RESEARCH ARTICLE

Analysis of the ability of prospective biology teachers to develop teaching modules on the *kampus mengajar* program

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Abstract: *Kampus Mengajar* is a program intended for university students in Indonesia to establish partnerships with schools and prepare themselves as future professional educators. Student participation in the *Kampus Mengajar* program requires mastery of pedagogical competencies, one of which is the development of teaching modules as a learning design that will be implemented. The purpose of this study was to describe the ability of Biology Education students of FKIP UNTAN to develop teaching modules, specifically, students who participated in the *Kampus Mengajar* Batch 6 (KM6). This research is descriptive qualitative research conducted by observing the completeness of the components of the 14 teaching modules developed. Based on the analysis conducted, it is known that the average percentage of general information is 98.81% with a very good category, the main components are 97.62% with a very good category, and the appendices are 78.57% with a good category. Overall, the average of all components is 92.44%, so it can be concluded that the ability of Biology Education students at FKIP UNTAN to develop teaching modules can be categorized as very good. The results obtained show that there are still flaws in the 14 teaching modules analyzed. Students need to develop their pedagogical professionalism so that their knowledge and skills in developing teaching modules increase.

Keywords: ability; development; pre-service biology teachers; *Kampus Mengajar*; teaching modules

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Introduction

The curriculum is an essential aspect in the field of education because it plays a vital role in determining the direction, content, and process of education to ultimately produce competent graduates (Astuti et al., 2024; Marzuqi & Ahid, 2023; Yoto et al., 2024). In Indonesia, curriculum development started in 1947 and has undergone many changes (Halil et al., 2024; Insani, 2019). The changes that occur in the curriculum are the dynamics of response to changes that occur in government structures and the development of science, technology, and globalization (Digna et al., 2023; Mustaqim, 2014). In the curriculum development process, those involved will design the general objectives and expected outcomes of learning before considering how students will be assessed based on the achievement of the desired learning outcomes (Bovill & Woolmer, 2019). In this regard, teachers must be able to adapt to the provisions that apply to the curriculum used. Currently, the latest curriculum implemented in Indonesia is known as the *Merdeka* Curriculum.

The *Merdeka* Curriculum is an alternative to improve the conditions of education implementation after the COVID-19 pandemic, which requires the learning process to be carried out online (Rizaldi & Fatimah, 2022). The *Merdeka* Curriculum is flexible by focusing on essential materials and skills as well as character development. In addition, the *Merdeka* Curriculum also focuses on using a student-centred learning approach or model to make learning activities more meaningful and enjoyable (Permanasari et al., 2024). In other words, the *Merdeka* Curriculum emphasizes students' freedom and creative thinking (Jasiah et al., 2024; Vebrianto et al., 2024). The *Merdeka* Curriculum gives educators the freedom to design innovative, active, and creative learning to suit the needs of students (Purnomo et al., 2023; Tunas & Pangkey, 2024). Curriculum changes certainly trigger must-needed adaptations in how teachers

design learning activities to create innovative and student-centered learning. Learning design in the *Merdeka* Curriculum is carried out through the development of teaching modules, whereas in the previous curriculum, the 2013 Curriculum, it was carried out through the development of Lesson Implementation Plans.

Teaching modules are learning tools used by educators as a guide to the learning process (Khikmiyah et al., 2022; Murti et al., 2023). Teaching modules function as a tool to implement the flow of learning objectives developed from the learning outcomes of the *Merdeka* Curriculum published by the Ministry of Education, Culture, Research, and Technology (Noviantari & Agustina, 2023). The teaching module is a replacement for the Lesson Implementation Plans that existed in previous curricula. The teaching module is divided into three sections, namely general information, main components, and appendices (Triana et al., 2023). The development of teaching modules is a pedagogical skill that must be mastered in order to facilitate effective classroom learning and the achievement of learning objectives (Nuryanti et al., 2023). However, students tend not to have the mastery to develop teaching modules. In addition, students also lack understanding of developing a learning experience that is appropriate for the developmental level of students in schools.

