



## Differentiating Product and Process: Comparison of Students' Learning Outcome

Rismel Fitri. Az<sup>1</sup>, Faizah Qurrata 'Aini<sup>2</sup>

1,2, Program Studi Pendidikan Kimia, Departemen Kimia, Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Padang, Jalan Prof. Dr. Hamka, Air Tawar Padang, Sumatera Barat, Indonesia.

\*Corresponding e-mail: [faizah\\_qurrata@fmipa.unp.ac.id](mailto:faizah_qurrata@fmipa.unp.ac.id)

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**Abstract: Differentiated Product and Process: Comparison of Students' Learning Outcome.** The aim of this research was to identify difference the student learning outcome using differentiated process and product in chemical bonding topic. This research using quasi experimental study and post-test only design. Design on this research have 2 sample class, experiment I and experiment II. The population in this research consisted of 208 students with a sample of 68 students at SMAN 1 Pasaman. The data normality test is 0,031 for experiment I and 0,011 for experiment II. The item said data is not distributed normally and must be have nonparametric test. The hypothesis test was Mann-whitney and have  $0,000 < \alpha$  (0,05) with means that  $H_0$  is rejected and  $H_1$  is accepted. The result of student learning outcomes with differentiated process is 78,34 and the student using differentiated product is 52,72. From these data student learning outcomes, it can be concluded that the learning outcomes of students by using differentiated process significantly higher than using differentiated product.

**Keyword:** differentiated product, differentiated process, learning outcomes

**Abstrak: Perbedaan Hasil Belajar Siswa menggunakan Diferensiasi Proses dan Produk.** Tujuan penelitian ini adalah untuk mengetahui perbedaan hasil belajar siswa menggunakan diferensiasi proses dan produk. Penelitian ini merupakan penelitian quasi experimental dengan desain post-test only. Desain penelitian ini dibagi menjadi dua kelas sampel yang terdiri dari kelas eksperimen I dan eksperimen II. Populasi pada penelitian ini terdiri dari 208 siswa dengan sampel 68 siswa di SMAN 1 Pasaman. Data yang diperoleh pada penelitian dilakukan uji normalitas dengan hasil 0,031 untuk kelas eksperimen I dan 0,011 untuk kelas eksperimen II. Hasil ini menunjukkan bahwa data yang diperoleh tidak berdistribusi secara normal sehingga dilakukan uji hipotesis nonparametrik. Uji hipotesis yang digunakan yaitu Mann-Whitney yang menunjukkan hasil  $0,000 < \alpha$  (0,05) dengan hasil  $H_0$  ditolak dan  $H_1$  diterima. Hasil belajar siswa yang melakukan diferensiasi proses yaitu 78,34 sementara siswa yang melakukan diferensiasi produk yaitu 52,72. Dari data hasil belajar tersebut dapat disimpulkan bahwa hasil belajar siswa yang menggunakan diferensiasi proses lebih tinggi secara signifikan dibandingkan dengan siswa yang menggunakan diferensiasi produk.

**Kata kunci:** diferensiasi produk, diferensiasi proses, hasil belajar



## ▪ INTRODUCTION

The merdeka curriculum is a renewal curriculum that aims to maximize the competencies possessed by students (Kemdikbud, 2022). In seeing the achievement of a material can be seen from the criteria for achieving learning goals (KKTP) through a test that shows student learning outcomes. Based on a questionnaire that has been distributed to 167 students at SMAN 1 Pasaman, the results show that 51.45% of students have difficulty in learning chemistry because they still go through a learning process that tends to take a lot of notes. This can be proven based on student learning outcomes through midterm assessments from six classes obtained results that 63.94% of students are below KKTP. Grades that are below KKTP are caused by not adjusting to the abilities possessed by each student both in learning readiness, interest, and learning profile. One solution that can be done in overcoming this difficulty is to use a differentiated learning approach.

Differentiated learning is an approach in learning based on students' learning characteristics through content, process, and product to be able to achieve learning goals by maximizing students' competencies based on readiness, interests, and learning profiles (Tomlinson, 2017). Teachers will accommodate students to find the best steps in the differentiated learning process so that students will find material concepts in various ways that are easy to understand (Sedeño et al., 2021) and a complex learning process (Dixon et al., 2014). In the merdeka curriculum, learning is required to use a differentiated learning approach that aims to maximize student competence so that learning goals can be achieved by each student (Kusuma & Luthfah, 2020). One of the differentiated learning bases that can support student learning needs is based on learning readiness (Mitee et al., 2015) by differentiating the process and product.

The implementation of differentiated learning activities based on learning readiness will show the temporary condition of students in facing learning activities. This will fluctuate in response to students' initial abilities (Tomlinson & Imbeau, 2023). Learning activities that prioritize student readiness will be better than prioritizing student ability (Tomlinson & Imbeau, 2023). Learning activities that are carried out based on readiness will help to improve learning outcomes (Gheysens et al., 2022). By using readiness learning will make it easier for teachers to plan learning activities based on initial assessments (Siam & Al-natour, 2016) the learning process will be more adapted to the initial abilities possessed by students (Tomlinson, 2001).

