

Integrated STEM-based Teaching Modules with the Values of Pancasila Student Profiles in Supporting the Implementation of Kurikulum Merdeka in Primary School

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ABSTRAK

Hadirnya Kurikulum Merdeka sebagai kurikulum baru di Indonesia menuntut guru untuk mampu beradaptasi dengan perubahan tersebut. Di sisi lain, masih terbatasnya referensi guru dalam melaksanakan pembelajaran yang bermakna dan berkarakter seperti yang dicitakan melalui kurikulum baru ini masih sangat terbatas. Oleh karena itu, penelitian pengembangan ini bertujuan untuk mengembangkan modul ajar berbasis STEM untuk kelas 4 SD yang terintegrasi dengan Profil Siswa Pancasila. Jenis penelitian ini yaitu pengembangan dengan menggunakan model pengembangan ADDIE (Analyse, Design, Development, Implement, Evaluate). Penelitian ini melibatkan guru dan 50 siswa kelas 4 di salah satu sekolah dasar negeri di Indonesia. Modul dikembangkan berdasarkan kebutuhan guru dan siswa yang diperoleh melalui observasi, wawancara, dan tes diagnostik kepada siswa. Teknik analisis data menggunakan analisis dekriptif kualitatif dan kuantitatif. Hasil penelitian yaitu validasi dari para ahli terhadap modul menunjukkan kategori sangat baik untuk aspek materi, tampilan dan grafis. Modul yang dikembangkan dinilai sangat praktis bagi guru di kelas, sedangkan respon siswa terhadap pembelajaran menggunakan modul tersebut sangat baik. Hal ini berdampak langsung pada hasil belajar siswa yang sangat memuaskan. Dengan demikian, modul yang dikembangkan layak dan dapat menjadi alternatif referensi bagi guru dalam melaksanakan pembelajaran berbasis STEM dengan mengintegrasikan nilai Profil Pelajar Pancasila di dalamnya.

ABSTRACT

The presence of the Merdeka Curriculum as a new curriculum in Indonesia requires teachers to be able to adapt to these changes. On the other hand, there still needs to be more teacher references in implementing meaningful and character learning as aspired to through this new curriculum. Therefore, this development research aims to develop STEM-based teaching modules for 4th-grade elementary schools integrated with the Pancasila Student Profile. This type of research is developed using the ADDIE development model (Analyse, Design, Development, Implement, Evaluate). This research involved teachers and 50 grade 4 students in one of the public elementary schools in Indonesia. The modules were developed based on the needs of teachers and students obtained through observation, interviews, and diagnostic tests on students. Data analysis techniques using qualitative and quantitative descriptive analysis. The study's results, namely the validation of the experts on the module, showed a very good category for the material, display, and graphic aspects. The developed module is considered very practical for teachers in the classroom, while the student response to learning using the module is very good. It has a direct impact on student learning outcomes which are very satisfying. Thus, the developed module is feasible and can be an alternative reference for teachers in carrying out STEM-based learning by integrating the values of the Pancasila Student Profile.

1. INTRODUCTION

There is no doubt that education is a means to build human civilization as well as human character based on the universal values or specific values in a certain culture or community (Dekawati,

2020; Roslan et al., 2014). Therefore, while education system and curricula in various parts of the globe are reformed and constantly evolving to adapt to a fast-changing world, the noble values and characters are integral parts of education. In the context of education in Indonesia, the national curricula have been evolved in the past few decades. Kurikulum Merdeka or Merdeka curriculum is a latest national curriculum that gradually replaces the predecessor curriculum called Kurikulum 2013. The Merdeka Curriculum is designed to be a more adaptable curriculum framework that prioritises fundamental subjects or materials (Makaborang, 2019; Wicaksono & Sayekti, 2020). Hence, students concentrate on the most important subject so they have enough time to study numerous fundamental skills, like literacy and numeracy, in-depth (Perdana & Suswandari, 2021; Pratikno et al., 2022). On the top of that, the growth of students' character and skills are also crucial. One of the primary features of this curriculum is project-based learning for the development of soft skills, while Profil Pelajar Pancasila or Pancasila Student Profiles is a set of characters and competencies that are expected to be developed according the noble values of the Indonesian ideology, Pancasila. This also highlights the paradigm shift in the teacher's role in the classroom from "the one in control" to "the one as a facilitator" who aids pupils in constructing new knowledge (Bansilal, 2010; Utomo, 2017). Hence, teachers are given more freedom to provide personalized learning based on student aptitudes or abilities and customize it depending on the local circumstances and subject matter. This way of thinking is further backed by the notion that teachers must have the freedom to modify their courses in accordance with both the needs of the students and their own pedagogical strategies (Margolis et al., 2016; Winarno et al., 2022).

