



# Effectiveness of Differentiated Learning in Natural and Social Science Projects Aspects of Substances and Their Changes in Realizing the Pancasila Student Profile Dimensions of Faith, Devotion to God Almighty and Having Noble Morals

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**Abstract:** This research aims to evaluate the effectiveness of differentiated learning in the Natural and Social Sciences Project (NSS Project) with a focus on aspects of substances and their changes. The application of this learning model is directed at realizing the Pancasila student profile of the dimensions of faith, devotion to God Almighty, and noble character by emphasizing the moral element towards nature. The research method used was experimentation with a control class and an experimental class. Differentiated learning is applied to the experimental class, while the control class receives conventional learning. Based on the results of the N-gain score test calculation, it shows that the average N-gain score for the experimental class (differentiated learning approach) is 57.1599 or 57.2%, which is in the quite effective category. With a minimum N-Gain value of 29.63% and a maximum of 89.67%. Meanwhile, the average N-Gain score for the control class (conventional learning) was 32.3181 or 32.3%, which was included in the ineffective category. With a minimum N-gain score of 10.875 and a maximum of 54.35%. So it can be concluded that the use of a differentiated learning approach is quite effective in increasing the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral.

**Keywords:** Differentiated Learning; Natural and Social Science Projects; Pancasila Student Profile; Have faith, have faith in God Almighty and have noble character; Morals towards Nature

## Introduction

The Ministry of Education and Culture officially launched an independent curriculum to overcome the learning crisis. The independent curriculum is synonymous with differentiated learning and the Pancasila student profile Pancasila (At'haya et al., 2023; Fadhillah, 2022). Differentiated learning is learning that is rooted in meeting students' needs both in terms of learning readiness, interests, or learning profiles and how teachers respond to these learning needs (Gheysens et al., 2022; Mahfudz, 2023; Suwartiningsih, 2021). Students are born with various characteristics and their own uniqueness (Snyder & Fromkin, 2012; Zagoto

et al., 2019). Their learning needs must of course be served as well as possible. As a teacher, in implementing independent learning, you must be able to become a facilitator for students in learning, so that their potential can develop optimally (Arviansyah & Shagena, 2022; Hadi, 2021; Ramadani, 2022). Therefore, teachers must be able to ensure that every student gets the same opportunity to learn in the best way that suits them (Alhafiz, 2022; Herwina, 2021). Through the application of differentiated learning, students will not only be able to maximize their potential, but they will also be able to learn about various important life values, which will contribute to their development in a more holistic or

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complete manner (Latifah et al., 2023; Swandewi, 2021; Wulandari, 2022).

In contrast to the 2013 curriculum, the actualization of the independent curriculum is more basic with an emphasis on forming a Pancasila student profile (Sadewa, 2022; Santika, 2022). This means that graduates will not only have knowledge competencies but also character based on national personality that must remain superior (Arifin et al., 2022). The Pancasila student profile consists of six dimensions, namely: faith, devotion to God Almighty, and noble character; independence; mutual cooperation; global diversity; critical reasoning; and creativity (Irawati et al., 2022). It is important to look at the six dimensions of the Pancasila student profile as one unit so that each individual can become a lifelong learner who has competence, character and behavior in accordance with Pancasila values (Mery et al., 2022; Musdalipah et al., 2023; Qulsum, 2022). Educators have an important role in developing these six dimensions as a whole, starting from early childhood education. To facilitate a deeper understanding of the dimensions of the Pancasila student profile, the meaning of each dimension needs to be explained and its development sequenced according to the psychological and cognitive development stages of school-aged children and adolescents (Maghfiroh et al., 2023; Windiatmoko, 2022; Wulansari, 2023). In addition, each dimension of the Pancasila student profile consists of several elements, and some elements are described in more detail into subelements (Hidayati et al., 2023; Sari et al., 2023).

To realize the Pancasila student profile, the implementation of character education must be integrated in all subjects, including the Natural and Social Science Projects on aspects of substances and their changes (Nurhayati et al., 2022). With the applied differentiated learning, it is hoped that it will be able to accommodate the dimensions of the Pancasila student profile in the Natural and Social Science Projects, especially the dimensions of faith, devotion to God Almighty and having noble morals. There are five elements in the dimension of having faith, being devoted to God Almighty, and having noble morals, namely: religious morals; personal morals; morals towards humans; morals towards nature; and state morals (Suhardi, 2022).

