The effect of differentiation learning on students' communication and collaboration skills on environmental change materials

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ARTICLE INFO	ABSTRACT
	The purpose of this study is to determine the influence of differentiated learning on communication and collaboration skills of tenth-grade high school students at a school in Central Java on the topic of environmental change. The research method used was a Quasi Experiment with a posttest only-matching-only control group design. The population in this study is all high school class X students with a total of 288 students divided into 8 classes. In this study using the Non-probability Sampling technique in the form of purposive sampling. The samples in this study were class X E as the experimental class, totaling 36 students and class X G as the control class, totaling 36 students. The data collection technique was in the form of a non-test using a Collaboration Self-Assessment Tool (CSAT) questionnaire with 44 statement items and an oral communication skill observation sheet with 5 indicators as an aspect of observation. The data analysis technique used is the One Way Anova Test. Based on the results of the study, it was concluded that the use of differentiation learning strategies can improve students' communication and collaboration skills on environmental change materials.

INTRODUCTION

The condition of Indonesian education, viewed from various national and international studies, proves that it is experiencing a learning crisis or learning loss. Learning Loss is a situation where students have lost knowledge and skills either generally or specifically or can be called an academic setback due to a prolonged gap resulting in disruption of the learning process (Hanafiah et al., 2022). To overcome this, the government is looking for a solution by making systematic changes through curriculum changes. The curriculum implemented to overcome these problems is adapted to student needs, and attention must be paid to the achievement of student competencies in the education unit in the context of learning recovery. The government provides three options, one of which is the Independent Curriculum (Kemdikbud, 2022).

The choice of an independent curriculum to overcome learning loss is in accordance with Government Regulation no. 57 of 2021 concerning National Education Standards, regarding the necessity to develop a curriculum that can be diversified according to the characteristics of regions, educational units and students. In implementing the independent curriculum, teachers have the freedom to choose various teaching tools so that students can understand the content according to student characteristics. Apart from that, the government also implements character project learning which is implemented in the Pancasila student profile (Kemdikbud, 2022). The profile of Pancasila students is relevant to 21st-century skills, where the character developed is related to skills such as critical thinking, creative, collaboration and communication.

Based on a preliminary study through an interview with the biology teacher for class marked by a decline in academics, especially in students' communication skills and collaboration skills. Mrs. Yanisa saw the decline in the communication skills of class Apart from that, the topics communicated during learning are also outside the context of biological material. Then apart from communication skills, students' collaboration skills are also considered lacking. When collaboration takes place, there should be a process of exchanging thoughts or ideas to solve a given problem, but in reality many students only rely on other students who are considered smart to solve it. Collaboration skills are essential to be developed during the science learning process (Ilma et al., 2022). Apart from that, in the process of teaching and learning activities, the teacher still applies the teacher-centered principle, which is in line with the instructions (Kemdikbud, 2022) in learning that applies an independent curriculum, the teacher only acts as a facilitator for students.

Based on the background of the problems that occurred, it is necessary to implement a learning effort that can overcome the problem of decline in the areas of student communication skills and collaboration skills. According to Zulfa & Rosyidah (2020) One way to help improve collaboration skills is by having good communication skills. Because with good communication, ideas will be conveyed, and solutions will emerge when collaborating. Communication plays a role in building relationships between teachers and students, or students and students. Hayat et al., (2019) stated that in studying biology these two skills play an important role. Because when studying biology, students not only have to have a scientific nature, but students also have to be able to communicate their ideas and be able to build teamwork which will help them solve problems.

Efforts that can be made by using Differentiated Learning strategies. Differentiated learning according to Tomlinson (1999) is a teaching and learning process where students can learn subject matter according to their abilities, what they like and their individual needs, therefore in its implementation the class must have diversity by providing equal opportunities for all students to achieve content, process ideas and improve results each student's learning so that they can learn more effectively. Differentiated learning itself has a student-centered concept, where teachers must be able to coordinate and collaborate on the different interests, potential and talents of different students with appropriate strategies (Faiz et al., 2022). Differentiated learning can be implemented by this school with an independent curriculum, because in this learning students can be free in learning, they are not required to be the same in everything, but can express themselves according to their own uniqueness or in other words this learning can liberate students (Purba et al., 2021) This research is more specific in applying differentiated learning to the concept of environmental change.

