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ANALYSIS OF THE NEED FOR DEVELOPMENT OF AN INTEGRATED PROJECT-ORIENTED CHEMISTRY LEARNING MODULE SUSTAINABLE DEVELOPMENT GOALS (SDGS)

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ABSTRAK

Pelaksanaan Kurikulum Merdeka mengharuskan guru untuk melakukan pembelajaran secara proyek dengan mengintegrasikan *Sustainable Development Goals* (SDGs). Untuk itu, guru membutuhkan media pembelajaran berupa modul dalam melaksanakan pembelajaran sesuai dengan Kurikulum Merdeka. Penelitian ini bertujuan untuk menganalisis kebutuhan modul pembelajaran berorientasi proyek terintegrasi SDGs pada pembelajaran kimia. Penelitian ini dilakukan di beberapa SMA di D.I. Yogyakarta dengan responden sebanyak 10 guru kimia. Jenis penelitian yang dilakukan adalah penelitian kualitatif deskriptif eksploratif dengan metode survei. Adapun instrument yang digunakan adalah angket analisis kebutuhan yang berbentuk angket semi tertutup. Pada penelitian ini, teknik penelitian yang digunakan adalah analisis konten dengan hasil berupa deskripsi secara mendalam. Hasil penelitian menunjukkan bahwa perlu adanya pengembangan modul dalam bentuk *blended learning* yang memuat materi terintegrasi SDGs dan video pembelajaran dalam bentuk pembelajaran berbasis proyek. Modul tersebut dapat memberikan solusi terhadap kendala guru kimia dalam melaksanakan Kurikulum Merdeka di sekolah.

ABSTRACT

Implementing the Merdeka Curriculum requires teachers to conduct learning on a project basis by integrating Sustainable Development Goals (SDGs). To do so, teachers need learning media in the form of modules to carry out learning by the Merdeka Curriculum. This study aims to analyze the needs of SDGs integrated project-oriented learning modules on chemistry learning. This research was conducted in several high schools in D.I. Yogyakarta with respondents of as many as 10 chemistry teachers. The type of research conducted is qualitative research of exploratory description with survey methods. The instrument used is a semi-closed needs analysis questionnaire. In this study, the research technique used was content analysis with results in in-depth descriptions. The results showed a need to develop blended learning modules that contain integrated SDGs material and learning videos in the form of project-based learning. The module can provide solutions to the obstacles chemistry teachers face when implementing the Merdeka Curriculum in schools.

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INTRODUCTION

Education is one of the keys to the quality of a nation. Quality education will also create quality Human Resources (HR). Currently, the government, through the Ministry of Education, Culture, Research, and Technology, has established the Merdeka Curriculum as a way to improve the quality of education in Indonesia. The Merdeka Curriculum is defined as a curriculum with diverse intracurricular learning where the content will be more optimal so that students have enough time to explore concepts and strengthen competencies (Kemendikbudristek, 2022).

The implementation of the Merdeka Curriculum has begun to be implemented in several schools in Indonesia and will be implemented nationally in 2024. In this curriculum, learning is emphasized on the Sustainable Development Goals (SDGs), which is a world agenda set by the UN to support the achievement of social welfare, environmental sustainability, and prosperity (Seva-Larrosa et al., 2023). In fact, the SDGs emphasis on the Merdeka Curriculum has been explicitly stated in the Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia No. 008/H/KR/2022 concerning Learning Achievements. One example is the Phase E-Learning Outcomes in chemistry subjects.

The Merdeka Curriculum is implemented by prioritizing differential learning, namely learning in which the material learned by students is material they like according to their abilities and needs (Huebner, 2010). Apart from that, the implementation of learning in the Merdeka Curriculum is also focused on students (student-centered). For this reason, an appropriate learning model is needed for its implementation. One of the appropriate learning models to support this learning is project-based learning (PjBL).

Project-based learning (PjBL) is learning that involves students in a project to create a product (Riyasni et al., 2023). PjBL is learning that is able to provide students with the opportunity to hone their communication, cooperation, and collaboration skills (Fahlevi, 2022). Apart from that, PjBL is also able to provide opportunities for teachers to innovate and be creative in planning projects according to the characteristics of their students (Nugrohadi & Anwar, 2022). PjBL is a learning model that is very good for use in subjects that require direct participation from students, such as chemistry subjects. Chemistry, which contains a lot of abstract material, certainly requires project learning to increase students' understanding of chemical concepts (Frida et al., 2019).

