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Teaching Module for Pancasila Student Profile Integrated Project-Based Learning: A Focus on Social Arithmetic Material for Middle School Students

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ABSTRAK

The study's intent is to find out about the Pancasila student profile strengthening project module based on project-based learning on social arithmetic material and to explain how it was made, what its prototype looked like, how valid it was, how practical it was, and how effective it was. This research involves developing a 4D model with four stages: defining, designing, developing, and disseminating. The subjects of this study were mathematics teachers and students at Public Middle School 33 and Public Middle School 6 in Makassar. The study's results show that (1) at the definition stage, it was learned that there was no P5 module related to a math topic or material, that students were not interested in learning on their own, and that pupils did not understand the concepts. (2) Design stage: During this phase, we produced prototype 1, which was the initial module design. (3) Development: The module is now in the valid category, and the module development trial is at the practical level. This process is based on how teachers and students responded to the module, how students responded to learning, observations of how the module was used, and results from learning outcome tests that showed how effective the module was. (4) Disseminate: At this stage, a summative evaluation is done to make sure that the module is useful and can improve learning outcomes. Next, they package the module and disseminate it.



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Introduction

Teachers and educators greatly influence students' success in the world of education (Alam & Mohanty, 2023). Teaching is the creation of an environmental system that allows the learning process to occur. Students often struggle to accept or understand the subject matter the teacher presents in the classroom (Kroeper et al., 2022). Teachers are unable to choose the right

learning method or model for a subject matter, so sometimes many students in the classroom are sleepy and bored (Ibrahim & El Zaatari, 2020).

We understand that identifying the appropriate method or model can be challenging. There are many types of learning methods or models, and the goodness of the method or model depends greatly on the learning objectives themselves (Vázquez-Canteli & Nagy, 2019). In essence, learning is a process in which teachers and students create a favorable environment for effective learning activities to occur (Cayubit, 2022; Rusticus et al., 2023). It is challenging to present a perfect learning method or model that can address every student's learning challenge. In reality, this learning method or model does not aim to cater to all learning types or incorporate a variety of learning styles. The creation of a learning method or model is based on the assumption that there are only certain learning methods or models that are suitable to be handled with certain learning methods or models. Therefore, specific learning requires specific learning methods or models (Janiesch et al., 2021; Shlezinger et al., 2023).

A learning model can be defined as a conceptual framework that describes a systematic procedure in organizing learning experiences to achieve certain learning goals (González-Fernández et al., 2024; Joyce & Calhoun, 2024). A series of learning activities generally follow the entire sequence of flows or steps described by the learning model. The learning model clearly shows what activities need to be carried out by the teacher or students, what the sequence of these activities is, and what specific tasks need to be carried out by students.

Teachers can use student-oriented learning models in their efforts to implement student-focused/centered learning (Abdigapbarova & Zhiyenbayeva, 2023; Kerimbayev et al., 2023). When students feel that learning is relevant to their interests and needs, they are more motivated to learn and participate actively. Students who are actively involved in group discussions and projects can develop social and emotional skills that are essential for everyday life (Blewitt et al., 2021; Fisher et al., 2020).

The project-based learning model is student-centered as a solution. Teachers use this model to address challenges in the teaching and learning process through project-based products (Farrow et al., 2024). Additionally, the project-based learning model is a learning model that uses projects by teachers giving students assignments for exploration, assessment, interpretation, synthesis, and information to produce various learning achievements (Chung et al., 2022). Project-Based Learning allows students to work on projects of their choice or that have personal relevance so that they are more involved and motivated to learn (Almazroui, 2023; Almulla, 2020). By working on projects that require an in-depth understanding of a particular topic, students will tend to remember information better and apply it in different contexts. Therefore, this model can develop 21st-century skills because it is able to develop important skills such as problem-solving, teamwork, and creativity that are very much needed in the modern world of work (Almazroui, 2023; Fallas Gabuardi, 2021). Furthermore, project-based learning fosters student initiative and responsibility for their own learning. In a study by Zhang & Ma (2023), the results showed that project-based learning can significantly improve students' learning outcomes compared to traditional teaching models. From a teaching perspective, project-based learning is more suitable for small classes of classroom teaching, and the best effect is achieved in groups of 4–5 students.

Through student-centered learning, teachers can cultivate more positive and supportive relationships with students, thereby enhancing their learning abilities and success (Kong & Wang, 2024). Therefore, one thing that teachers can try is to use teaching modules. Teaching modules can facilitate and improve the quality of learning and become a framework that describes the procedures and organization of learning according to learning objectives (Patel et al., 2018). The learning method with modules is carried out by preparing a learning package containing one unit of learning material concept to be studied independently by students. If students have mastered one unit of the learning package, they can continue to the next unit.

Schools that are members of the Pioneer School Development Project in Indonesia have developed module learning since 1974. Open middle schools and open universities continue to utilize module learning today. In module learning, students learn individually. Students can adjust their learning speed according to their respective abilities. During the learning process, students no longer act as listeners and note takers of teacher lectures, but they are active learners. In module learning, the teacher acts as a manager, director, mentor, facilitator, and motivator of student learning activities (Mamun et al., 2020). The results of the effectiveness test show that the module can improve student learning outcomes before and after it is used (Moradi et al., 2018). The developed learning module influences discipline, commitment, learning responsibility, communication, cooperation, self-confidence, and learning interest within the affective domain.