Each step that students go through so that learning objectives can be achieved is referred to as differentiated process (Borja et al., 2015). Learning carried out with process differentiation has tiered activities ranging from basic levels to levels of complexity that are able to optimize each student's classroom experience. In differentiated process, students are given direction at various levels of need and adjust to the power or speed of students in analyzing. The learning activities created by the teacher are aligned with the preferred learning modalities and become the focus of students. Teachers need strategies to facilitate the exploration of learning topics with higher order thinking, open thinking, discovery, reasoning and research (Joseph, 2013).

Differentiated product is a summative assessment to determine the level of student understanding in demonstrating knowledge (Taylor & Taylor, 2015) and skills after the learning process (Joseph et al., 2013). Product differentiation can develop students' creativity (Altıntaş & Özdemir, 2015) and knowing how students design knowledge based on learning goals (Melesse, 2015). In differentiated product, teachers will pay more attention to the products students produce than to the process and content (Ismajli & Imami-Morina, 2018). The strategies provided by teachers in developing and planning products are key to the success of product differentiation in improving student learning outcomes (Joseph et al., 2013).

## • METHOD

The type of research was quasi experimental (Sedeño et al., 2021) using a post-test only design. This research was conducted in the even semester of the 2022/2023 school year at SMAN 1 Pasaman. The population in this study was six classes totaling 208 students grade X. The sampling technique used was purposive sampling. Based on this technique the sample is taken based on a specific purpose

(Rukminingsih et al., 2020). The class selected as the sample is class X 1 as experiment I class and X 4 as experiment II class.

**Table 1.** The Research Prosedured

| Preparation Stage                                                                                                                                      | Implementation Stage                                                                                                                                                                                                                                                                                                                                                                                                                                  | Completion Stage                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Apply for a permission letter to the school</li> <li>• Determining the experimental class I and II</li> </ul> | <ul style="list-style-type: none"> <li>• Three days before the learning process is implemented, students are given a pre-test (readiness)</li> <li>• Dividing student groups based on pre-test</li> <li>• Experimen I was treated using differentiated process</li> <li>• Experimen II was treated using differentiated product</li> <li>• During the learning process both classes were assisted with the guided discovery learning model</li> </ul> | <ul style="list-style-type: none"> <li>• Data collection of post-test results</li> <li>• Analyzing and testing post-test data</li> <li>• Drawing conclusions</li> </ul> |

The instrument used in this study is the SEDToC instrument developed by Rahayu and Fitriza with chemical bonding topic (Rahayu & Fitriza, 2021). This instrument is a structured essay consisting of 35 questions, each question answered correctly is given a score of 1 and wrong is given a score of 0. This instrument is used to provide concept understanding about chemistry topic (Fitriza et al., 2020) and correct misconceptions in chemical bonding topic because chemical bonding material is one of the materials that is quite difficult to learn because it is abstract (Rahayu & Fitriza, 2021).

The learning outcomes data obtained were then analyzed using a normality test using Kolmogorov-Smirnov (Malmia et al., 2019), homogeneity test, and hypothesis test (Rukminingsih et al., 2020). The level of completeness of student learning outcomes was analyzed using the criteria for achieving learning goals (KKTP). The place of research implementation is SMAN 1 Pasaman using the criteria for achieving learning goals of 75.

## • RESULT AND DISCUSSION

In this study, learning outcomes were obtained from post-test scores as learning outcomes from the cognitive domain. Based on the student post-test scores that have been analyzed, student learning outcomes in both sample classes are obtained. As in the following table

**Table 2.** Learning Outcomes of Sample Classes

| Class          | Post-test Average |
|----------------|-------------------|
| Eksperiment I  | 78,34             |
| Eksperiment II | 52,72             |

Based on table 1, the average value in experiment I class is higher at 78.34 compared to experiment II class which is 52.72. Data on post-test scores were analyzed to be able to draw conclusions carried out through statistical tests so that a conclusion was obtained based on the results of hypothesis testing. Before hypothesis testing, data analysis was carried out with normality test and homogeneity test. The results of the normality test can be seen in the table below

**Table 3.** Normality Test

| Class          | A    | N  | Sig.  | Decision                 |
|----------------|------|----|-------|--------------------------|
| Eksperiment I  | 0,05 | 32 | 0,031 | Not normally distributed |
| Eksperiment II |      | 36 | 0,011 |                          |

Based on table 2, it can be seen that in experiment I class which has a significance value of  $0.031 < \alpha (0.05)$  and in experiment II class of  $0.011 < \alpha (0.05)$ . This shows that the data in experiment classes I and II are not normally distributed. The normality test is carried out to determine whether the data obtained on the sample is normally distributed or not. When the data obtained is not normally distributed, parametric tests cannot be carried out (Khatun, 2021) and must use nonparametric analysis.