SDGs in chemistry subjects are included in the Global Warming and Climate Change material. This material implements the SDGs goal in point 13, namely regarding climate change. This goal has the aim of hoping for the recovery of the world climate from bad influences and understanding the sustainability of existing global climate problems (Chamisijatin et al., 2023). For this reason, chemistry is the right subject to implement this material because chemistry contributes to realizing a sustainable life.

The emphasis on SDGs in project-based learning is one form of appropriate innovation in implementing the Merdeka Curriculum. This can be realized in the form of teaching materials such as modules that are project-oriented and integrated towards the SDGs. This is because modules are teaching materials that can be used Merdekaly by students without or with teacher guidance (Dharma, 2008). Not only that, this project-oriented and SDGs-integrated module can also be an alternative teaching material for teachers due to changes in the existing curriculum.

The development of project-oriented and integrated SDGs modules needs to begin with conducting a needs analysis. This research focuses on chemistry teachers' needs for SDGs-integrated project-oriented chemistry modules. This module is intended for class X phase E students in chemistry subjects, especially on

Global Warming and Climate Change material. This is because class X phase E students have implemented the Merdeka Curriculum starting in the 2023/2024 school year. The research will be carried out using a survey method of chemistry teachers. Thus, the development of project-oriented chemistry learning modules integrated with SGDs can be made with the characteristics expected by teachers.

METHODS

This research was conducted in the form of exploratory descriptive qualitative research using a survey method, and data collection was carried out using a needs analysis questionnaire in the form of a semi-closed questionnaire totaling 30 questions adapted from Rothwell et al. (2016). Exploratory research is the first step of research, which is expected to formulate a problem whose solution can be solved by other types of research. This type of research is very suitable for analyzing chemistry teachers' needs for the required chemistry learning modules (Mudjiyanto, 2018). Then, this research was conducted in August - November 2023 by taking data from 10 respondents in the form of high school chemistry teachers in D.I. Yogyakarta with data collection techniques in the form of purposive sampling techniques (purposeful samples). The conditions for collecting respondent data were that of a chemistry teacher who taught in class

In this research, the data analysis was content analysis. Content analysis is a data analysis technique that codes transcription data obtained from respondents' answers (Sitasari, 2022). Then, the information obtained will be described in depth regarding the need for SGDs integrated project-oriented chemistry learning modules in the implementation of the Merdeka Curriculum.

RESULT AND DISCUSSION

Research data was obtained from 10 respondents consisting of 7 female teachers and 3 male teachers with an instrument in the form of a semi-closed questionnaire totaling 30 questions from 11 indicators. The results of this research are in Table 1.

Table 1. Results of data analysis

Indicator	Result		
Assessment on current status			
School teachers' understanding of the Merdeka Curriculum	70%, Understand	30%, Not Understand	70% of respondents were able to explain the Merdeka Curriculum and understand the main differences between it and the previous curriculum because they had implemented it in schools, while the other 30% of respondents still did not understand the Merdeka Curriculum because they had not implemented it in schools.
School teachers' understanding of learning media	100%, Understand	-	Learning media can be interpreted as anything that is a tool or means to help or support the learning process. There are several types of learning media, including visual, audio, and audiovisual media.
School teachers' understanding of the SDGs	60%, Understand	40%, Not Understand	60% of respondents were able to explain SGDs correctly because they had integrated them into learning, while the other 40% of respondents were not able to explain SGDs correctly because they had never integrated them into learning.
School teachers' understanding of project-based learning	100%, Understand	-	All respondents were able to explain the project-based learning model because they had already applied it to learning. The project-based learning, referred to as collaborative learning gives students the opportunity to create products.
Theoretical understanding			
The true essence of the Merdeka Curriculum	-	-	The Merdeka Curriculum aims to make students believers, productive, creative, innovative, effective, and able to contribute to the nation so that it becomes a curriculum that suits the nation's conditions. The Merdeka Curriculum has learning