In the Merdeka Curriculum, biology subjects learning outcomes include Students have the ability to create solutions to problems based on local or global issues from their understanding of the diversity of living things and their roles, viruses and their roles, the application of biotechnology, ecosystem components and interactions between components and environmental changes (Kemendikbudristek BSKAP, 2022). The biological material used in this research is environmental

change material. In this environmental change material, students are required to be able to create solutions to problems based on local or global environmental change issues, therefore good communication and collaboration skills are needed so that students can solve problems with good communication and good teamwork.

This research aims to determine the effect of differentiation learning on the students' communication and collaboration skills on environmental change material. The application of differentiated learning provides freedom based on students' interests to choose work flows and interests in choosing presentation methods. So that later students will carry out learning that suits their characteristics and this learning can provide experience and become meaningful learning for students. The expected results through this differentiated learning are that it can improve students' communication skills and collaboration skills by giving students freedom based on their interests.

METHODS
Research Design

In this research, the method used was Quasi-Experimental Design. According to (Sugiyono, 2015). This research developed from true experimental design research, which is difficult to carry out, whereas in the Quasi-Experimental Design, the control group does not function fully to control external variables that influence the implementation of the experiment. The subjects of this research were class X students from one of the senior high schools in Purbalingga, Indonesia. Sampling in this study used a non-probability sampling technique in the form of purposive sampling.

The research design used in this study was the matched-only posttest-only control group design. In this study, researchers used two class groups, namely control and experiment. In the control group, learning was carried out without differentiation. Meanwhile, in the experimental class, learning is carried out by applying product differentiation. From the results of implementing the treatment in both class groups, the average post-test score was obtained. Where later the average value will be compared between the average value of the control class and the average value of the experimental class. This comparison is used as a factor in determining whether there is a significant difference in the effect of using differentiated learning on improving communication and collaboration skills between the two classes. In this study, differentiated learning was used as an approach, and the learning process employed the project-based learning (PJBL) model for the experimental class and the direct instruction model for the control class.

Population and Samples

The population in this study consists of 8 grade X high school classes, with a total of 288 students. Purposive sampling was used in this study, selecting class X F, consisting of 36 students, and class XG, also consisting of 36 students. The class samples selected in the research paid attention to student characteristics that were assessed as almost the same by the teacher. Determination of the experimental class and control class was carried out by random drawing, obtaining the results for the experimental class, namely class X F, while the control class was class X G.

Instrument

The instruments used in this research were observation sheets to measure oral communication skills and CSAT questionnaires to measure collaboration skills. This observation sheet instrument is filled in by the teacher with 5 indicators in it. Teachers assess students using this observation sheet when students work on reports on discussion results during learning. Oral communication can be measured with an instrument in the form of an observation sheet which contains 5 indicators of oral communication. Each indicator has three scale indicators (1 to 3) which are presented in a narrative description at each level. The 5 indicators of communication skills used can be seen in Table 1.

The oral communication observation sheet instrument must be tested before being used in research. The test used is the construct validity test from expert opinion or experts' judgment. This expert judgment has carried out by the Biology Education assessment lecturer. Then, based on comments and suggestions from expert judgment, a trial was carried out with observers. In the trial, the researcher and two observers equalized the perception of the assessment so that later when the observation sheet was used, the assessment between the researcher and the observer could be the same in objectively assessing the student's communication skills.

Table 1

Oral Communication Skills Observation Sheet Grid

No	Indicator	Item Number
1.	Convey ideas orally	1
2.	Reveal the results of the conversation	2
3.	Identify the mood of the interlocutor	3
4.	Influence the other person in a positive way	4
5.	Deliver presentations according to plan to the audience	5

Source: (Harris et al., 2007)

The research instrument used to measure collaboration skills is the Collaboration Self-Assessment Tool questionnaire. This instrument was given to students in both classes, control and experiment. This questionnaire has 11 indicators to measure collaboration skills in students. Each indicator has four scales (1 to 4, with 1 = lowest level of achievement and 4 = highest level of achievement) which are presented in a narrative description at each level. The indicators that will be used in this questionnaire can be seen in Table 2.