Kampus Mengajar is a program initiated by the Ministry of Education, Culture, Research, and Technology as part of *Merdeka Belajar Kampus Merdeka*, which is intended for students from various universities throughout Indonesia (Shabrina, 2022). The *Kampus Mengajar* program is an effort to improve and advance the education system in Indonesia (Panjaitan et al., 2022), with students as prospective professional educators participating in assisting the implementation of learning. As prospective professional educators, students who take part in the *Kampus Mengajar* program must certainly master various pedagogical competencies, which include developing teaching modules as a basis for carrying out learning activities in accordance with the focus of the *Merdeka* Curriculum. A common problem experienced by students participating in the *Kampus Mengajar* program is the lack of teaching experience. The lack of teaching experience is one of the factors that cause students' lack of mastery in developing teaching modules and designing innovative learning, which is undoubtedly in accordance with the applicable curriculum and the resources available in the education area. Therefore, students in the field of education, especially those participating in the *Kampus Mengajar* program, must be able to develop teaching modules. In the *Kampus Mengajar* Batch 6 (KM6), participating students will be placed in elementary schools, junior high schools, and vocational high schools in various regions (Nasihah & Ramadhan, 2024).

Research related to the analysis of the ability to develop teaching modules has been carried out previously, such as those conducted by Afriyanti et al. (2024), Kurniawan & Wulandari (2024), and Saipani et al. (2024). However, research to analyze the ability of Biology Education students at FKIP UNTAN to develop teaching modules has never been done. This study aims to describe the ability of Biology Education students of FKIP UNTAN to develop teaching modules, specifically, students who participated in the KM6 program. Based on the research, the study's results can show the results of the analysis of teaching modules developed by Biology Education students of FKIP UNTAN who participated in the KM6 program. In connection with that, the results of this study are also expected to be a basis for further development in student professionalism in the field of education and for improving the quality of prospective biology teachers who will later design innovative and student-centered learning.

Method

This research is descriptive qualitative research. Qualitative research is research that produces findings that cannot be achieved with the use of statistical or quantitative procedures (Sidiq & Choiri, 2019), while descriptive research is research that aims to describe the phenomena that are the focus of research (Virgiawan et al., 2015). In this study, the descriptive qualitative form in question is to describe the completeness of the teaching module components that have been developed by FKIP UNTAN Biology Education students who take part in the KM6 program. This research was conducted in Pontianak, West Kalimantan, from March to April 2024.

The population in this study were all teaching modules that had been developed by Biology Education students of FKIP UNTAN who participated in the KM6 program. The sampling technique used is total sampling. This is due to the small population (Sugiyono, 2022). The data collection technique used in this study was observation. Prawiyogi et al. (2021) stated that observation is data collection carried out by systematically observing and recording the state of the research object. Observations were made with a checklist to see the completeness of each component in the 14 teaching modules analyzed. This is in accordance with Nurdin & Hartati (2019) that checklists are used to facilitate the examination of indicators that are met from the object being observed. The analysis of the completeness of the teaching module components was carried out using Formula 1. The calculation results are then categorized into the observation assessment category proposed by Sudijono (Azizah & Wardani, 2024) in Table 1.

$$\% = \frac{X}{N} \times 100\% \quad (1)$$

Note:
% : Percentage of teaching modules that contain the component
X : Amount of teaching modules that contain the component
N : Total amount of teaching modules analyzed

Table 1. Observation assessment category

Percentage	Category
86-100	Very good
71-85	Good
56-70	Fair
41-55	Poor
25-40	Very poor

Results and Discussion

The ability of FKIP UNTAN Biology Education students to develop teaching modules was analyzed through the completeness of the parts of the teaching modules that had been developed when participating in the KM6 program. The number of teaching modules analyzed was 14 teaching modules. The analysis of the completeness of the teaching module components refers to (Triana et al., 2023). The teaching module is divided into three sections: general information, main components, and appendices. FKIP UNTAN Biology Education students who participated in KM6 were placed in 14 schools in West Kalimantan, as presented in Table 2.