			outcomes (CP), whose derivatives are more specific learning objectives for each learning phase.
The meaning of learning media	-	-	Effective and efficient learning media is media that is able to support learning material, contains learning objectives to be achieved, is easy to use, and has an attractive appearance. One of the learning media that is very necessary in learning is learning modules.
Meaning of learning module	-	-	Learning modules are learning media that can be used Merdekaly by students to learn, and simplify and clarify the delivery of material so that it is appropriate to support learning material. Apart from that, modules are also appropriate teaching materials as a means to integrate new learning concepts and are able to overcome space and time limitations
Performance gap			
Pengalaman penggunaan modul pembelajaran kimia	100%, ever been	-	All respondents have used modules in carrying out learning, but the printed modules used are still not suitable for SGDs integrated project-based learning. There was only one respondent who had used the SGDs integrated project-oriented chemistry learning module and stated that the module made it easier for teachers to deliver the material.
The need for integrated project-oriented modules of SGDs	100%, Need	-	100% of respondents stated that the Merdeka Curriculum requires project-oriented learning modules integrated with SGDs in the implementation of learning because project learning is able to encourage students to find new ideas and think critically in solving a project problem, while material integrated with SGDs will provide an overview of the concept and implementation of development sustainable so as to increase student's awareness of the environment.
Solutions and Side Effects			
Solutions	-	-	SGDs integrated project-oriented learning modules are required in learning. The expected module is a printed/electronic module that contains learning videos, illustrations/pictures, practice questions, SGDs material, and material related to daily life and has an attractive appearance.
Side Effects	60% choose an electronic platform	40% choose non-electronic form	60% of respondents want electronic modules published via Flip PDF, Canva, or Flipbook Maker platforms, while the other 40% of respondents want non-electronic/printed modules.

Based on the results of the analysis in table 1 above, information was obtained regarding teachers' needs for SGDs integrated project-oriented learning modules. Some of these need factors are explained as follows.

Understanding and Implementation of the Merdeka Curriculum

The Merdeka Curriculum is a new curriculum that has been applied to education in Indonesia. This curriculum focuses on 3 things, namely 1) developing soft skills with project-based learning that is adapted to the character of Pancasila students, 2) providing essential material on basic competencies so that learning has sufficient time, and 3) teacher freedom in carrying out differential learning according to the participants' circumstances. students while still adapting to the context of

existing local content (Idhartono, 2022). In the Merdeka Curriculum, learning outcomes (CP) are used to contain learning objectives for students in each learning phase. CP contains knowledge, skills, and attitudes in a continuous process to build learning competencies in certain subjects and will be reduced to teaching modules and learning objective flows (Purnawanto, 2022). In the Merdeka Curriculum, the project to strengthen the Pancasila student profile (P5) is a target that expects students to become human beings who believe and are devoted to God Almighty, healthy, capable, knowledgeable, have noble character, creative, Merdeka, and become responsible citizens. answer. The series of activities will emphasize students' understanding of finding solutions to sustainable issues in accordance with SGDs (Kemendikbudristek, 2022).

Data from respondents' answers shows that 70% of them have understood the Merdeka Curriculum well, starting from the focus of its implementation, the learning tools, namely learning outcomes, teaching modules, and the flow of learning objectives, the implementation of project-based learning which has a target of strengthening the profile of Pancasila students (P5), and differentiated learning which makes it easier for teachers to determine the learning characteristics that students like. This is because respondents have implemented the Merdeka Curriculum in their learning at school. Meanwhile, 30% of respondents apparently did not understand the nature of implementing the Merdeka Curriculum because they had not implemented the Merdeka Curriculum in their learning at school. In implementing the Merdeka Curriculum, which was carried out by 70% of respondents, it turned out that they experienced various obstacles. These obstacles include a lack of learning media in the form of modules that are in accordance with the Merdeka Curriculum, limited time in SGDs to be integrated into learning, a lack of learning resources that integrate SGDs, and a lack of time to carry out project activities. These obstacles certainly have an adverse impact on the implementation of the Merdeka Curriculum, so appropriate solutions are needed to overcome them.

Learning Media in the form of Learning Modules

Learning media can be defined as a tool or means used by teachers to convey material/messages in the learning process so that students can receive the material/messages well (Moto, 2019). The use of learning media cannot be separated from the learning process. This is because learning media is a physical vehicle or component of learning resources that is able to provide instructional material to students who are studying (Firmadani, 2020). Apart from that, learning media can also attract students' attention to learning so that it will increase motivation and make learning enjoyable.

Learning media generally has 3 types, namely visual media, audio media, and audio-visual media. According to Faujiah et al. (2022), understanding various types of media in the form of 1) audio media is media that can only be heard, such as sound recordings or radio, 2) visual media is media that can only be watched, such as books, modules, drawings, paintings or photos, and 3) Audiovisual media is media that combines elements of sound and images so that it contains elements of sound images such as videos or films. Various types of learning media can be used according to the teacher's needs. This is because each type of media has its own advantages and disadvantages. Therefore, teachers need to use effective and efficient learning media to carry out the learning.