In this research the focus is on the moral element towards nature. As members of the environment, Pancasila students implement noble moral behavior through responsibility, compassion and concern for the surrounding environment (Irawati et al., 2022; Judiani, 2010; Wahyudi & Miftahusyai'an, 2023). They realize their role as an integral part of the earth's ecosystem that mutually influences each other (Lasaiba, 2023). This

awareness brings understanding that as humans, they have a responsibility to protect and preserve nature as a gift from God. Indonesian students who have faith, are devoted to God Almighty, and have noble morals are students who uphold their morals in their relationship with God Almighty (Istianah et al., 2021; Kiska et al., 2023). They have a deep understanding of religious teachings and personal beliefs, and apply this understanding in everyday life (Jannah, 2023; Pratama et al., 2023). This understanding encourages them to care for the surrounding environment so that it remains habitable for all living creatures, both now and for future generations. They refuse to destroy or abuse the natural environment and are willing to take an active role in stopping behavior that can harm and damage the environment. Apart from that, Pancasila students are always reflective, considering and building awareness of the consequences or impacts of their actions on the natural environment (Santika, 2020; Wahyudi & Miftahusyai'an, 2023). This awareness is the basis for them to adopt an environmentally conscious lifestyle, so that they can actively contribute to preserving the environment (Al Karim et al., 2023; Ningrum et al., 2023).

According to the results of teacher observations and interviews with colleagues and students, the learning currently taking place at SMKN 3 Jepara still uses the old pattern. Learning is still carried out classically, assuming the abilities of all students are relatively homogeneous. As a result, the absorption of knowledge by students has not been maximized, for example in learning aspects of substances and their changes, all content, processes and products in learning are the same for all students. Apart from that, the actualization of the Pancasila student profile from students is still minimal, after the Covid-19 pandemic, students' character has decreased, values such as politeness, concern for protecting the school environment, discipline, responsibility, independence and mutual cooperation are starting to fade. Many people complain about this in various places or schools.

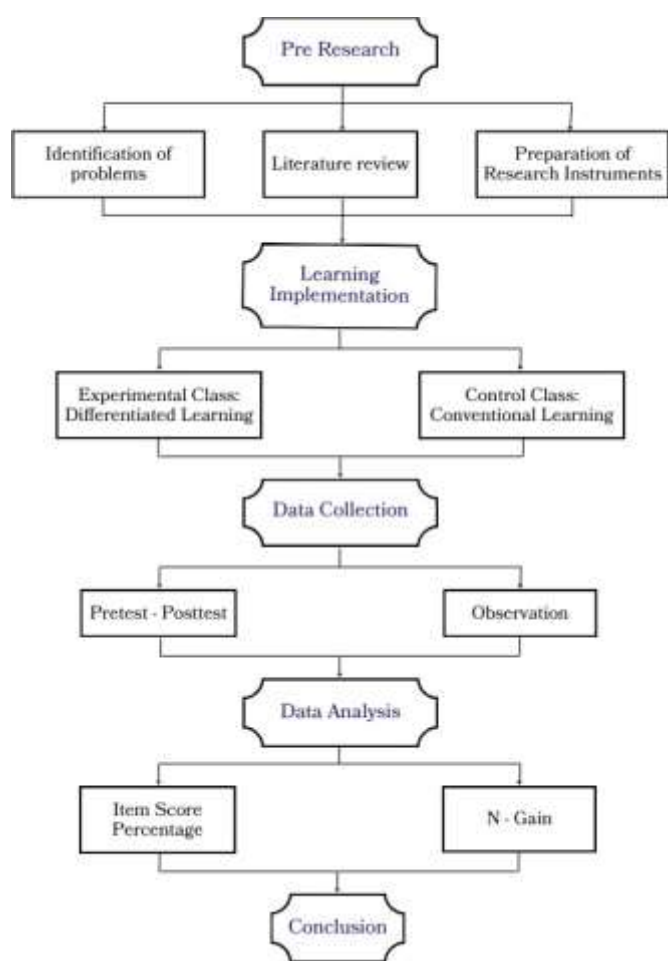
Therefore, the researcher believes that by implementing differentiated learning in the Science and Science project, aspects of substances and their changes can create a Pancasila student profile, especially the dimensions of faith, devotion to God Almighty and noble moral elements towards nature. This research is important to study because it can provide insight into the extent to which differentiated learning methods can improve students' understanding and skills in understanding the concepts of Natural and Social Science Projects in Vocational Schools, especially aspects of substances and their changes. This research can also contribute to developing the profile of Pancasila students with dimensions of faith, devotion to God