A number of studies have revealed various positive impacts and outcomes of educational formats that provide independence to students and teachers in learning, such as growth in students' conceptual understanding, building positive relationships between the teacher and the students, fostering a community of learners in the classroom who take turns being responsible for one other's and their own learning (Peters, 2010; Schiller, 2002; Wisehart, 2004). While the Merdeka Curriculum in Indonesia that provides such a freedom to teachers to adapt and design their own teaching based on their students' needs or their own pedagogical strategies, shifting the dominance of traditional teaching practice for years in Indonesia to a more learner-centred teaching presents barriers to teachers. This is because compared to teacher-centered classrooms, learner-centered classrooms' educational design is more flexible and unpredictable, so teachers need more assistance in planning lessons where they are no longer the only subject-matter experts in order to give students the abilities and opportunities to collaborate to build knowledge (Blanchard et al., 2009; Peters, 2010). Teachers are accustomed to deliver and provide explanations in one direction, transferring knowledge from teachers to the students (Aeni, 2019; Nasir et al., 2020; Schiller, 2002). Because of this learning pattern, teachers are worried that the application of varied approaches can hinder teachers from completing the material that has been determined by the national curriculum (Haidar & Agustina, 2021; Kolar & Hodnik, 2021). Furthermore, there are currently relatively few resources available for teachers in implementing the curriculum because it has only been socialized by the Indonesian government. This assertion is based on our preliminary research, which involved speaking with several teachers and a principal at a public elementary school in Tarakan City, Indonesia. We used the stark contrast between the demands of the new curriculum and the actual issues facing schools as our inspiration for creating teaching modules that would act as supplementary resources for instructors to support meaningful learning based on a separate curriculum.

As mentioned earlier, project-based learning is one key feature of the Merdeka Kurikulum. In other words, teachers are encouraged to plan their lessons such that students actively participate through engaging learning projects. As a form of student-centered instruction, project based learning emphasises the importance of students' active participation in the learning process, hence real-world situations are highly suggested to be used to provide the context for learning through authentic questions and problems within the projects students will work on (Al-Balushi & Al-Aamri, 2014; Kokotsaki et al., 2016). This implies that students are expected to be able to connect materials and concepts as well as real-life situations they experience every day, so that they are able to understand and solve problems both in and out of the class. Literatures show that project-based instructional strategy has various positive impacts such as promoting students' conceptual knowledge of the topics they deal with in their projects (Al-Balushi & Al-Aamri, 2014; Barak, 2012), developing students' social interactions and group work skills as they work in collaborative project with their peers (Bell, 2010; Kaldi et al., 2011), which eventually lead to a meaningful learning experiences.

One learning approach that highly support the implementation of project based learning and promote students' active participation in learning process is STEM learning which is based on the integration of Science, Technology, Engineering and Mathematics known as STEM Learning (Mardhiyah et al., 2021; Ramadita et al., 2021). STEM learning is a learning that combines science, technology, engineering and mathematics altogether and plays a role for students in developing creativity through the

process of solving problems in life. The application of STEM learning characteristics in the curriculum will be better and maximal to be able to motivate teachers or teachers so that they affect learning activities and outcomes (Amsar et al., 2021; Mu'minah & Aripin, 2019). Some of the main characteristics of STEM learning such as asking, imagining, planning, creating, and improving stages. According to previous study STEM learning is applied in Elementary Schools, it will realize 4 characters of students' creative thinking: 1) Originality, that is the uniqueness of the ideas expressed, 2) Fluency, that is the ability to create ideas as much as possible, 3) Flexibility, this is indicated by the absence of the same idea when someone is asked to express an idea or opinion, 4) Elaboration, indicated by a number of additions and details on each idea so that a simple stimulus becomes more complex (Daniels, 2002). These values are highly related to the Pancasila Students Profile as outlined in the Merdeka Kurikulum. Therefore, we have seen at this point how STEM learning can be one of viable alternatives of instructional approach that teachers in primary school can use as part of attempts to introduce project-based learning, one of the teaching strategies in the Merdeka curriculum.