Data analysis in Table 1 shows that all respondents understand the learning media they use in implementing learning. Apart from that, respondents also revealed that effective learning media is media that is able to support learning material, is in accordance with the objectives to be achieved, is easy to use, and has an attractive appearance. Apart from that, respondents also revealed that modules are a much-needed learning medium. This is because the module can be used by students to learn Merdekaly, makes it easier, and clarifies the delivery of

material so that it is appropriate to support learning material, can integrate new learning concepts, and is able to overcome space and time limitations. Based on the definition of the Ministry of National Education (Depdiknas, 2008), learning modules are systematic teaching materials used by students to learn with or without a teacher.

In data analysis, respondents showed that 100% of respondents had used the module in implementing learning. However, in implementing the Merdeka Curriculum, respondents still had difficulty finding appropriate learning modules. This is because implementing the Merdeka Curriculum requires learning modules that are able to integrate SGDs material and have project-based learning activities. One respondent used the SGDs integrated project-oriented chemistry learning module and stated that the module made it easier for teachers to deliver learning material according to the Merdeka Curriculum.

Integrating Sustainable Development Goals (SGDS)

Sustainable Development Goals (SGDS), which Indonesians call sustainable development goals, are a world development agenda that aims to improve the welfare of humans and the planet (Paputungan, 2023). SGDs is a sustainable program created by the UN which contains 17 sustainable goals with 169 targets. These goals cover 3 areas of sustainable development: economic, ecological, and social. According to the UN, the purpose of the SGDs in question is to create a collective plan to end extreme poverty and inequality and protect the planet by 2030 (Aji & Kartono, 2022). This means that the existence of SGDs aims to achieve a sustainable future for the world community.

The realization of SGDs certainly requires participation from various fields, such as the field of education. This is because the goals and targets of SGDs cannot stand alone, so they require integrated implementation (Paputungan, 2023). In Indonesia, the implementation of SGDs has been implemented in the Merdeka Curriculum. In fact, in the Merdeka Curriculum, SGDs have been integrated directly into phase E-learning outcomes in chemistry subjects. This shows that the integrity of SGDs in the Merdeka Kurilukum can be an important step in creating a generation that is able to commit and contribute to sustainable development (Vioreza et al., 2023). There are several benefits from the urgency of integrating SGDs in the Merdeka Curriculum, namely that students will be equipped with knowledge, skills, and attitudes that support sustainable development efforts; education is the beginning of forming agents of change who will create a sustainable and inclusive future; and of course, creating a generation that is ready to face sustainable challenges and play an active role in creating a sustainable future on this planet earth.

The result data in Table 1 shows that 60% of respondents have explained SGDs well and have been able to integrate them into learning at school, while the other 40% of respondents have not been able to explain SGDs well because they have never integrated SGDs into their learning at school. In fact, one respondent also said that integrating SGDs could make learning easier. This shows that integrating SGDs is an urgent necessity in implementing chemistry learning. This is because SGDs applied to learning will give students direct experience in understanding sustainable issues in everyday life and help them develop a sense of responsibility and awareness of a more sustainable future for all. However, respondents who have integrated SGDs have obstacles in their implementation, namely the lack of learning resources that can integrate SGDs. Respondents who had not been able to integrate SGDs revealed that they had not had time to understand SGDs before integrating them into learning. Therefore, learning resources such as teaching media that contain SGDs are needed so that teachers can easily integrate SGDs into learning.

Project Based Learning Orientation

Project-based learning (PjBL), or in English, Project-based learning, is defined as a learning model applied to the Merdeka

Curriculum. According to the Ministry of Education and Culture (2022), PjBL is learning by making goods or services a vehicle for mastering learning competencies. PjBL can also be defined as collaborative learning, which provides students with the opportunity to be active and creative when creating the final learning product. In its implementation, PjBL is able to accommodate students' differences in learning styles and train independence, creativity, critical thinking skills, a sense of responsibility, and self-confidence in students (Dewi, 2022). In fact, according to PjBL, it has the advantage of sorting, developing, fostering motivation, communication, and developing group work, which can improve student learning outcomes (Muliaman & Mellyzar, 2022). This shows that PjBL is a learning model that is suitable for the Merdeka curriculum and emphasizes differentiated learning.