The Independent Learning Curriculum is the current curriculum in use. This independent learning curriculum is characterized by three main features (Bawadi et al., 2023). 1) Competency and character development is facilitated through the Pancasila Student Profile Strengthening Project (P5). 2) Flexible, giving educators the freedom to adapt, add richness to the subject matter, and align the curriculum with student characteristics, the vision and mission of the educational unit, and local culture and wisdom. 3) By focusing on essential content, we ensure that all students achieve minimum competencies. This approach necessitates student-centered learning.

Within the field of mathematics, there exists material that is both highly engaging and directly applicable to everyday life, one of which is social arithmetic (Harron et al., 2022). Social arithmetic studies the relationship between numbers and social life. In short, people who master social arithmetic will find it easy to live in society. Social arithmetic studies many things that are social in nature, for example, taxes, interest, profit, loss, and others. In addition, the social arithmetic material contains character values, which makes it interesting to be raised as part of a project to strengthen the profile of Pancasila students.

The results of Wulandari & Isya (2020) research show that there are character values in social arithmetic material. The character value of religious in profit and loss when getting profit is gratitude or thankfulness, while when getting loss is patience and sincerity. The character value of discipline in single interest is when making a loan by giving the requirement to pay in installments every month with a fixed nominal as a rule that must be understood. The character value of creative in discount is when the seller gives a discount to attract customers; this idea is obtained from a thinking process that involves cognitive activity, and this process is called the thinking process. When the product packaging aligns with the actual situation, it embodies the character value of honesty in gross and net tare calculations.

The development of teaching modules based on Pancasila student profiles that examine social arithmetic material presents a challenge for researchers. However, there are several previous studies related to the development of teaching modules for Pancasila student profiles, such as those conducted by Jamila et al. (2023). This study specifically examines the development of guidance and counseling teaching modules (Jamila et al., 2023).

Currently, there are still many teachers in schools who still teach conventionally by using textbooks provided by the school. Where in the textbook are all the materials discussed in one semester? Additionally, a preliminary study conducted by researchers through interviews with mathematics subject teachers at the school identified several issues. Such as teachers not having used teaching modules in the learning process, diverse student needs because each student has different learning needs, limited time, and lack of student independence in learning. Therefore, it is necessary to make renewal efforts in the implementation of learning in the classroom, for example, through teaching modules. Based on the problems described above, the objective of

this study is to find out and develop the Pancasila student profile strengthening project module based on project-based learning on social arithmetic material.

Method

Type of research

The study employs 4D model research and development. The research and development method involves producing a specific product and evaluating its effectiveness. To produce a particular product, research is used in needs analysis, and to test the effectiveness of the product so that it can function in the wider community. Research is needed to test the effectiveness of the product.

Research Subject

This research was conducted in two public schools during the 2024/2025 academic year. The research was conducted at public middle school 33 Makassar and public middle school 6 Makassar. Specifically, the subjects of this study were students of grade VII C of public middle school 33 Makassar, consisting of 28 people as subjects of the development trial, and students of grade VII F of public middle school 6 Makassar, consisting of 43 people as subjects of summative evaluation at the dissemination stage. The subjects of this study were selected using a purposive technique, namely using the criteria of classes that have average abilities based on information from teachers.

Instrument

Research instruments are tools in research used to collect data so that research activities become systematic and easier. The research instruments used in this study are validation sheets, questionnaire sheets, observation sheets, and learning outcome tests. We use validation sheets to gather feedback on expert assessments of the developed teaching modules. To improve the caliber of our instructional modules, we consider the findings of expert evaluations. The validation sheets consist of two types: design expert validation and material expert validation. The developed project-based learning teaching module uses the questionnaire sheet to collect data on student responses during the learning process. This questionnaire is a tool to measure the level of practicality of the developed teaching module. Additionally, the module implementation observation sheet collects information on how the module is implemented, which is crucial to determining its usefulness. Moreover, we use the test for learning outcomes to gauge and evaluate students' learning progress. The test sheet for learning outcomes evaluates module effectiveness following all material discussions. The criteria used are that at least 75% of the total students who take part in learning obtain a LOAC (Learning Objectives Achievement Criteria) score. The following is a presentation of the test instrument for learning outcomes in [Figure 1](#).

1. Mrs. Sri bought 10 chickens for Rp. 50.000,00 each. Then, she sold the chickens for Rp. 55.000,00 each. But this time, two chickens died. Did Mrs. Sri gain a profit or loss? Determine the amount of profit or loss obtained by Mrs. Sri!
2. Upik saved Rp. 1.000.000,00 in a bank for 1 year; the bank gave an interest of 12% per year. Determine the amount of Upik's money after 1 year of saving!
3. An electronics store gives a discount of 7% + 3% for all types of goods if paid in cash. Iwan saw the price of a watch before getting a discount on the display for Rp. 75,000. Iwan wanted to buy the watch, but he only had Rp. 65.000,00. Does Iwan have enough money to buy the watch he wants?
4. A shop sells rice, with a gross weight of 50 kg per sack. We estimate the weight of the sack to be 2% of the gross weight. Andi bought 1 sack of rice from the shop without buying the sack. If the price of rice per kg is Rp. 10.000,00, determine the amount of money that Andi must pay!

