.39 | Very good |
| 2. | SMA Negeri 5 Medan | B1 | 79.77 | Good |
| | | B2 | 95.95 | Very Good |
| 3. | SMA Negeri 12 Medan | C1 | 87.13 | Very Good |
| | | C2 | 86.76 | Very Good |
| | | C3 | 77.57 | Good |
| Average | | | 85.49 ± 5.93 | Good |

The results showed that the value of the suitability of teaching modules with the implementation of learning in public high schools in Medan was included in the good category with an average value of 85.49 ± 5.93 . The suitability with the highest score was obtained by B2 teachers with a score of 95.95, while the suitability with the lowest score was obtained by C3 teachers with a score of 77.57. There are still several aspects that did not fully refer to the plans outlined in the teaching modules, particularly in terms of communicating the benefits of learning, applying learning models, conducting reflections, evaluations, and using attachments such as reading materials and glossaries. These findings indicate that although the implementation is already in the good category, consistency in adhering to the instructional module design still needs to be improved to achieve more optimal learning outcomes.

To determine the correlation between teaching modules and learning implementation, a linear regression test analysis was conducted. From the data processing that has been carried out, it is known that the coefficient $a = 0.9441x$ and the coefficient $b = 1.376$, so that the regression equation between x_1 and y is $\hat{y} = 0.9441x + 1.376$. The form of the linear regression equation can be seen in Figure 1.

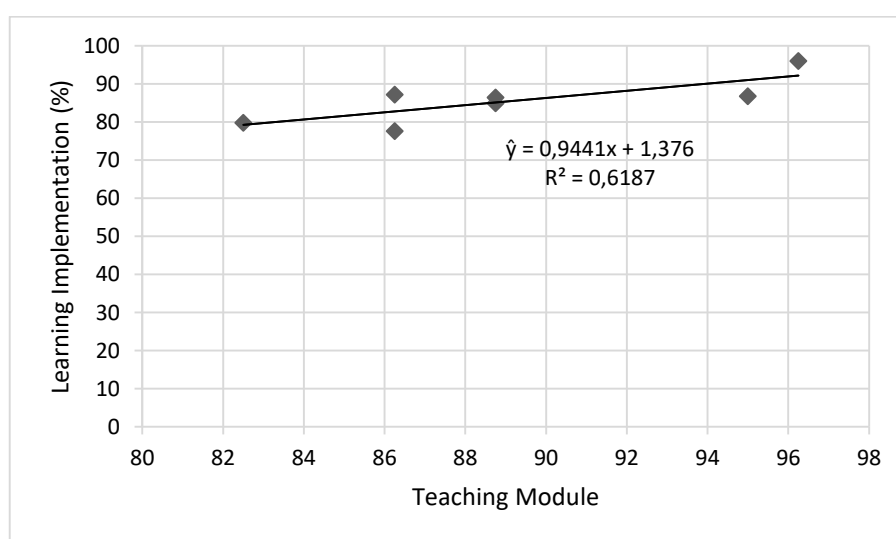


Figure 1. Relationship between Teaching Modules and Learning Implementation in Public High Schools in Medan

From the regression test results, a coefficient of determination value of 0.618 or 61.8% was obtained, which means that the ability of teachers to develop teaching modules contributes to the implementation of learning.

To find out the relationship between the teacher's ability to develop teaching modules and the implementation of learning is statistically significant, the Pearson Product Moment correlation test was conducted which can be seen in Table 5.

Table 5. Pearson Product Moment Correlation Test of Planning in Teaching Modules with Implementation of Biology learning in State High Schools in Medan

| Correlations | | X | Y |
|--------------|---------------------|-------------------|-------------------|
| X | Pearson Correlation | 1 | .787 [*] |
| | Sig. (2-tailed) | | .036 |
| | N | 7 | 7 |
| Y | Pearson Correlation | .787 [*] | 1 |
| | Sig. (2-tailed) | .036 | |
| | N | 7 | 7 |

. Correlation is significant at the 0.05 level (2-tailed).

From the table above, it can be seen that the Pearson correlation coefficient is 0.787 (> 0.05), and the significance value is 0.036 (< 0.05) which indicates that the teaching module variable has a very significant relationship with learning implementation.

The Pearson correlation value is 0.787, which indicates a positive relationship that the more able to use the teaching module, the higher the success of learning implementation. The results of this study are in line with the findings of Heriaddon & Manurung (2016) which show a positive relationship between the lesson plans used by teachers and student learning outcomes (correlation 0.75). Research by Usman *et al.* (2024) also supports this finding, which shows the suitability between lesson plans and the implementation of Biology learning in Madrasah Aliyah Negeri in Tangerang Regency is quite good. Therefore, the teacher's ability to develop and implement teaching modules greatly affects the success of learning (Baadilla *et al.*, 2023).

Based on interviews with teachers, the main obstacles faced in learning are the diverse characteristics of students, less than optimal use of media in the classroom, students being less sensitive to real contexts in everyday life, and the application of differentiated learning. Although the teaching module has been prepared with the appropriate learning model and method, in practice, support from students is often not optimal, especially due to the low ability of students to collaborate in groups. In addition, time is limited in implementing all components of the teaching module. Teachers said that the effectiveness of time is an obstacle, especially with the allocation of 3 lesson hours which is divided into 2 lesson hours and 1 lesson hours. If the lesson is only 1 lesson hours, it is difficult for teachers to implement learning optimally. To overcome this, teachers can implement differentiation strategies by adjusting learning content, processes, and products based on the needs, interests, and learning styles of students. This strategy increases relevance, motivation, and learner engagement. The use of technology also supports wider access to information (Mulyawati *et al.*, 2022). Reflection and discussion among teachers are important for evaluating and improving learning. In overcoming time constraints, teachers need to understand the characteristics of students so that Curriculum Merdeka learning strategies can be adjusted to the time allocation. This understanding helps in preparing the right sequence of material (Novitasari *et al.*, 2020).

Overall, teachers in public high schools in Medan realize that the use of teaching modules is very important in supporting the successful implementation of the learning process. However, it is necessary to re-direct and coach teachers that implementing the learning process must continue to be guided by the teaching module so that the learning process carried out becomes more directed and learning objectives can be achieved as well as possible because a well-designed and effectively implemented teaching module can have a significant positive impact on student achievement (Umar *et al.*, 2024). Therefore, teachers need to

continue to improve their skills and creativity in designing and implementing teaching modules so that learning becomes fun and meaningful according to the demands of the Curriculum Merdeka. This study has a limitation it does not deeply analyze the assessment or assessment carried out by teachers on students' understanding. Therefore, it is recommended that future researchers examine this aspect to obtain a more comprehensive picture of the learning process standards so that the research results can contribute more to improving the quality of education.

CONCLUSION

This study shows that biology teachers at three selected senior high schools in Medan are capable of planning lessons very well and in accordance with the Process Standards in Minister of Education and Culture Regulation No. 16 of 2022. These teachers are also able to implement the lesson plans they have developed with good results. It was also found that what is planned in the lesson modules aligns with what is implemented in the classroom learning process with good results, although there are still some aspects that do not fully align with the lesson modules, such as the presentation of learning outcomes, the application of learning models, the conduct of reflections, evaluations, and the implementation of closing components.

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