Furthermore, the homogeneity test was carried out on the sample class. The homogeneity test is carried out to determine the variance of the data in the homogeneity sample or not. A data can be said to be homogeneous if the significance value is more than 0.05 ( $\alpha$ ) (Parra-Frutos, 2013). Based on the results of the homogeneity test conducted, the significance value of the sample is 0.010. This states that the data in the sample does not have a homogeneous variance.

Hypothesis testing was carried out based on nonparametric tests because the data was not normally distributed (Pednekar et al., 2022) and the variance was not homogeneous. The hypothesis test using Mann-Whitney because it has 2 independent sample classes (Orcan, 2020) and used to compare differences between two independent classes (Pednekar et al., 2022). The results of hypothesis testing in both sample classes obtained a significance value of  $0.000 < \alpha (0.05)$ . if the hypothesis value less than ( $\alpha$ ) 0,05 this indicates that  $H_0$  is rejected and  $H_1$  is accepted (Simbolon & Juniar, 2023). The acceptance of  $H_1$  means that the post-test value of experimental class I is significantly higher than experimental class II. This shows that the implementation of the learning process using differentiated process has more effect on student learning outcomes than using differentiated product. The following is a comparison of the learning outcomes of the two sample classes

**Table 4.** Comparison of Learning Outcomes of Sample Classes

| Class          | N  | Percentage of Completion | Average |
|----------------|----|--------------------------|---------|
| Eksperiment I  | 32 | 56,25%                   | 78,34   |
| Eksperiment II | 36 | 27%                      | 52,72   |

Based on table 3 shows that the average of the experiment I class is higher than the experiment II class. The criterion value for achieving learning objectives at SMAN 1 Pasaman is 75, based on the data in table 3, experiment I class has a percentage of completeness of 56.25% while in experimental class I only 27%. This shows that using differentiated process has an influence on learning outcomes because by differentiating the process the teacher adjusts to the way students understand learning material. Differentiated process is an activity in the learning process that gives students the possibility to retain, apply, and transfer material to students. In process differentiation, the activities given to students must make sense, and help students solve the problems they find (Tomlinson & Imbeau, 2023). The differentiation of the process carried out is adjusted based on the learning readiness possessed by students by grouping students based on their learning readiness. Grouping students based on their learning readiness will facilitate the learning process because students carry out learning activities by reviewing basic material before entering the learning material being implemented. Learning readiness shows a temporary and fluctuating condition in response to curricular changes and high-quality teaching. In learning activities, paying attention learning readiness is better than the ability possessed by students because it benefits both teachers and students (Tomlinson & Imbeau, 2023). Learning implemented with process differentiation provides flexibility in forming student groups (Magableh & Abdullah, 2020).

Experiment II class used differentiated product. Differentiated product is a way for students to demonstrate the understanding and knowledge that has been obtained in the learning process (Tomlinson & Imbeau, 2023). In the implementation of product differentiation, students are more

grouped based on the work that students are interested in at the end of the learning process so that students are able to expand the knowledge that has been obtained during learning activities. The learning activities require students to be more actively involved in learning to find a concept in a learning material with more efficient and accurate information (Tomlinson & Imbeau, 2023). However, during the implementation of the study students tended to rely on the ability of higher discussion partners to solve the problems found and contributed less during the discussion process. This resulted in students who tended to rely on the ability of discussion partners not forming concepts properly so that the learning outcomes illustrated that differentiated product was less effective in the learning activities carried out.

An important target in seeing the achievement of learning objectives is learning outcomes. Learning outcomes are usually expressed in knowledge, skills and attitudes. However, to define learning outcomes can be carried out in various forms according to the objectives expected by the teacher who carries out learning activities (Balgan et al., 2022). In learning activities, teachers have an important role in planning and assessing student learning outcomes. This is in line with the implementation of differentiated learning which starts the learning process based on students' learning needs (Smale-jacobse et al., 2019) and uses diverse asesments (Anggraena et al., 2022). The learning process can also be assisted by interactive media that can be improve the student learning outcome (Nuranisah & Aini, 2022).

## • CONCLUSION

Based on the results of this research, it can be concluded that there are differences in student learning outcomes using process and product differentiation. The learning outcomes of students by use differentiated process are significantly higher than students who learn using differentiated product on chemical bonding topic at SMAN 1 Pasaman. Differentiated learning is an merdeka curriculum demand that can accommodate a variety of student needs, so that the implementation of this research can be a reference in carrying out learning activities according to curriculum demands. The implementation of differentiated learning is entirely the responsibility of the teacher in determining the bases of differentiating and strategies in implementing differentiating. Differentiating of product and process implementated on bases of readiness is very suitable for the needs of students at SMAN 1 Pasaman because with it students become more well cared for and use uncomplicated infrastructure. However, the result of this research are not very satisfying for differentiated product, so that it still needs deeper evaluation and becomes an alternative chosen in the learning process.

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