Figure 1. Learning Outcome Test

Data Collection Procedure

The data collected for analysis in this study includes learning information, the validity of the teaching module, and the responses of teachers and students to the developed module. Methods for gathering data were used to find out how valid, practical, and effective the teaching module was for the Pancasila student profile strengthening project for seventh-grade students that was based on project-based learning. In this study, validation sheets, response questionnaires, observations, and learning outcome tests were used. We used a validation sheet to assess the validity of the teaching module, a response questionnaire to gauge its practicality, and a learning outcome test sheet to gauge the effectiveness of the developed teaching module.

Data analysis

The data in this study were analyzed using descriptive statistical analysis techniques and inferential statistical analysis. Descriptive analysis was used to analyze the validation results, teacher and student responses, observations of module implementation, and learning outcome tests. We used inferential analysis to test hypotheses based on student responses, differences in average learning outcomes, classical completeness, n-gain scores, and n-gain percentages. We need the analysis results to assess the developed module's validity, practicality, and effectiveness. If these three criteria are met, the teaching module for the Pancasila student profile strengthening project based on project-based learning for grade VII students is said to have excellent quality.

Research result

According to the study's results, the Pancasila Student Profile Strengthening Project teaching module for grade VII has been built up in stages. These stages are based on Project-Based Learning on Social Arithmetic material. The study aims to elucidate the development process, prototype, validity, practicality, and effectiveness of the Pancasila student profile strengthening project teaching module, which is based on project-based learning on social arithmetic material for grade VII.

The Four-D (4D) development model is used to create a teaching module for a project that will improve the profile of Pancasila students through project-based learning on social arithmetic material for grade VII. The steps are defined, designed, developed, and disseminated. There were four steps that were taken to create a teaching module for a project that aimed to

improve the profile of Pancasila students through project-based learning of seventh-grade social arithmetic material. Here are the results.

Define Stage

At this point, the researcher conducted a comprehensive analysis of the learning process. After conducting direct observations at the school and discussing with the mathematics subject teacher for grade VII, the researcher obtained several pieces of information, namely: there was no teaching module for the Pancasila student profile strengthening project (P5) that was linked to a mathematics topic; the learning process still used textbooks that contained all topics in one semester; and there was a lack of student interest in learning mathematics. Based on the problems found, one alternative that was carried out was the development of a P5 teaching module based on project-based learning on the social arithmetic material for grade VII.

Furthermore, the student analysis revealed that the social arithmetic material was unfamiliar to the grade VII students, indicating a lack of interest in independent learning. Additionally, the students' conceptual understanding was lacking, as they were unable to connect basic concepts and apply them to various topics. The analysis of student characteristics indicates that students need to grasp and comprehend the fundamental calculations involved in the studied topics. In this study, the material or topic raised was social arithmetic; therefore, students must first master fractions or percentages as the basis for the calculations that will be used in social arithmetic. The material analysis assignment also brought up social arithmetic issues. As a result, there are a few main ideas that students need to understand: total value, per unit, part, profit and loss, single interest, rebate (discount), tax, gross, net, and tare.

Design Stage

This stage is a connecting stage between the process in phase one, the definition phase, and the design phase. At this stage, the researcher compiles the learning outcome test grid based on the specifications of learning objectives and analysis of student characteristics. The learning outcome test grid is as follows, presented in [Table 1](#).

Table 1. Learning outcome test grid

Material	Learning Objectives Flow	Question Indicator	Question Number	Question Form
Social Arithmetic	Students can understand the value of the whole, per unit, part. Students can determine profit and loss.	Presented with problems related to total value, per unit, part, and profit and loss, students can determine profit or loss.	1	Essay
	Students can solve problems related to a single interest.	Presented with problems related to single interest, students can solve them correctly.	2	Essay
	Students can solve problems related to rebates and taxes.	Presented with problems related to discounts, students can solve them correctly.	3	Essay
	Students can solve problems related to gross, net, and tare.	Presented with problems related to gross, net, and tare, students can solve them correctly.	4	Essay

The next step is media selection, which entails matching tasks and concept analysis, target user characteristics, production resources, and distribution plans with various media attributes. The media developed is a project module for strengthening the profile of Pancasila students based on project-based learning on social arithmetic material for grade VII. In addition, the

selection of formats in the development of learning devices aims to formulate the design of learning media, as well as the selection of strategies, approaches, methods, and learning resources. At this point, the project module for Pancasila students to improve their profiles through project-based learning on social arithmetic material for grade VII has been planned. It will include general information parts, core parts, and attachment parts. The project-based learning model employs a scientific approach and incorporates the discussion method as its learning strategy. The first stage of design, the teaching module for the Pancasila student profile strengthening project that combines project-based learning with social arithmetic material for grade VII, is now finished. The parts of this module are called Prototype 1 in this study.