The result from a preliminary study that we did through observation and interviews with a number of elementary school teachers at one public school in Tarakan City, however, demonstrate that the teachers still have challenges applying a range of instructional approaches in their classrooms because of the limited references they have access to, despite the fact that the Merdeka Curriculum hasn't been released by the Indonesian government for a long time. Therefore, moving on from that reality conditions, we come with an idea to develop STEM teaching modules which is integrated with the Pancasila Student Profile. Through the developed modules, it is hoped that it can provide references for teachers in primary schools in designing and implementing STEM learning that inculcate the Pancasila Students Profiles in primary school students.

2. METHOD

As this study aims to develop STEM-teaching modules, it is, hence, carried out using Research and Development (R&D) methodology. Furthermore, this research uses the ADDIE development model which consists of five stages, namely analyse, design, development, implementation, and evaluation (Saifudin & Sukma, 2020). Figure 1 illustrates 5 steps of ADDIE development research cycle.

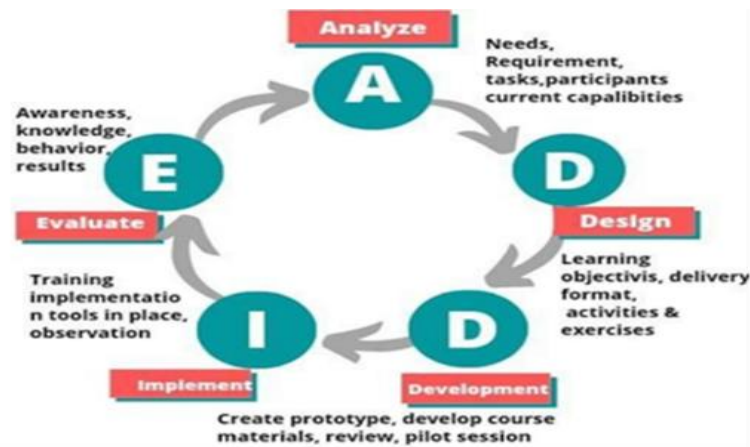


Figure 1. ADDIE Model

The initial step of this study is analysis stage. It was carried out through several activities, such as curriculum analysis, needs analysis and student characteristics analysis. Curriculum analysis is carried out to see which materials are difficult for students and for teachers to convey to students, while needs analysis is carried out to see how learning media are used in schools. Analysis of student characteristics is also conducted in order to determine students' learning styles which were gathered through questionnaires. In the next stage of this developmental research, we started to design teaching modules based on the analysis that had been done. Material selections, lesson plans and hands-on activity for the STEM learning are at the heart of this designing stage. This stage also includes the design of research instruments such as diagnostic tests before and after the lesson for students, and all questionnaires needed for data collection. Once the modules have been designed, it gets into development stage where the designed modules are printed as prototype. These prototype modules were given to two experts for validation. Comments and feedbacks from experts are used to revise the modules until it meets the

standard criteria for 3 main aspects: materials, layout and graphics. [Table 1](#) illustrates the instrument grids for validating the designed modules.

Table 1. Expert Validation Grid

Aspects	Indicators
Materials	1. Material truth and accuracy
	2. The suitability of material with learning objectives
	3. Material novelty
Layout	1. Clear instructions
	2. Availability of examples and illustrations that supports the clarity of the presentation of learning materials.
	3. Availability of contextual practice questions, assignments, or so.
Graphics	1. Module size
	2. Unity or harmony of appearance, layout module skin elements
	3. The suitability of using letters and font sizes.

This stage also includes a pilot study in which the revised prototype modules implemented in a class outside the two classes that are the subject of this research to see the practicality of the modules. Evaluation of this pilot study is used as the basis for revising and perfecting the developed modules, before it is actual implementation. Next, in the implementation stage, the valid and revised STEM teaching modules are ready to use by teachers in class. Teachers will teach their class according to the lesson plans provided in the modules. In this implementation stage, there are 2 classes of grade 4 in one public school in Tarakan, North Borneo, Indonesia involved. Each class consists of 27 and 23 students respectively.