Almighty, and noble character. This is important to form a holistic student character.

The novelty of this research is evaluating the extent to which a differentiated learning approach in natural and social sciences Project subjects, especially in aspects of substances and their changes, provides better results compared to conventional learning methods. Research also does not only involve academic aspects, but also dimensions of character and Pancasila values, such as faith, devotion to God Almighty, and noble morals.

**Method**

The flow diagram related to the stages carried out in this research is depicted in figure 1.



**Figure 1.** Research flow diagram

The subjects in this research were class X students at SMKN 3 Jepara. Sampling was carried out using a cluster random sampling technique which resulted in class X AKL4 (Accounting and Finance Institution 4) as the experimental group and class X AKL3 as the control group with a total of 36 students in each class. Students carry out differentiated learning on the science and

science project on aspects of substances and their changes to test the effectiveness of differentiated learning on the science and science project on aspects of substances and their changes to realize the Pancasila student profile of students with the dimensions of faith, devotion to God Almighty and noble moral elements towards nature.

The effectiveness of differentiated learning in the Science and Science Project, aspects of substances and their changes in realizing the Pancasila student profile, the dimensions of faith, devotion to God Almighty and noble moral elements towards nature, is carried out by providing a questionnaire consisting of 20 statement items with 4 alternative answers in the sub-element of understanding the interconnectedness of ecosystems. earth and protect the natural environment. In scoring alternative answers, the author uses a Likert scale, namely always: 4, often: 3, never: 2, never: 1. Meanwhile, the item score percentage is calculated using the following equation 1.

$$\text{Score} = \frac{S_o}{S_t} \times 100\% \tag{1}$$

Information:

So: Score obtained

St: Ideal score (highest score of alternative answers x total statements)

Because the highest score of alternative answers is 4, and the number of statements is 20, then  $S_t = 4 \times 20 = 80$ . Next, the scores are interpreted according to the criteria in table 1.

**Table 1.** Pancasila Student Profile Score Criteria

Intervals (%)	Criteria
0 - 60	Not yet developed
61 - 70	Starting to develop
71 - 80	Developing as expected
81 - 100	Very developed

Apart from the questionnaire, an observation sheet was also created to find out the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral elements towards nature during the learning process. This observation sheet was filled in by the teacher in project-based learning (Project Based Learning) making products developed from the concept of substances and changes to the topic of separating mixtures. Data analysis using N-gain, this is used to determine whether or not there is an increase (Gain) in the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral elements towards nature in students who use differentiated learning (experimental class) with students whose learning does not use a differentiated

learning approach (control class). Data was obtained from the results of the pre\_test and post\_test through a student questionnaire with the following N-gain as equation 2.

$$Gain(g) = \frac{\text{post\_test score} - \text{pre\_test score}}{\text{maximum score} - \text{pre\_test score}} \quad (2)$$

The assessment criteria for the instrument of faith, devotion to God Almighty and noble morals are elements of morals towards nature as in table 2 below:

**Table 2.** N-gain Effectiveness Criteria (Hake, 1999)

Percentage (%)	Category
>76	Effective
56 - 76	Effective enough
40 - 55	Less effective
< 40	Ineffective