Development Stage

The development stage aims to develop the product. This stage involves experts or validators improving the product and testing it on consumers. During this phase, the researcher prepares the research instrument for expert validation and conducts the trial. The validation process is carried out by visiting the validators and then showing the initial design of the module and the research instrument that was developed. The validators then provide comments, suggestions for improvement, and general assessments, which will later become a reference for researchers to revise the module and the research instruments that were developed. Furthermore, the revised module according to the suggestions for improvement from experts is then tested for development. We conducted the trial to ascertain and elucidate the practicality and effectiveness of the developed module. The trial was carried out in 5 learning meetings for 28 grade VII C students at public middle school 33 Makassar. Before the learning meeting, a pre-test was carried out to determine the learning outcomes of students before learning using the developed module. We asked a maths teacher at the school to observe the implementation of the module during the learning process. After the learning meeting was completed, a post-test was carried out to determine the learning outcomes of students after learning using the module. Teachers and students received the response questionnaire for the module. Students received the learning response questionnaire.

Disseminate Stage

This stage is the final stage in the development process. A summative evaluation, which includes testing on research subjects to see if the results from the development stage are still accurate, is done before dissemination or distribution. The final packaging comes after the summative evaluation, and diffusion is the last step. The purpose of the summative evaluation is to explain the effectiveness of the developed module in terms of learning outcomes. Summative evaluation consists of 3 phases: the first is an initial decision; in this phase, the researcher determines the evaluation design to be used, creates and collects tests, and selects research objects. The evaluation design used is a one-group pretest-posttest design; the test used is the learning outcome test previously used at the development stage, and the research subjects selected are grade VII F students at public middle school 6 Makassar. b. Evaluation: In this phase, a pretest is carried out first before learning; the learning process then uses the module, after which a pretest is carried out. c. Data analysis and compiling results: analyzing data obtained from the pretest and posttest and then compiling the results of the data analysis.

The goal of the diffusion phase is to make the teaching module of the Pancasila student profile-strengthening project known to as many people as possible so that it can be accepted and used. Project-based learning on the social arithmetic material for grade VII will accomplish this. Four things that need to be considered are user analysis, time, selection of distribution

media, and distribution criteria; for the sake of distribution, researchers pay attention to truth, validity, pervasiveness, impact, timeliness, and practicality.

Prototype Description

The first design stage, also known as the initial draft, led to the creation of a teaching module for the Pancasila student profile strengthening project. The initial draft called it Prototype 1, and it centered on project-based learning of social arithmetic material for grade VII. Figure 2 displays the initial design of the teaching module product.



Figure 2. Overview the initial design of the teaching module

Description of Validity Level

We ensured the validity of the developed module by comparing it with the teaching module for the Pancasila profile strengthening project. This project-based learning is based on social arithmetic material for grade VII. The validation process was carried out by two validators and received several corrections, suggestions for improvement, and assessments of the teaching module along with other research instruments that had been developed.

The results of the module validation obtained an assessment from Validator I with an average of 3.42 and met the valid category; also, the results of the module validation obtained an assessment from validator II with an average of all aspects of 3.60 and were in the valid category. For the research instrument, the average score from validator I was 3.42, which meant it was valid. For the results of the validation of the research instrument, the average score from validator II was 3.73, which also meant it was valid.

Description of Practicality and Effectiveness Level

We got information about how useful the Pancasila student profile strengthening project's teaching module was by using project-based learning to teach social arithmetic to grade VII students. This information came from teacher response questionnaires about the module, student response questionnaires about the module and learning, observation sheets for putting the module into action, and learning outcomes tests done at public middle school 33 Makassar. The results of the analysis of the teacher response questionnaire sheets for the module are presented in [Table 2](#) below.

Table 2. The teacher response questionnaire sheets for the module

No	Assessment Aspects	Percentage (%)	Information
1	Ease of use	100	Positive
2	The appeal of the dish	100	Positive
3	Benefit	83,33	Positive
	Average	94,44	Positive

The results of [Table 2](#) showed that the average percentage of all aspects of teacher assessment of the developed module is 94.44% and is in the positive category. Furthermore, [Table 3](#) presents the results of a study that examined students' perceptions of the teaching module for the Pancasila student profile strengthening project, which utilizes project-based learning for grade VII social arithmetic material.

Table 3. The student response questionnaire sheets for the module

No	Assessment Aspects	Percentage (%)	Information
1	Ease of use	81,10	Positive
2	The appeal of the dish	81,55	Positive
3	Benefit	81,14	Positive
	Average	81,26	Positive

Based on [Table 3](#) above, the average percentage of all aspects of the teacher's assessment of the developed module is 81.26%, meaning it meets the positive category. Additionally, the results of the analysis of the module implementation observation sheet are presented in [Table 4](#) below.

Table 4. The module implementation observation sheet

No	Assessment Aspects	Average Rating	Information
1	Substantial stages of the module	4	Implemented

2	Social interaction	3,86	Implemented
3	Reaction principle	4	Implemented
	Average	3,95	Implemented

Based on the table above, it can be concluded that the average observer's assessment of the implementation of the module in the learning process is 3.95, which meets the implemented category.

Next, information about how practical the module has come from a test of learning completion that was given twice to students in grade VII C at public middle school 33 Makassar. We conducted the pre-test at the beginning before learning using the module. We conducted the post-test at the end of the module's learning process. Table 5 presents the results of the learning outcome test analysis.