Last but not least, after the implementation of the STEM teaching modules, it is crucial to evaluate the implementation of the modules. This evaluation consists of evaluation from teachers who have used the modules, and also from students who have participated in the STEM learning. Those evaluations are gathered through questionnaires that ask about their response to the use of the STEM modules in their classroom. Not only evaluation of student and teacher responses but also suggestions regarding the development of teaching modules for the future. After evaluating student responses and suggestions regarding the development of the teaching module, the revision phase of the teaching module was carried out again. This stage also includes the formative assessment for the students in the end of the lesson to see their academic achievement.

3. RESULT AND DISCUSSION

Result

Analyse Phase

Analysis phase is carried out by analysing learning needs, curriculum and student learning styles. First, the analysis of learning needs was carried out through a Focus Group Discussion (FGD) with 2 homeroom teachers regarding problems they faced in teaching. The FGD concluded that the teachers experienced difficulties in teaching adaptation, especially during the pandemic using the so-called “emergency curriculum”, where interaction between teachers and students was very limited in the learning process. It is also known that teachers were constrained by the limitations of references and media used in teaching. This finding is in line with the results from direct observations we conducted in the classroom, where learning tends to be teacher-centred and relies heavily on the use of textbooks and student worksheets, as a result students are not active in the learning. In fact, the textbooks used varied and fragmented depending on the subjects. Moreover, results from interviews with students revealed that they tend to be less enthusiastic in learning because of the limited variety of learning activities such as direct practicum in class, while most students who focused on learning were those who were sitting in the front rows only. Therefore, the result of the analysis of classroom needs is the need for teaching tools for teachers that can enable students to actively participate in class. Subsequently, we conducted an analysis of student learning styles to determine the learning characteristics of each individual. Information related to student learning style was gathered through questionnaire that was given to 50 students. The result of student learning style analysis is summarised in [Table 2](#).

Table 2. Analysis of Student Learning Style

Type of Learning Style	Frequency (100%)	Total students
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Type of Learning Style	Frequency (100%)	Total students
Visual Learning Style	30 %	15
Auditory Learning Style	31 %	15
Kinesthetic Learning Style	39 %	20
Total	100 %	50

Table 2 shows that students' learning styles vary with the dominance of kinesthetic learning styles with a percentage of 39% and visual and auditory learning styles with almost the same percentage. This implies that learning needs to provide opportunities for students to participate actively in class. Thus, the designed learning needs to accommodate the varied learning styles of each student.

Furthermore, a diagnostic assessment of students is also carried out to identify the characteristics, conditions of competence, strengths and weaknesses of the student learning model. The diagnostic assessment designed consists of two assessments, namely an assessment of thematic material consisting of questions related to the shape of objects, energy changes, energy sources, fairy tale texts, characteristics of living things, as well as rights and obligations, and mathematical diagnostic assessments related to material. numbers, arithmetic operations, measurement and data analysis. The results of the mathematics and thematic diagnostic assessments of 50 fourth-grade students can be seen in Figures 2, and Figure 3 consecutively.