### Result and Discussion

The first step in the research was to carry out an initial assessment, namely a cognitive assessment by giving 5 questions using Google Form to group students based on their readiness in the experimental class, namely class X AKL4 at SMK Negeri 3 Jepara. Of the 36 students, 18 were in the less prepared group, 7 were in the quite prepared group and 11 were in the ready group. From the results of this initial assessment, researchers formed heterogeneous groups, where one group consisted of students who were less ready, quite ready and ready, so that students who were ready could become peer tutors for students who were less ready and quite ready. From the results of the initial assessment of students in one class, 6 groups can be formed with 6 members in each group consisting of 3 students who are less ready, 1 student who is quite ready and 2 students who are ready. This is in accordance with the opinion of (Tomlinson, 2001) that each student has a different learning style and level of readiness. Forming heterogeneous groups and providing differentiation in learning can increase the effectiveness of teaching and reception of information. Project-based learning, in the experimental class, takes place using differentiation of content, process and product, where the product in the Science and Technology Project is the substance aspect and its changes in the form of a water purifier prototype.

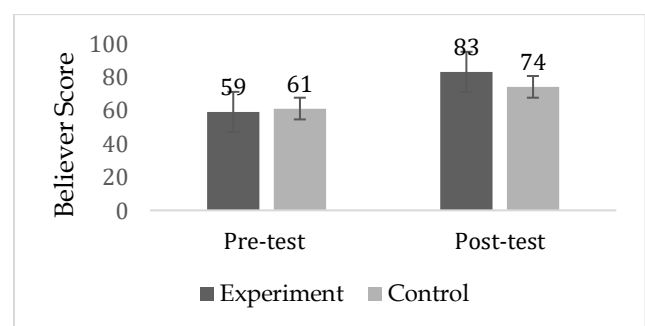


**Figure 2.** Initial cognitive assessment in the experimental class



**Figure 3.** Students Presented Water Purifier Products

The effectiveness of differentiated learning in the Science and Science Project, aspects of substances and their changes in realizing the Pancasila student profile of the dimensions of faith, devotion to God Almighty and having noble morals, elements of morals towards nature, is carried out by giving a questionnaire. The average percentage of pre-test and post-test questionnaire scores for the dimensions of faith, devotion to God Almighty and noble character, elements of morals towards nature, sub-elements of understanding the interconnectedness of the earth's ecosystem and protecting the surrounding natural environment can be seen in figure 4.



**Figure 4.** Average percentage score for moral elements towards nature

From the data presented in Figure 2, it can be seen from the questionnaire that the average percentage of pre-test scores for the experimental group was 59 and the same for the control group at 61. Meanwhile, in the questionnaire, the average percentage of post-test scores for the experimental group was 83 and for the control group was 74. The increase in post test scores in the



experimental class is in accordance with the opinion of Tomlinson (1995) that differentiated learning can increase students' understanding and involvement. This approach allows students to learn at a level appropriate to their abilities, thereby creating a more positive learning experience.

Next, a t-test was carried out to compare the means of two samples (control class and experimental class) that were not related to each other with the aim of whether the two samples had differences or not. From the results of the t test for post-test data, a sig (2-tailed) value of  $0.000 < 0.05$  was obtained, so it can be concluded that there is a significant difference in the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral elements towards nature between the participants. students who learn using a differentiated learning approach in the Science and Science Project aspects of substances and their changes with those who do not use a differentiated learning approach. This is in accordance with the findings of Hattie (2008) who stated that differentiation in teaching can have a significant impact on student learning outcomes.

Next, an N-Gain analysis is carried out, this analysis is used to determine whether or not there is an increase (Gain) in the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral elements towards nature in students whose learning uses a differentiated learning approach (experimental class) with students who do not use a differentiated learning approach (control class).

**Table 3.** N-Gain Score Test Calculation Results

	N-Gain score	
	Experiment Class	Control Class
Mean	57.1599	32.3181
Minimum	29.63	10.87
Maximum	89.47	54.35

**Table 4.** Observation Results of Pancasila Student Profiles Dimensions of Faith, Fear of God Almighty, and Noble Morals Elements of Morals towards Nature

Sub-Elements	Starting to Develop		Developing		Developing according to Expectations		Highly Developed	
	Experi-ment	Control	Experi-ment	Control	Experi-ment	Control	Experi-ment	Control
Understanding the interconnectedness of the earth's ecosystem	-	-	8	21	26	15	2	-
Protect the natural environment	-	-	2	6	30	28	4	2