Table 5. The learning outcome test analysis

KKTP	Number of Students		Percentage (%)	
	Pre-test	Post-test	Pre-test	Post-test
< 80	28	4	100	14,29
≥ 80	0	24	0	85,71
Total	28	28	100	100

The results in Table 5 show that the number of students who got scores below the KKTP before learning using the module was 28, with a percentage of 100%. This indicates a lack of classical completion. While students who got scores above the KKTP after learning using the module were 24 students with a percentage of 85.71%, this shows that learning with the module has achieved classical completion, namely >75%.

Additionally, another type of statistical analysis was used to test the hypothesis. It was based on data from student learning outcome tests that were given to research subjects. With the help of R-Studio, the paired sample t-test is used to find the average difference between how well students learned before and after the intervention. Table 6 presents the following analysis results.

Table 6. Paired sample test results

Data	P-Value	Decision	Mean Difference	Information
Pre-test and Post-test	$< 2,2 \times 10^{-16}$	Reject H_0	-59,71	There is a significant difference

As the 0.05 significance level meant that the p-value was less than 0.05, it was decided to reject H_0 and accept H_1 . This was because the average learning outcomes before and after using the module were 59.71 points lower than those after using the module. Next, the normalized N-gain percentage hypothesis testing is calculated using the one-sample test with the help of R-Studio. The results of the analysis are presented in Table 7 below.

Table 7. Results of the n-gain score hypothesis test

Variables	P-Value	Decision	Average	Information
N-Gain Score	$3,46 \times 10^{-6}$	Reject H_0	82,94 %	$\mu > 76\%$

The results of the analysis with the help of R-Studio using a significance level of 0.05 obtained a p-value smaller than 0.05, as seen in Table 7. Therefore, we reject H_0 and accept H_1 . The percentage of normalized n-gain is greater than 76% with an average of 82.94%, indicating effective learning outcomes.

Discussion

Using the Four-D (4D) development model of defining, design, develop, and disseminate, we are making a teaching module for a project to improve the profile of Pancasila students. The module is based on project-based learning on social arithmetic material for grade VII. The results of the module validation were assessed by Validator I with an average score of 3.42, which means valid. In addition, Validator II assessed the module with an average score of 3.60 in all aspects, which means valid. The average score from Validator I for the research instrument was 3.42, which shows its validity. The results of the research instrument validation showed an average score of 3.73 from Validator II, which indicates its validity.

The results of the teacher response questionnaire to the module, the student response questionnaire to the module, the student response questionnaire to learning with the module, and the module implementation observation sheet show how practical the teaching module is. [Ananda & Usmeldi \(2023\)](#); [Nada et al. \(2022\)](#) stated that a questionnaire, specifically a practicality test, provided the practical data. An analysis of the level of practicality in the development trial showed that 94.44% of all the questions on the teacher response questionnaire about the module were positive, 81.26% of all the questions on the student response questionnaire about the module were positive, and 84.29% of all the questions on the student response questionnaire about learning were positive. The module implementation observation sheet yielded an average value of 3.95, indicating its successful implementation. Based on the results of this analysis, all response questionnaires to the module and learning got positive results; also, the module implementation observation got an assessment that the module was implemented in learning.

In the development trial at public middle school 33 Makassar with 28 students in grade VII C as research subjects, the learning outcome test was given. The results showed that all 28 students got scores below KKTP before learning using the module, which is 100%. This means that it has not been done in the traditional way. While students who got scores above the KKTP after learning using the module were 24 students with a percentage of 85.71%, this shows that learning with the module has achieved classical completion, namely $>75\%$. Therefore, we can conclude that the developed module is suitable for practical application.

The module's level of effectiveness is judged by how well students responded to the research questions and how well they did on learning outcome tests, specifically the results of the pre- and post-tests. These tests are then looked at for learning completeness (also called classical completeness), increased learning outcomes, and gain tests. [Logan et al. \(2021\)](#) stated that we use learning outcome test questions to assess the effectiveness of the module. The descriptive module developed got 81.03% positive responses from students, and the inferential module got 81.02% positive responses from students. This meant that H_0 was thrown out and H_1 was accepted. This means that the practicality of the module was proven by the fact that more than 75% of students who responded to it gave it a positive rating. Additionally, the learning outcome test was obtained based on descriptive posttest data, showing that a percentage of students (90.67%) obtained scores above the KKTP, while inferentially H_0 was rejected and H_1 was accepted, namely a classical completeness of more than 75%. By looking at [Hasbi et al. \(2019\)](#), we can say that classical completeness is met. According to [Wongkar & Tiwow \(2022\)](#), a class has achieved classical completion if at least 75% of its students have finished their work, as shown by the KKTP score.

The improvement in learning outcomes led to an average N-Gain score of 0.829, which is in the high category. This means that H_0 is not true and H_1 is true; that is, the average N-Gain score is more than 0.3. Therefore, we can conclude that there was a significant increase both before and after using the module. We got an average of 82.94% for N-Gain with an effective

category that means H_0 is rejected and H_1 is accepted. This means that the average N-Gain percentage is more than 76%. We can therefore conclude that the developed module is effective.