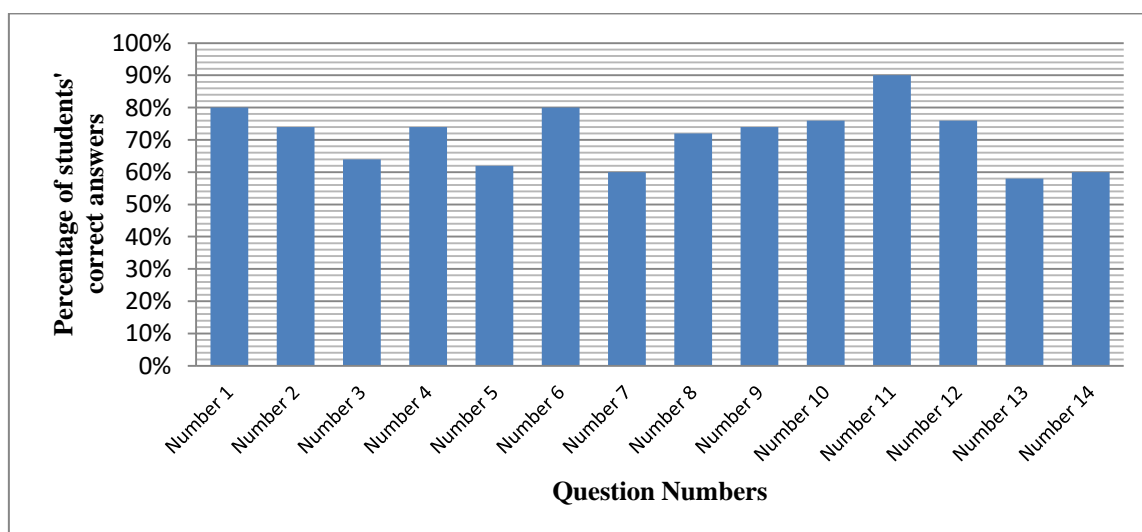


Figure 2. Mathematics Diagnostic Test Results

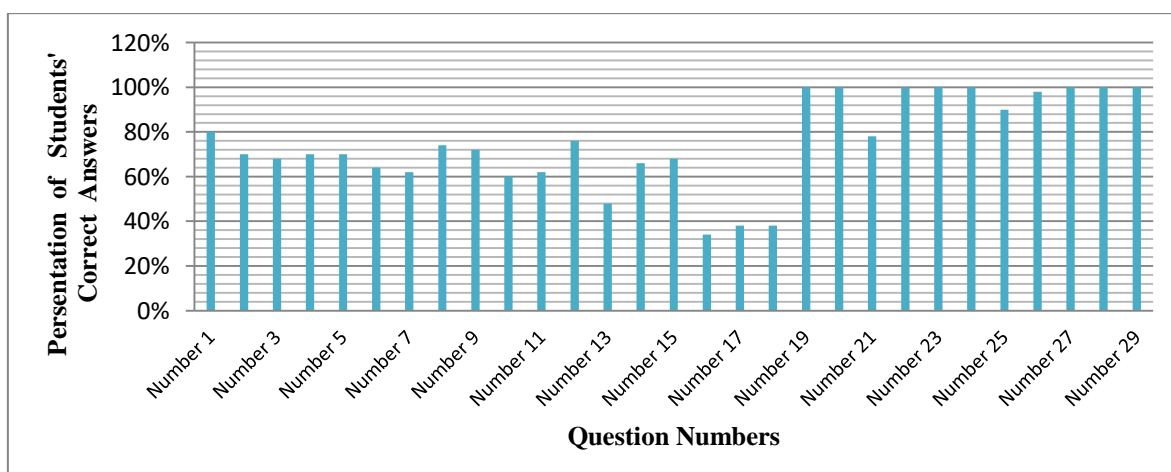


Figure 3. Thematic Diagnostic Test Results

In Figure 2, there is one significant information obtained in which the majority of students have difficulty solving mathematical problems on material related to data analysis in the form of diagrams (questions number 16, 17, 18), while the situation is inversely proportional to questions related to

numbers, arithmetic operations, and measurements. This data is used as a reference in determining the mathematics material to be developed through STEM-based teaching modules.

Furthermore, the results of the analysis of students' thematic diagnostic assessments, as presented in Figure 3, show that most students have difficulty in materials related to energy sources, but are quite good at materials related to objects, energy changes, fairy tale texts, characteristics of living things, as well as rights and obligations.

The analysis of different aspects that we did above in an effort to find out the realities and concrete problems faced by students, teachers and schools was used as a reference for us in designing and developing STEM-based teaching modules with the integration of the Pancasila Student Profile. This module is expected to be a reference for teachers in teaching STEM-based learning with the integration of the Pancasila Student Profile in an effort to increase student participation in the learning.

Design Phase

Based on the results of the analysis stages above, we came up with an idea to design teaching materials that can support learning in the classroom. So, we designed STEM modules that integrate the Pancasila Student Profile on the 9th learning theme "The Wealth of My Country", Sub-theme 1 related to the Wealth of Energy Resources in Indonesia which became a topic in the even semester of 4th grade. This designed teaching modules include the integration of 5 subjects, namely Mathematics, Science, Social Studies, Citizenship Education, Indonesian Language, and Cultural Arts. We then designed the basic competencies to be achieved through the lessons contained in these teaching modules, namely describing the benefits of solar energy, the use of natural resources for the welfare of the community.