From the results of observing the profile of Pancasila students in the dimensions of faith, devotion to God Almighty, and having noble morals, elements of

Based on the results of the N-gain score test calculation, it shows that the average N-gain score for the experimental class (differentiated learning approach) is 57.1599 or 57.2%, which is in the quite effective category. With a minimum N-Gain value of 29.63% and a maximum of 89.67%. Meanwhile, the average N-Gain score for the control class (conventional learning) was 32.3181 or 32.3%, which was included in the ineffective category. With a minimum N-gain score of 10.875 and a maximum of 54.35%. So it can be concluded that the use of a differentiated learning approach is quite effective in increasing the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral elements towards nature in the Science Project subject, aspects of substances and their changes in class X students at SMK Negeri 3 Jepara for the 2023 academic year. Meanwhile, classes that do not use a differentiated learning approach are not effective in increasing the profile of Pancasila students in the dimensions of faith, devotion to God Almighty and noble moral elements towards nature in the Science and Science Project subject, aspects of substances and their changes in class X students at SMK Negeri 3 Jepara in the academic year. 2023. These results provide evidence that differentiated learning in the science and science project, aspects of substances and their changes, is more effective in realizing the Pancasila student profile of the dimensions of faith, devotion to God Almighty and noble moral elements towards nature than undifferentiated learning. The high N-gain value in the experimental group is consistent with Marzano (2007) view of effective learning strategies, that effective education includes learning strategies that pay attention to the individual needs of students, namely a differentiated learning approach.

At the project stage, observations were made using an observation sheet, data were obtained in table 4.

morals towards nature in table 4, out of 36 students in the experimental class, data was obtained on the sub-element of understanding the interconnectedness of the

earth's ecosystem, 8 students were developing, 26 The students developed according to expectations and 2 students developed very well. In the sub-element of protecting the surrounding natural environment, it was found that 2 students were developing, 30 students were developing according to expectations and 4 students were developing very well. Meanwhile, in the control class, data obtained on the sub-element understanding the interconnectedness of the earth's ecosystem showed that 21 students were developing and 15 students were developing according to expectations. In the sub-element of protecting the surrounding natural environment, it was found that 6 students were developing, 28 students were developing according to expectations and 2 students were developing very well.

From the data it can be concluded that observing the profile of Pancasila students, the dimensions of the students are faith, devotion to God Almighty, and noble moral elements towards nature when learning the science and science project, aspects of substances and their changes in the project of making a water purifier, in the experimental class the results were more effective than The control class is proven by the number of students who develop according to expectations according to the phase, namely phase E in the experimental class is more than the control class. Using a differentiated learning approach in experimental classes, which involves peer tutoring and heterogeneous group work, can increase students' understanding in accordance with the principles of teaching effectiveness (Marzano, 2007).

Effective differentiated learning is able to realize the Pancasila student profile, where in this research the focus is on the dimensions of faith, devotion to God Almighty, and noble moral elements towards nature. This is in line with research on differentiated learning that is integrated with social emotional learning, by accommodating students' learning needs, the learning atmosphere becomes conducive and the learning objectives are achieved, namely realizing the Pancasila student profile (Ana, 2022). Students who have morals towards nature realize the importance of caring for the surrounding environment so that they do not damage or abuse the natural environment, so that nature remains habitable for all living creatures now and for future generations (Setyaningsih, 2022).

## Conclusion

The research results show that differentiated learning is effective in increasing students' understanding of scientific concepts about substances and their changes. Apart from that, the implementation of Pancasila values, such as faith, piety and noble

morals, can be observed in students' responses and work on IPAS projects. This learning process helps create an inclusive learning environment and supports students' holistic development. The implications of this research can provide guidance for educators to design learning strategies that not only focus on understanding scientific concepts, but also integrate moral and spiritual values. Apart from that, the results of this research can be a positive contribution to the development of curriculum and learning methods that are oriented towards building student character in accordance with Pancasila values.

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## Author Contributions

The author was involved in the entire research

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## Conflicts of Interest

The authors declare there are no conflicts of interest related to this research.

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