The development of a project module for strengthening the profile of Pancasila students has been carried out by [Sa'bani & Ngazizah \(2024\)](#), who created a project module for strengthening the profile of Pancasila students with the theme of local wisdom, and by [Julaidar et al. \(2024\)](#), who created an e-module for strengthening the profile of Pancasila students based on local wisdom. Both studies produced a satisfactory and quality project module for strengthening the profile of Pancasila students, but it was not linked to any material in the lesson and only focused on the process of developing student character. That's the good thing about the module that was made: it's a teaching module for strengthening the profile of Pancasila students. It connects and includes lesson material, like social arithmetic, which is one of the most important things that students need to learn. This module helps students develop their skills and character, which is what the independent curriculum is all about; it's flexible and focused on what's important.

The development of modules based on a learning model has also been widely carried out by previous researchers, by [Hayu et al. \(2023\)](#), who developed a mathematics module based on problem-based learning, and by [Gumanti et al. \(2024\)](#), who developed a module based on project-based learning. The modules produced from this research are excellent and are of quality. But the final module doesn't have the Pancasila student profile dimensions yet. One thing that makes the independent curriculum unique is that it focuses on building skills and character. This is what makes the resulting module different from previous research: in addition to developing student competencies, it also develops student character through a project to strengthen the Pancasila student profile. As [Faridahtul & Thooriq \(2023\)](#) said, the Pancasila student profile is the difference between the previous curriculum and the independent curriculum, which is the goal of a learning process related to the formation of student character.

The module components developed are in line with the explanation above; what distinguishes it from ordinary teaching modules is the Pancasila student profile section, which is part of the teaching module in the independent curriculum. In this module, there is a theme, a project title, a Pancasila student profile, and a mapping of the dimensions of the Pancasila student profile brought up in this module that are relevant to the needs of social arithmetic material, such as creativity, critical thinking, and working together. The module maps each dimension of the Pancasila student profile along with the target achievements. The module maps critical reasoning, creativity, and cooperation as dimensions in competency development, specifically around social interaction.

Conclusion

The process of developing the teaching module for the Pancasila student profile strengthening project based on project-based learning on the social arithmetic material for grade VII uses the 4D development model, which consists of 4 stages, namely Define or definition: at this stage, some information was obtained that there was no P5 module associated with a material or topic of mathematics, lack of student interest in learning independently, and lack of conceptual understanding of students. At this stage, the production of prototype 1 or the initial module design took place. At this stage, we conducted validation tests and development trials. At the dissemination or distribution stage, we conducted additional trials and, upon reaching the final stage, distributed the module.

It was judged to be valid that the teaching module for the Pancasila student profile strengthening project, which was based on project-based learning for seventh-grade social arithmetic, was valid by experts. This can be seen from the average validity of all aspects of validator 1, which is 3.42 out of a maximum of 4 with a valid category; the average validity of

all aspects of validator 2 is 3.60 out of a maximum of 4 with a valid category. It was decided that the Pancasila student profile strengthening project's teaching module for grade 7 social arithmetic based on project-based learning was practical. This was based on teacher and student response questionnaires to the module and student responses to learning and observation sheets for the module's implementation in the development trial. The teaching module for the Pancasila student profile strengthening project is also very good. It is based on project-based learning of social arithmetic material for grade VII, and it has been judged to be effective based on student learning outcomes such as classical completeness, increased learning outcomes, and N-Gain test results. As a suggestion, the teaching modules that have been developed are still limited to social arithmetic material, so it is hoped that there will be further research into developing modules that use other essential materials.

Conflict of Interest

The authors declare that there is no conflict of interest.

Author Contributions

A.R.D. conceived the research idea presented and collected the data. The other two authors (M.A.T. and R.) actively participated in the development of theory, methodology, organization, and analysis of data; discussion of results; and approval of the final version of the work. All authors affirm that they have read and approved the final version of this paper. The total percentage of contribution to conceptualization, drafting, and proofreading of this paper is as follows: A.R.D.: 40%, M.A.T.: 30%, and R.: 30%.

Data Availability Statement

The corresponding author, [A.R.D.], will make the data supporting the study's results available upon reasonable request, the authors declare.

References

- Abdigapbarova, U., & Zhiyenbayeva, N. (2023). Organization of Student-Centered learning within the Professional Training of a future teacher in a Digital Environment. *Education and Information Technologies*, 28(1), 647–661. <https://doi.org/10.1007/s10639-022-11159-5>
- Alam, A., & Mohanty, A. (2023). Cultural beliefs and equity in educational institutions: exploring the social and philosophical notions of ability groupings in teaching and learning of mathematics. *International Journal of Adolescence and Youth*, 28(1), 2270662. <https://doi.org/10.1080/02673843.2023.2270662>
- Almazroui, K. M. (2023). Project-Based Learning for 21st-Century Skills: An Overview and Case Study of Moral Education in the UAE. *The Social Studies*, 114(3), 125–136. <https://doi.org/10.1080/00377996.2022.2134281>
- Almulla, M. A. (2020). The Effectiveness of the Project-Based Learning (PBL) Approach as a Way to Engage Students in Learning. *Sage Open*, 10(3), 2158244020938702. <https://doi.org/10.1177/2158244020938702>
- Ananda, P. N., & Usmeldi, U. (2023). Validity and Practicality of E-Module Model Inquiry Based Online Learning to Improve Student Competence. *Jurnal Penelitian Pendidikan IPA*, 9(4), 2010–2017. <https://doi.org/10.29303/jppipa.v9i4.3563>