Table 2. School placement of FKIP UNTAN Biology Education students who participated in KM6

Code	School Placement
M1	SD Negeri 28 Sungai Raya
M2	SD Negeri 56 Pontianak Barat
M3	SMP Cahaya Harapan Tayan
M4	SMP Negeri 1 Jawai Selatan
M5	SMP Negeri 2 Sungai Ambawang
M6	SMP Negeri 3 Sungai Raya
M7	SMP Negeri 4 Sengah Temila
M8	SMP Negeri 16 Singkawang
M9	SMK Negeri 1 Selakau Timur
M10	SMK Swasta Al Madani Pontianak
M11	SMK Swasta Bhinneka Tunggal Ika Pontianak
M12	SMK Swasta Muhammadiyah Pontianak
M13	SMK Swasta Tri Dharma Sanggau
M14	SMK Swasta Yayasan Pendidikan Kristen Pontianak

Analysis of the General Information Section

The general information section includes the module author's identity, initial competence, *Pancasila* Student Profile, facilities and infrastructure, target students, and the learning model used (Triana et al., 2023). Figure 1 shows the results of the completeness analysis of the general information section.

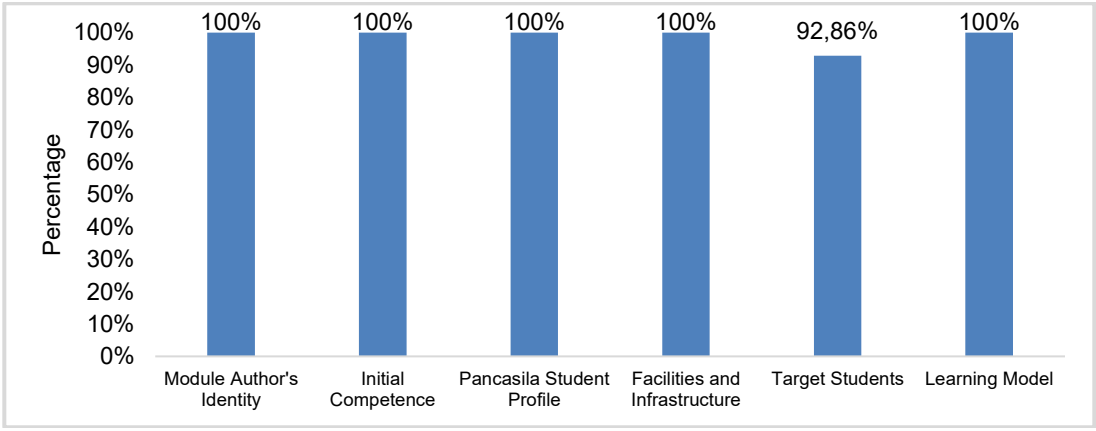

Figure 1. Analysis result of the general information section

The first component is the module identity. The module identity contains information about the teaching module developed (Rasyid, 2023). Salsabilla et al. (2023) stated that the module identity must contain the identity of the teaching module developer, the institution of origin of the teaching module, the year the teaching module was developed, the school level, class, and time allocation. The analysis conducted on 14 teaching modules that have been developed shows that all (100%) contain module identity, so they are classified as very good. Module identity is a component that must be contained in the teaching module because it informs the ownership and objectives of the teaching module (Salsabilla & Nurhalim, 2024).

The second component is initial competence. Initial competencies are knowledge and skills students must possess before learning the following material (Salam et al., 2019; Salsabilla et al., 2023). Of the 14 teaching modules analyzed, it is known that all (100%) have contained initial competencies, so they are classified as very good. Initial competence becomes a measuring point for how deeply the teaching module is developed (Merta et al., 2024).

The third component is the *Pancasila* Student Profile. Rusilowati et al. (2024); Zein et al. (2023) stated that the *Pancasila* Student Profile is an aspect of the actualization of students in Indonesia to have global capabilities and behaviours that are in line with the values contained in *Pancasila*. Based on the analysis conducted on 14 teaching modules, it was found that all teaching modules (100%) had included the *Pancasila* Student Profile in the developed teaching modules so that they were classified into the very good category. The *Pancasila* Student Profile itself consists of six dimensions, namely "Believing, fearing God Almighty and having noble character", "Creative", "Mutual cooperation", "Global diversity", "Critical reasoning", and "Independent" (Irawati et al., 2022). The teaching module developed does not have to contain the six dimensions of the *Pancasila* Student Profile. This is by the statement of Salsabilla & Nurhalim (2024) that the selection of the *Pancasila* Student Profile is adjusted to the needs of educators and learning activities to be implemented.