The respondents' answers in Table 1 show that 100% of them already understand project-based learning (PjBL) because they have applied it to learning at school. However, in practice, respondents still had various obstacles. These obstacles are a lack of time for project implementation, a lack of time to monitor student project progress, and the difficulty of designing the learning project design that will be used.

Integrated Sustainable Development Goals (SGDS) Project-Oriented Learning Module

The results of the data analysis in Table 1 show that 100% of respondents need SGDs-integrated project-oriented learning modules in the implementation of learning. This is because the implementation of SGDs in learning is related to the project-based learning approach applied in the current curriculum, namely the Merdeka Curriculum. Apart from that, this approach will also inspire students to be involved in preventing sustainable issues so that they can become active agents of change directly in society (Vioreza et al., 2023). In fact, research conducted by Latifah et al., (2023) project learning as a differentiated learning strategy that integrates SGDs in it will provide students with great potential to increase students' understanding, involvement, critical abilities, and awareness of issues. the environment around them. This is because students can feel that the learning they are doing is relevant to their daily lives and their future. Therefore, the development of project-oriented learning modules integrated with SGDs in implementing this learning is really needed by teachers in implementing learning in schools.

In the data obtained, respondents expressed their hopes for the development of the learning modules that will be created. 50% of respondents expect printed modules, 30% expect electronic modules, and 20% of respondents expect printed and electronic modules. Apart from that, 80% of all respondents also expect modules with learning videos. According to 50% of respondents, printed modules are needed because they are easier to understand, more familiar to students, and easier to apply to various learning styles, while other respondents think that electronic modules are needed because they are more flexible in their use and easier to apply anywhere. On the other hand, modules with videos are also widely desired by respondents because they are more interesting for students and can explain chemistry material well. The results of this analysis show that the need for printed modules and electronic modules are both important because they each have their own advantages, but modules with videos are also a good module development innovation. Thus, the form of the module that is created can be a blended learning module, which is better applied to the development of the learning module that will be created because it can contain 2 types of learning media forms that are expected by respondents.

Respondents want learning modules with certain content and characteristics, not only in the form of learning media. This is because the learning module consists of planned learning, which contains a set of experiences, and the module also has a design that is able to help students master the existing learning objectives (Rahdiyanta, 2016). Based on the answers from respondents, there are 3 expected content contents, namely a module that is able to

contain the relationship of the material to everyday life, has illustrations/animations to explain the material clearly and contains practice questions for students. As for the expected characteristics, 80% of respondents expected the module to contain material context related to the SGDs topic, contain practice questions, and have an attractive appearance. Other respondents also hoped that the module that would be developed would contain images that could support the learning material. This is quite in line with the learning module requirements required for implementing the Merdeka Curriculum because there are learning outcomes that contain SGDs.

Then, choosing a platform as a delivery system for creating blended learning modules is also very important. This is because project-oriented learning modules integrated with SGDs must fulfill innovative pedagogical components in their development (Fahlevi, 2022). The choice of a delivery system for blended learning-based modules must be made appropriately because the platform as a delivery system is an important factor in the success of learning. Currently, the delivery system in learning is closely tied to the use of technology (Setiyadi, 2023). In accordance with this, respondents wanted learning modules with delivery systems in the form of Flip PDF, Canva, and Flipbook Maker. This shows that respondents want learning modules delivered with the latest technology and that are in line with current developments. Flip PDF, Canva, and Flipbook Maker are online platforms that can be accessed freely using the internet, so their use will be easier and more flexible. On the other hand, respondents can also use learning modules with a delivery system in the form of printed modules, which are more familiar to them.

CONCLUSION

Developing an integrated SGDs project-oriented learning module is feasible if seen from the results of the data analysis that has been carried out. The SGDs-integrated project-oriented learning module is a blended learning module that contains SGDs-integrated material in the form of project-based learning. This module can increase student activity in collaborating to form a product related to sustainability issues in the surrounding environment so that learning will be more enjoyable and relevant to students' daily lives. It is hoped that the module, which also contains learning videos, will make it easier for students to understand what is being carried out. The SGDs integrated project-oriented learning module is also expected to be able to help teachers design learning projects and make it easier for them to integrate SGDs in accordance with the Merdeka Curriculum.

This needs analysis research is initial research in describing the need for project-oriented learning modules integrated with SGDs or not. The research results show that the development of SGDs integrated project-oriented learning modules needs to be continued at the development stage. Apart from that, recommendations regarding module development need to be carried out by distributing questionnaires more widely so that needs related to module development are better known.

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