- Bawadi, S., Novaliyosi, N., Pujiastuti, H., Yuhana, Y., & Hendrayana, A. (2023). Implementation of Teacher and Student Independent Curriculum in Mathematics Learning: Systematic Literature Review. *JIIP-Jurnal Ilmiah Ilmu Pendidikan*, 6(1), 602–609. <https://doi.org/10.54371/jiip.v6i1.1292>
- Blewitt, C., O'Connor, A., Morris, H., Nolan, A., Mousa, A., Green, R., Ifanti, A., Jackson, K., & Skouteris, H. (2021). “It’s Embedded in What We Do for Every Child”: A Qualitative Exploration of Early Childhood Educators’ Perspectives on Supporting Children’s Social and Emotional Learning. *International Journal of Environmental Research and Public Health*, 18(4), 1530. <https://doi.org/10.3390/ijerph18041530>
- Cayubit, R. F. O. (2022). Why learning environment matters? An analysis on how the learning environment influences the academic motivation, learning strategies and engagement of college students. *Learning Environments Research*, 25(2), 581–599. <https://doi.org/10.1007/s10984-021-09382-x>
- Chung, C.-C., Huang, S.-L., Cheng, Y.-M., & Lou, S.-J. (2022). Using an iSTEAM project-based learning model for technology senior high school students: Design, development, and evaluation. *International Journal of Technology and Design Education*, 32(2), 905–941. <https://doi.org/10.1007/s10798-020-09643-5>
- Fallas Gabuardi, V. M. (2021). Project-Based Learning: boosting 21st century skills. *Estudios*, 43, 340–419. <https://doi.org/10.15517/re.v0i43.49335>
- Faridahtul Jannah, & Thooriq Irtifa’ Fathuddi. (2023). Penerapan Modul Ajar Berbasis Kurikulum Merdeka II UPT SD Negeri 323 Gresik. *SOKO GURU: Jurnal Ilmu Pendidikan*, 3(1), 131–143. <https://doi.org/10.55606/sokoguru.v3i1.2099>
- Farrow, J., Kavanagh, S. S., Samudra, P., & Pupik Dean, C. (2024). The promise of the project to student-centered learning: Connections between elements, curricular design, and practices of project based learning. *Teaching and Teacher Education*, 152, 104776. <https://doi.org/10.1016/j.tate.2024.104776>
- Fisher, D., Frey, N., & Almarode, J. (2020). *Student learning communities: A springboard for academic and social-emotional development*. ASCD.
- González-Fernández, R., Ruiz-Cabezas, A., Domínguez, M. C. M., Subía-Álava, A. B., & Salazar, J. L. D. (2024). Teachers’ teaching and professional competences assessment. *Evaluation and Program Planning*, 103, 102396. <https://doi.org/10.1016/j.evalprogplan.2023.102396>
- Gumanti, G., Roza, Y., & Murni, A. (2024). Pengembangan Modul Ajar dengan Menggunakan Model Project Based Learning untuk Meningkatkan Kecakapan Pemecahan Masalah Matematis Siswa SMP. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 8(1), 542–551. <https://doi.org/10.31004/cendekia.v8i1.3001>
- Harron, J. R., Jin, Y., Hillen, A., Mason, L., & Siegel, L. (2022). Maker Math: Exploring Mathematics through Digitally Fabricated Tools with K–12 In-Service Teachers. *Mathematics*, 10(17), 3069. <https://doi.org/10.3390/math10173069>
- Hasbi, M., Lukito, A., Sulaiman, R., & Muzaini, M. (2019). Improving the Mathematical Connection Ability of Middle-School Students through Realistic Mathematics Approach. *Journal of Mathematical Pedagogy*, 1(1), 37–46. <https://journal.unesa.ac.id/index.php/JOMP/article/view/7147>
- Hayu, E., Saragih, S., & Kartini, K. (2023). Pengembangan Modul Matematika Berbasis Etnomatematika Menggunakan Model Problem Based Learning pada Materi Segiempat dan Segitiga SMP. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, 7(3), 3006–3017. <https://doi.org/10.31004/cendekia.v7i3.2633>
- Ibrahim, A., & El Zaatari, W. (2020). The teacher–student relationship and adolescents’ sense of school belonging. *International Journal of Adolescence and Youth*, 25(1), 382–395. <https://doi.org/10.1080/02673843.2019.1660998>