The fourth component is facilities and infrastructure. Facilities refer to tools and materials used to support learning activities (Jannah & Sontani, 2018), while infrastructure refers to relevant learning materials and resources that will be used in learning activities (Merta et al., 2024; Salsabilla & Nurhalim, 2024). The analysis conducted on 14 teaching modules showed that all teaching modules (100%) contained facilities and infrastructure that would be used in the learning activities that had been designed so that they were classified as very good. Facilities and infrastructure are crucial to consider when designing learning activities. According to Ahsani et al. (2021), the learning process without facilities and infrastructure will not take place optimally.

The fifth component is the target students. Target students are information related to who will be targeted in the learning activities to be implemented (Apriyanti, 2023). Merta et al. (2024); Salsabilla et al. (2023) explained that the target students are divided into three categories, namely regular students (have no difficulty in understanding learning materials), students with learning difficulties (have limitations in learning styles and tend to find it challenging to learn something, both physically and mentally), and high achievement students (able to understand learning materials quickly and have skills in critical thinking). Based on the analysis of 14 teaching modules, it is known that 13 teaching modules (92.86%) include target students, so they are classified as very good categories even though one teaching module does not contain this component, namely teaching module M5.

The sixth component is the learning model used. A learning model can be defined as a conceptual plan containing systematic procedures for organizing learning experiences to achieve learning objectives (Tabrani & Amin, 2023). Analysis of 14 teaching modules showed that all of them (100%) included learning models, so they were classified as very good. Of the 13 teaching modules, it is known that the learning models used include problem-based learning (PBL), discovery learning, project-based learning, and cooperative learning, which are certainly centred on students. Amiruddin et al. (2023) wrote that learning activities in the *Merdeka* Curriculum must be student-centred and innovative. In addition, choosing a suitable learning model can create a pleasant learning atmosphere so students can develop their creativity (Suratno et al., 2023).

Overall, the completeness of general information obtained an average of 98.81% with a very good category. Based on the analysis results, it is known that the target students are the component that has yet to be found in all modules analyzed.

Analysis of the Main Components Section

The main components section consists of learning objectives, assessment, meaningful understanding, trigger questions, learning activities, and educators' and students' reflections (Triana et al., 2023). Figure 2 shows the results of the analysis of the completeness of the main components section.

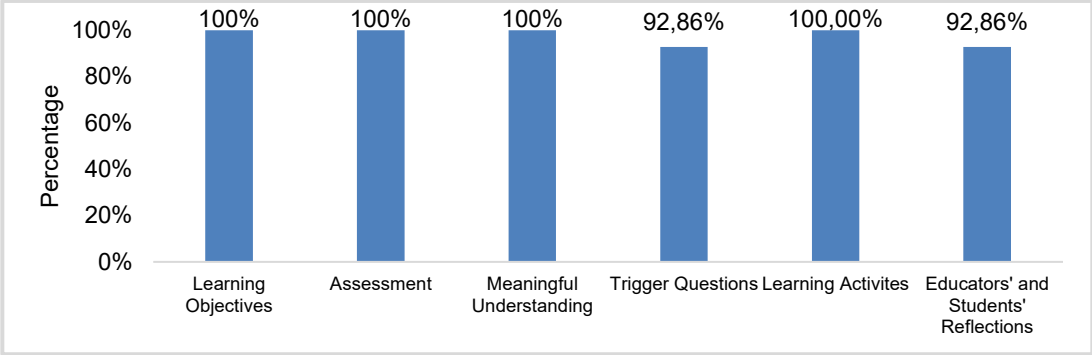

Figure 2. Analysis result of the main components section

The first component is learning objectives. Learning objectives are statements that communicate instructional goals that contain verbs and describe expected students' performance and the conditions under which that performance should occur (Orr et al., 2022). According to Pitasari & Febriyanti (2023); Yamanaka & Wu (2014), a good learning objective contains four components, namely A (audience), B (behavior), C (condition), and D (degree). Component A is the students as the subject of learning, component B is the competency that the students must achieve, component C is the learning conditions that will be implemented according to the design that has been made, and component D is the target measure of learning outcomes. Of the 14 teaching modules analyzed, all (100%) have contained learning objectives, so they are classified as very good.