These designed modules are composed of a cover display, a table of contents, a guide to using the module, as well as an introduction to STEM Learning and Pancasila Student Profiles. Furthermore, details related to learning objectives, learning activities, understanding meaning, worksheets, assessment sheets and other supporting attachments are also designed in these teaching modules. These modules are designed in A4 size with two different models which aim to provide alternative choices that can be used by teachers. The cover display of the designed teaching modules can be seen in Figure 4.



Figure 4. Cover Display of the Designed STEM Teaching Modules

Figure 4 show these teaching modules are designed to assist grade 4 elementary school teachers in carrying out classroom learning activities that focus on STEM learning activities with the integration of Pancasila Student Profile values in the learning series. In these teaching modules there are interrelated activities and real manifestations of Indonesian students as lifelong learners who have global competence and behave in accordance with the values of Pancasila.

Development Phase

The teaching modules that have been designed are then printed in prototype form and ready to be validated by experts. In this development stage, the designed STEM-based learning module have been revised in 4 stages. In the first stage, the design of the learning module was made too redundant in terms of colours and images. In the second stage, the preparation of learning materials that are too broad is suggested to be shorter, denser, and detailed. In the third stage of compiling the table of contents there was a misplacement, so it is recommended to place the use of teaching modules at the beginning, followed by an explanation of STEM-based learning, and the Pancasila Student Profile. In the fourth stage, the number of assessment questions is considered too many, so it is recommended to reduce it according to the competencies to be achieved.

After several times of development, the developed teaching modules are ready for final validation from experts. In general, the assessments given by experts to the designed teaching modules include material, layout and graphic aspects. The results of the judgments from these experts are presented in [Table 3](#).

Table 3. Experts' Judgement

Aspects	Score	Percentage	Category
Material	15	100 %	Very good
Layout	15	100 %	Very good
Graphic	14	93 %	Very good

Based on [Table 3](#) validation results from the experts, both material and layout aspects show the validation percentage reaches 100% which is included in the very good category. Meanwhile, the graphic aspect of the designed teaching module obtained a score percentage of 93% which is also included in the very good category. In addition to the assessment, there are also notes in the form of suggestions and improvements from these experts on the designed teaching modules. The advice given by media experts on the development of this STEM-based learning module is that the module is reproduced according to learning. These experts' judgement, thus, shows that the STEM-based teaching module developed is feasible to be used and implemented as teaching materials in the classroom.

After being declared valid and practical based on expert validation, the developed STEM teaching module was then tested on a limited basis as a preliminary study before the actual implementation. This trial was carried out in one grade 4 in a public school in Tarakan, North Kalimantan, Indonesia, with a total of 27 students and involving 1 class teacher. The results of this trial show that the use of teaching modules in learning is very practical and is used well by teachers in teaching with minor revision. In other words, the tested teaching modules are ready to be actually implemented in the classroom.

Implementation Phase

The developed modules are ready to be implemented and used by teachers in classroom learning after being revised. Teachers used the developed module as a guide in implementing STEM-based learning that can trigger students' active participation in class. Figures 5 and 6 below show class activities during the implementation of the teaching modules.

Figures 5 and 6 are the documentations from the STEM-based learning practices in grade IV with the integration of Pancasila Student Profile values. The profile of the Pancasila Lessons that have been applied to the practicum above are: 1) teamwork or cooperation, as shown in Figure 5, each group member works together in practicum activities; 2) Independence, as shown in Figure 6, each group is able to calculate the data obtained in practicum activities independently. 3). Critical reasoning, practicum activities designed in learning are designed with activities that require critical reasoning power; and 4). Creative, each group needs to be creative in assembling a series of lights from batteries as shown in [Figure 5](#).