- Jamila, J., Hasibuan Fauzi, M., & Ngayomi Yudha Wastuti, S. (2023). Modul Bimbingan dan Konseling Berbasis Project Based Learning dalam Penguatan Profil Pelajar Pancasila bagi Siswa. *Murhum: Jurnal Pendidikan Anak Usia Dini*, 4(2), 865–875. <https://doi.org/10.37985/murhum.v4i2.347>
- Janiesch, C., Zschech, P., & Heinrich, K. (2021). Machine learning and deep learning. *Electronic Markets*, 31(3), 685–695. <https://doi.org/10.1007/s12525-021-00475-2>
- Joyce, B., & Calhoun, E. (2024). *Models of teaching*. Taylor & Francis.
- Julaidar, J., Marsithah, I., & Jannah, M. (2024). Pengembangan E-Modul Projek Penguatan Profil Pelajar Pancasila (P5) Berbasis Kearifan Lokal pada Fase E. *Jurnal Penelitian, Pendidikan Dan Pengajaran: JPPP*, 5(2), 95–117. <https://doi.org/10.30596/jppp.v5i2.17017>
- Kerimbayev, N., Umirzakova, Z., Shadiev, R., & Jotsov, V. (2023). A student-centered approach using modern technologies in distance learning: a systematic review of the literature. *Smart Learning Environments*, 10(1), 61. <https://doi.org/10.1186/s40561-023-00280-8>
- Kong, S.-C., & Wang, Y.-Q. (2024). The impact of school support for professional development on teachers' adoption of student-centered pedagogy, students' cognitive learning and abilities: A three-level analysis. *Computers & Education*, 215, 105016. <https://doi.org/10.1016/j.compedu.2024.105016>
- Kroeper, K. M., Fried, A. C., & Murphy, M. C. (2022). Towards fostering growth mindset classrooms: identifying teaching behaviors that signal instructors' fixed and growth mindsets beliefs to students. *Social Psychology of Education*, 25(2–3), 371–398. <https://doi.org/10.1007/s11218-022-09689-4>
- Logan, R. M., Johnson, C. E., & Worsham, J. W. (2021). Development of an e-learning module to facilitate student learning and outcomes. *Teaching and Learning in Nursing*, 16(2), 139–142. <https://doi.org/10.1016/j.teln.2020.10.007>
- Mamun, M. A. Al, Lawrie, G., & Wright, T. (2020). Instructional design of scaffolded online learning modules for self-directed and inquiry-based learning environments. *Computers & Education*, 144, 103695. <https://doi.org/10.1016/j.compedu.2019.103695>
- Moradi, M., Liu, L., Luchies, C., Patterson, M. M., & Darban, B. (2018). Enhancing Teaching-Learning Effectiveness by Creating Online Interactive Instructional Modules for Fundamental Concepts of Physics and Mathematics. *Education Sciences*, 8(3), 109. <https://doi.org/10.3390/educsci8030109>
- Nada, Q., Zaini, M., & Ajizah, A. (2022). Implementasi e-LKPD liveworksheets archaeobacteria dan eubacteria: Pengaruhnya terhadap hasil belajar kognitif dan keterampilan berpikir kritis peserta didik kelas X MIPA. *Practice of The Science of Teaching Journal: Jurnal Praktisi Pendidikan*, 1(2), 88–96. <https://doi.org/10.58362/hafecspost.v1i2.21>
- Patel, S. R., Margolies, P. J., Covell, N. H., Lipscomb, C., & Dixon, L. B. (2018). Using Instructional Design, Analyze, Design, Develop, Implement, and Evaluate, to Develop e-Learning Modules to Disseminate Supported Employment for Community Behavioral Health Treatment Programs in New York State. *Frontiers in Public Health*, 6, 113. <https://doi.org/10.3389/fpubh.2018.00113>
- Rusticus, S. A., Pashootan, T., & Mah, A. (2023). What are the key elements of a positive learning environment? Perspectives from students and faculty. *Learning Environments Research*, 26(1), 161–175. <https://doi.org/10.1007/s10984-022-09410-4>
- Sa'bani, K., & Ngazizah, N. (2024). Pengembangan Modul Projek Penguatan Profil Pelajar Pancasila Dengan Tema Kearifan Lokal Untuk Kelas IV di SDN 2 Mranti. *Jurnal Binagogik*, 11(1), 9–17. <https://doi.org/10.61290/pgsd.v11i1.1005>

- Shlezinger, N., Whang, J., Eldar, Y. C., & Dimakis, A. G. (2023). Model-Based Deep Learning. *Proceedings of the IEEE*, *111*(5), 465–499. <https://doi.org/10.1109/JPROC.2023.3247480>
- Vázquez-Canteli, J. R., & Nagy, Z. (2019). Reinforcement learning for demand response: A review of algorithms and modeling techniques. *Applied Energy*, *235*, 1072–1089. <https://doi.org/10.1016/j.apenergy.2018.11.002>
- Wongkar, V. Y., & Tiwow, D. (2022). Implementasi Model Make A Match untuk Meningkatkan Hasil Belajar Matematika Siswa SD. *Journal on Education*, *5*(1), 564–576. <https://jonedu.org/index.php/joe/article/view/651>
- Wulandari, S. R., & Isya, W. (2020). Eksplorasi Nilai-Nilai Karakter dalam Materi Aritmetika Sosial pada Mata Pelajaran Matematika. *Pedadidaktika: Jurnal Ilmiah Pendidikan Guru Sekolah Dasar*, *7*(1), 41–53. <https://doi.org/10.17509/pedadidaktika.v7i1.26328>
- Zhang, L., & Ma, Y. (2023). A study of the impact of project-based learning on student learning effects: a meta-analysis study. *Frontiers in Psychology*, *14*, 1202728. <https://doi.org/10.3389/fpsyg.2023.1202728>

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