The second component is assessment. Assessment is the process of collecting information related to students' understanding, knowledge, and skills towards the learning objectives to be achieved (Brown, 2022; Hidayat et al., 2023). In the *Merdeka* Curriculum, the assessment that can be carried out is divided into three types, namely diagnostic assessment, formative assessment, and summative assessment (Budiono & Hatip, 2023). Diagnostic assessment is an assessment used to find information related to the strengths and weaknesses of students, which will play a role in planning learning activities (Iskak et al., 2023). Formative assessment is an assessment that aims to provide feedback to educators and students so that the learning process can be further developed (Dann, 2014; Ismail et al., 2022), while summative assessment is a comprehensive assessment carried out at the end of learning to measure the achievement of all learning objectives (Dixson & Worrell, 2016; Schellekens et al., 2021). Mubarok et al. (2023) explained that the assessments made by educators vary depending on the material studied by students. Based on the analysis of 14 teaching modules, it was found that all (100%) contained assessment information, so they were classified as very good.

The third component is meaningful understanding. Merta et al. (2024) wrote that meaningful understanding is the benefit that students will get after going through the designed learning activities. Meaningful understanding is expected to shape students' behaviour in a better direction (Salsabilla et al., 2023). The analysis conducted on 14 teaching modules showed that all of them (100%) contained meaningful understanding, so they were classified into the very good category.

The fourth component is the trigger questions. Trigger questions are questions that aim to increase students' participation in entering into learning material (Ramadhani et al., 2023). Trigger questions are an effort to increase interaction between educators and students during learning activities (Destriana et al., 2023). Of the 14 teaching modules, 13 (92.86%) included trigger questions, so they were classified as very good categories. However, there was one teaching module that did not include trigger questions as a component, namely module M5.

The fifth component is learning activities. Learning activities are learning procedures that will be carried out within the time duration planned by the teaching module developer (Merta et al., 2024). Learning activities must be organized systematically by providing alternative learning options that are suitable for what is needed by students (Salsabilla et al., 2023). Learning activities are divided into three main activities, namely opening activities, leading activities, and closing activities, that have been adapted to the selected learning model. Based on the results of 14 teaching modules, all (100%) have included detailed and systematic learning activities.

The sixth component is educator and student reflection. Reflection is an activity carried out to review learning activities that have been carried out and includes planning, implementation, and the results of the learning itself (Ismayanti et al., 2020). Educator reflection can encourage educators to confront their assumptions regarding learning practices that have been designed and implemented by the educator (Firdyiwek & Scida, 2014), while students reflection aims to measure their understanding of the material that has been learned and discuss the causes of their failure to achieve the specified learning objectives (Susilo et al., 2022). Based on the analysis of 14 teaching modules, it was found that 13 teaching modules (92.86%) included educator and student reflections, so they were classified as very good

categories. However, there was one teaching module that needed to include educator and student reflections in it, namely module M6.
Overall, the completeness of the main components section obtained an average of 97.62%, which is a very good category. The components that were not found in the 14 teaching modules analyzed were trigger questions and educators' and students' reflections.

Analysis of the Appendices Section

The appendices section consists of student worksheets, enrichment and remedial materials, reading materials for educators and students, a glossary, and a bibliography (Triana et al., 2023). Figure 3 shows the results of the analysis of the completeness of the core component parts.