Figure 5. Project-based Activity

Evaluation Phase

At this stage, a thorough evaluation is carried out for all stages of the process of developing STEM-based teaching modules that are integrated with the values of the Pancasila Student Profile. This evaluation is carried out specifically after the implementation of the teaching module. The evaluation concerns the level of practicality of using the module by classroom teachers, students' responses related to the STEM learning using the developed teaching module, and evaluation regarding student learning outcomes at the end of the lesson. Firstly, evaluation of the practicality of the teaching modules developed was obtained through a questionnaire to classroom teachers who used the module in STEM learning. The practical aspects that were evaluated consisted of effectiveness, interactivity, efficiency, and creativity from the developed teaching modules. The results of the evaluation related to the practicality of the developed media are presented in [Table 4](#).

Table 4. Evaluation of the Practicality Level of the Developed STEM Teaching Module

No.	Aspects	Score	Percentage	Category
1.	Effective	10	100%	Very Practical
2.	Interactive	9	90 %	Very Practical
3.	Efficient	8	80 %	Very Practical
4.	Creative	19	95%	Very Practical
Total		50	100 %	

Based on [Table 4](#) regarding the evaluation of the practicality of the developed STEM-based learning module, the total score was 46 out of 50 with an average percentage of 92% of the four practical aspects evaluated. This percentage is in the range of 80% - 100% which is included in the very practical category. Therefore, it can be concluded that this STEM-based learning module has a practical level with a very practical category so that it can be used in any STEM learning in grade 4 primary schools. The teachers also commented on the developed teaching module that it was very helpful for teachers in implementing STEM-based learning which provided a pleasant learning atmosphere for students; hence, they would continue to use the module in future lessons.

Furthermore, an evaluation was also carried out to collect student responses to a series of lessons in which their teacher used the developed teaching module as a reference in teaching. A questionnaire was given to 50 students after participating in the STEM learning. The results of the questionnaire revealed that as many as 79% of students stated that STEM-based learning modules were very useful in understanding the material, as many as 85% of students stated that STEM-based learning modules were very useful, easy to understand and fun, while as many as 81% of students stated that they were very satisfied and happy to learn using the module. STEM-based learning. Thus, the percentage of each of these aspects is in the range of 75.01%-100% which is included in the very good category. Finally, evaluation was also carried out by conducting tests on these students at the end of STEM learning. The test results of 45 of the 50 participating students scored above 80, with an average student test score of 86 out of 100.

Discussion

The findings of this current study have demonstrated that the STEM-based teaching modules created with the integration of the Pancasila Student Profile are recognized as valid, applicable, and efficient. The inspiration for this teaching module came from the needs analysis study in our analysis phase. Needs analysis itself is an integral part of a development research ([Farihah et al., 2021](#); [Yusop et al.,](#)

2015). From the needs analysis, it was found that the teacher's classroom teaching references were extremely limited for fostering a positive learning environment in elementary schools and for implementing the new Indonesian curriculum, the Kurikulum Merdeka. Also, the teacher's instructional strategy in the classroom did not take into account the various learning preferences of the pupils, based on what we observed during the analysis phase. Whereas, in general, each student essentially receives and processes information or material conveyed in learning in a unique manner. Visual learning styles (seeing and observing), auditory learning styles (listening), and kinesthetic learning styles (seeing, hearing, and moving) are the three types of learning styles (Papilaya & Huliselan, 2016; Sheromova et al., 2020). With this range of learning styles in mind, learning instruction should be planned to accommodate the varied learning styles of pupils. Additionally, the diagnostic tests given to the grade 4 students during the analytical phase of this study revealed that the majority of pupils still had trouble comprehending mathematical concepts and thematic content. We contend that students' poor academic performance is a result of the repetitive learning environment created by teachers' preferred teaching strategies. Other studies have suggested to consider developing interdisciplinary STEM activities, and particularly encourage the development of activities that relate to current events in order to promoting students learning (Barrett et al., 2014; Yu et al., 2021).

The findings obtained from the analysis phase helped us in design the STEM-based teaching modules that included the Pancasila Student Profile, one of the key components of the Merdeka Curriculum. In designing these modules, materials and activities are designed to assist teachers in planning and conducting STEM learning based on the students learning styles. Apart from that, the learning activities designed in this module place a greater emphasis on project-based learning, in which students take an active participation through interesting projects. As project-based learning places a stress on students' active engagement in the learning process, it is best suggested to use real-world events to frame lessons through authentic questions and problems in the projects they will complete (Al-Balushi & Al-Aamri, 2014; Kokotsaki et al., 2016; Mardhiyah et al., 2021). Furthermore, the designed modules were then validated by a media expert and a material expert. As stated by previous study state that an effective educational media is one that considers the graphics, contents, and layout (Sherlyane Hendri et al., 2019). The results of the validity test from the experts on the designed modules show that it broadly meets the very good criteria for each aspect of the material, layout and graphics. Thus, the developed module is feasible to be implemented directly by the teacher in classroom.