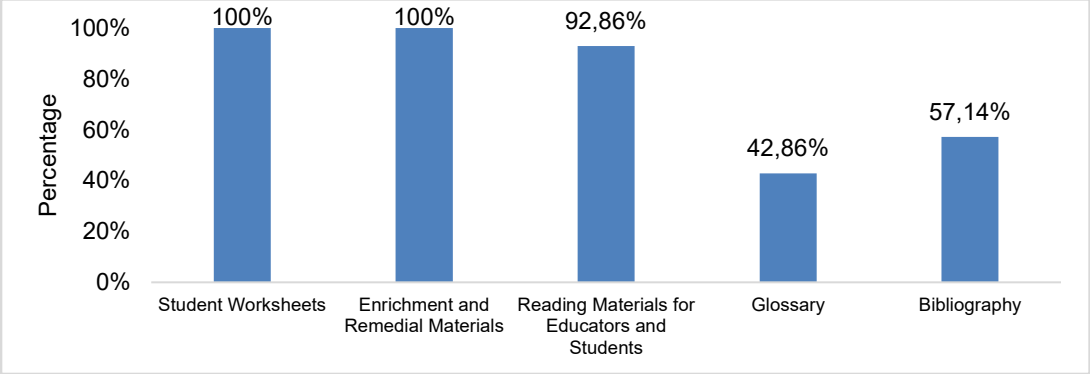

Figure 3. Analysis result of the appendices section

The first component is student worksheets. Students worksheets can be interpreted as learning resources in the form of sheets that contain activities that must be carried out by students during learning activities (Mahyuny et al., 2022; Wenno et al., 2016). Based on the analysis of 14 teaching modules, it is known that all (100%) have included student worksheets it so that it is classified into the very good category. Student worksheets are essential for learning activities. The presence of student worksheets will encourage students to participate actively and deepen their understanding of concepts (Distrik et al., 2024).
The second component is enrichment and remedial materials. Enrichment is defined as learning activities carried out to develop the potential of students with high achievements to be more optimal (Kim, 2016; Merta et al., 2024), while remedial is a service provided by educators to students to improve their learning achievement in order to achieve the predetermined learning achievement completeness criteria (Hassan, 2023). The results of the analysis of 14 teaching modules showed that all (100%) included enrichment and remedial materials, so they were classified into the very good category.
The third component is reading materials for educators and students. Reading materials are materials that can be freely accessed for reading and learning, including materials that contain subject matter to support the implementation of the learning process (Saadillah et al., 2023). Reading materials can improve students' reading skills while broadening their horizons related to the material studied (Triana et al., 2023). Based on the analysis of 14 teaching modules, it was found that 13 teaching modules (92.86%) included reading materials for educators and students, so they were classified into very good category even though there was one teaching module that did not include reading materials for educators and students, namely teaching module M1.
The fourth component is the glossary. A glossary is an alphabetical list of terms equipped with their definitions to help readers understand terms that are difficult or not commonly found (Merta et al., 2024; Susanti, 2016). Analysis conducted on 14 teaching modules showed that only six teaching modules (42.86%) included a glossary, so it was classified as a poor category. Teaching modules that do not include a glossary are teaching modules M1, M3, M4, M5, M6, M7, M11, and M14. Teaching modules that are not equipped with a glossary will make it difficult for readers if there are terms that are difficult to understand.
The fifth component is the bibliography. A bibliography is a list that contains information related to publications used in the content of a product, such as author information, year, title, and origin of these publications (Ocaña-Fernández & Fuster-Guillén, 2021). In teaching modules, the bibliography contains information on the reference sources used to develop the teaching module (Merta et al., 2024). Of the 14 teaching modules analyzed, only eight teaching modules (57.14%) contained a bibliography, so they were classified into fair category. Teaching modules that do not include a bibliography are teaching modules M1, M4, M5, M7, M9, and M11. Errors or the absence of citations and bibliographies can lead to assumptions of plagiarism in the products created (Faturrahman et al., 2023).

Overall, the completeness of the appendices section obtained an average of 78.57% with a good category. The analysis conducted on 14 teaching modules showed that the components not found in all teaching modules were reading materials for educators and students, a glossary, and a bibliography.

Overall Results on the Ability of Prospective Biology Teachers to Develop Learning Modules in the KM6 Program

This study was conducted to analyze the ability of prospective biology teachers, especially Biology Education students of FKIP UNTAN who participated in the KM6 program, to develop teaching modules. Teaching modules are learning tools used by educators as a guide in carrying out the learning process that has been designed (Khikmiyah et al., 2022; Murti et al., 2023). Therefore, students in the field of education who will become prospective teachers must be able to develop teaching modules properly. Teaching module development is one form of pedagogical skill that must be mastered so that the learning process can occur efficiently and learning objectives can be appropriately achieved (Nengsih et al., 2024).