These STEM-based teaching modules have also helped teachers successfully implement STEM instruction in their classrooms where the learning process is not monotonous, because the focus of classroom learning activities is on students actively creating their own knowledge, with the instructor serving as a facilitator. Studies have shown that such learning formats that give students and teachers autonomy in their learning have a variety of positive effects, including an increase in conceptual understanding, the development of positive relationships between the teacher and the students, and the creation of a community of learners in the classroom who alternately take responsibility for their own and one another's learning (Peters, 2010; Schiller, 2002; Wisehart, 2004). The results of this study further demonstrate that using the developed modules improves students' learning outcomes, with the average student learning outcomes after learning reaching 85 and the entire class learning mastery reaching 90% of the participating students.

The educational process is expected to motivate students to acquire their own knowledge. In the 2013 curriculum, teachers can use one of the learning models, such as the STEM model, because this STEM model can help students in future generations to solve real-world problems by applying the concepts of disciplines and having critical thinking skills, collaboration and creativity (Wang et al., 2020; Yuliana et al., 2022). STEM can develop students' understanding of different roles to improve achievement, motivation, and problem solving through contextualization. STEM-based teaching modules can improve students' creative thinking skills to get interesting criteria.

STEM-based teaching modules are widely developed in various subjects and at various levels of education. This can be an alternative for teachers in using this STEM-based teaching module to improve students' critical thinking, creativity, collaboration and communication. The practicality of the teaching module is seen from the teacher's response and the student's response, that this STEM-based teaching module can improve students' creative thinking skills that are easy for students to understand. Based on the results of practicality tests and student response questionnaires, it shows that the use of teaching modules and activities in textbooks provides convenience for students in learning activities in class. According to previous study teaching materials are all materials (both texts, tools, information, and books) that are systematized and fully reflect the competencies that will be mastered by students in order to plan and study exercises and use them in the learning process (Mudhofir & Rusydiyah, 2017; Prastowo, 2017).

The existence of a teaching module in a learning activity has many benefits. These benefits include making learning activities more interesting, providing opportunities for students to study independently and reducing dependence on the presence of teachers, as well as providing convenience to students in learning the competencies that must be mastered (Amri et al., 2010; Fearnley & Amora, 2020). The effectiveness of the teaching module is the achievement of the learning objectives that have been determined. Based on the results of the validation test, small group trial, as for the advantages and disadvantages of the designed teaching modules.

The advantages of the teaching module from the aspects of validity, practicality, attractiveness, and effectiveness are as follows: (a) it has a 90% - 100% validity level (very valid). (b) textbooks that have been developed based on pictures are in accordance with the learning materials. (c) the instructions for using this STEM-based teaching module are easy to understand. (d) there is a practice at the end of the sub-theme activity. (e) there are songs that can support students' understanding of learning materials according to the themes and sub-themes. (f) the forms of activities and practice questions are varied and relatively small so that students do not get bored during the learning process. The weaknesses of this STEM-based teaching module are: 1) This STEM-based teaching module is only limited to 9 sub-theme 1 theme for class IV. The product developed in this study has advantages including: 1) Teaching modules that have been made with an attractive and unique appearance make students enthusiastic in learning. 2) students will practice more with various problems because there are worksheets and practice questions in various modules.

4. CONCLUSION

The STEM-based teaching modules with the integration of the Pancasila Student Profile that were developed in the present study have shown its feasibility as an alternative source of teaching references for teachers in carrying out STEM-based learning that integrates Pancasila Student Profile values in it. The modules are valid based on the evaluation of 2 validators. Furthermore, both participating teachers and students provided positive feedback on the developed teaching modules, after the implementation in the classroom. On top of that, students achieved very satisfactory learning outcomes and performed the highlighted values of the Pancasila Student Profile in the learning process.

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