Based on the analysis conducted on 14 teaching modules, the average percentage of general information is 98.81% with a very good category, the main component is 97.62% with a very good category, and the attachment is 78.57% with a good category. Overall, the average of all components is 92.44% with a very good category. A well-developed teaching module will show that students understand concepts well when developing teaching modules. In addition, a well-developed teaching module also shows that students have an excellent understanding of the concepts of the material to be taught to students. Understanding concepts is essential because it is a benchmark for knowing how far students can implement the knowledge, they have gained during lectures (Putri & Hartuti, 2019).

The teaching module must be contextualized by considering the resources, facilities, and infrastructure available in the school area. Implementing contextualized learning can support the improvement of students' knowledge and understanding of the environment around them (Putri et al., 2021). FKIP UNTAN Biology Education students in the KM6 program are placed in elementary, junior high, and vocational high schools in various regions. Therefore, students participating in the KM6 program must be able to develop teaching modules that contain learning activities that follow the available resources, both natural and human resources, and technological resources, around the schools. Contextualized learning can increase the efficiency of achieving learning objectives to achieve optimal learning outcomes (Anjarsari et al., 2022). The design of contextualized learning activities in the teaching module can be seen in general from how students compile initial competencies and determine the *Pancasila* Student Profile, facilities and infrastructure, target students, and the learning model to be used.

The detailed learning implementation process that will be carried out by students participating in the KM6 program lies in the main components section, which includes learning objectives, assessment, meaningful understanding, trigger questions, learning activities, and reflection of educators and students. The learning implementation process that has been designed is undoubtedly reviewed by the mentor teacher who accompanies students who take part in the KM6 program. Mentor teachers make direct observations in the classroom when students are teaching. The observation aims to observe the implementation and flaws in the learning process in the classroom (Firdaus et al., 2023). In addition, the mentor teacher also reflects with the students after the learning activities are completed. Reflection aims to gain a deep understanding of the factors that can affect the success of learning activities that have been carried out (Gusmaningsih et al., 2023). The feedback obtained by students from mentor teachers through observation and reflection activities becomes material to evaluate the effectiveness of learning activities using the teaching modules that have been designed.

The learning implementation process will not be separated from supporting devices in the appendices section, which includes learner worksheets, remedial and enrichment materials, reading materials for educators and students, a glossary, and a bibliography. Students' creativity can be seen in the appendices section, especially in the learner worksheets and reading materials for educators and learners. The quality of students can be seen from the creativity and productivity produced by the students themselves (Barokah et al., 2021). Based on the 14 teaching modules that have been analyzed, it is known that there are variations in the design of these two components. The learner worksheets developed vary from printed to electronic form. Reading materials utilized by students in the teaching modules developed are in the form of books published by the Government and reading materials developed independently with attractive designs. In addition, it is known that the learning media included in each teaching module also varies and tends to be electronic-based, such as PowerPoint and learning videos obtained from external sources. The variation in these components of the 14 modules that have been analyzed is determined by considering the resources available at the school, indicated by the presence of conventional (printed materials) and innovative (technology-based materials) components. Limited resources can hinder the implementation of learning that should be structured under the focus of the *Merdeka* Curriculum (Tuerah & Tuerah, 2023).

Conclusion

Based on the research that has been carried out from this study, it is known that the ability of Biology Education FKIP UNTAN students who take part in the KM6 program to develop teaching modules is very good. Of the three sections of the teaching module, the average percentage of general information is 98.81% with a very good category, the main components are 97.62% with a very good category, and the appendices are 78.57% with a good category. Overall, the average of all components is 92.44%, with a very good category. Although it has reached a very good category, there are still areas for improvement in the teaching modules analyzed, so direction and guidance are needed in developing teaching modules so that they can be better.

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Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Author Contributions

E. S. Wahyuni.: conceptualization, data curation, investigation, and supervision; **M. A. Faturrahman:** formal analysis and visualization; **E. S. Wahyuni** and **M. A. Faturrahman:** methodology and manuscript writing.

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