Table 2

Collaboration Questionnaire Grid

No	Indicator	Item Number
1.	Contribution	1
2.	Motivation/ Participation	2
3.	Quality of Work	3
4.	Time Management	4
5.	Team Support	5
6.	Preparedness	6
7.	Problem Solving	7
8.	Team Dynamics	8
9.	Interactions with Others	9
10.	Role Flexibility	10
11.	Reflection	11

Source: (Ofstedal & Dahlbergh, 2009)

Just like the communication skills instrument, in the CSAT questionnaire instrument, the validity test used is the construct validity of expert opinion. After being validated by experts, researchers will give this questionnaire instrument to respondents for language or readability testing. This is in line with Sukmadinata in (Saftina et al., 2018) which says that with a readability test, a feasibility value will be obtained from the product being developed and it is also hoped that there will be good input in the form of comments, suggestions and criticism for improving the product. Apart from that, this test also aims to find out which sentences in the question items are not understood and to find out how much time the respondent needs to allocate for processing. The readability test was carried out on a small scale, namely carried out by 11 students of class X F. These 11 students of class biology. When carrying out the Readability Test, several words in the indicators were not understood by students. In indicator number 4 "Time management" 5 students did not understand the meaning of "deadline" so the author changed it to "time limit". And in the "Reflection" indicator, students do not understand the meaning of the word "Reflection" so the alternative "reflection or self-introspection" is added. Then, the time required for 3 participants to complete the questionnaire is 10 minutes. 4 participants 13 minutes. And 4 people for 15 minutes. Based on the results of the readability test, to make it easier for students to work on it, several sentences in each indicator are adjusted to the students' understanding without changing the meaning of the validated questionnaire source. Then, based on the time that had been completed by the students, the author decided that 15 minutes would be given to complete the Collaboration Self-Assessment Tool questionnaire.

Procedure

This research involved two classes, namely the experimental class and the control class. In its implementation, the experimental class was treated using a differentiated learning strategy using the PJBL learning model. Meanwhile, the control class in this study used the Indirect Instruction strategy with the PJBL learning model. The differentiated elements in learning in the experimental class are

process and product elements. Before carrying out treatment, a diagnostic assessment was carried out in the experimental class. The results of this diagnostic assessment are the basis for selecting which elements will be differentiated. After determining a differentiation strategy with process and product elements that have been adapted to student characteristics, the next step is to carry out differentiation learning in the experimental class according to the PJBL model. For the control class, learning is carried out as usual using the PJBL model.

After learning in both the experimental and control classes is complete, data collection for the communication skills questionnaire will be taken when students are making product presentations/demonstrations. Meanwhile, the CSAT questionnaire will be filled in by students at the end of the lesson and both results from the observation sheet and CSAT questionnaire will be used as a post-test which will be compared between the experimental and control classes.

Data Analysis Techniques

The data used in this research is post-test data for both the control class and the experimental class. This data will later be compared between the post-test scores of the control class and the experimental class. This comparison is used as a factor in determining whether there is a significant difference in the effect of using differentiated learning on improving communication and collaboration skills between the two classes. The research data was initially analyzed using the Kolmogorov-Smirnov test to determine whether the research data was normally distributed or not. After that, the research hypothesis was tested using the One-Way ANOVA test with a significance level of 5%, to determine the effect of differentiated learning on communication skills and collaboration skills.

RESULTS AND DISCUSSION

After taking the post-test results using the observation sheet and CSAT questionnaire, it was found that the two data results were normally distributed because they had a significance value greater than 0.05. For communication skills, the experimental class has a significance value of 0.094 and the control class has a significance value of 0.159. So, it can be stated that the data resulting from critical thinking skills in the experimental class and control class are normally distributed with Sig > α that is 0.094 > 0.05 dan 0.159 > 0.05. In terms of collaboration skills, the experimental class has a significance value of 0.200 and the control class has a significance value of 0.195. So, it can be stated that the data on creative thinking skills in the experimental class is normally distributed at 0.200 > 0.05, while in the control class, the distribution was normal at 0.195 > 0.05.

After carrying out a normality test, the data from observations of communication skills and the data from filling out the CSAT questionnaire were subjected to a homogeneity test to find out whether the data came from homogeneous data variance or not. The homogeneity test results show that communication skills obtained a significance value of 0.922, while collaboration skills obtained a significance value of 0.951. So, the data on communication skills and collaboration skills comes from homogeneous data variance.

Table 3
Test one-way ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Collaboration Skills	Between Groups	150.222	1	150.222	12.181	0,001
	Within Groups	863.278	70	12.333		
	Total	1013.500	71			
Communication Skills	Between Groups	19.014	1	19.014	4.638	0,035
	Within Groups	286.972	70	4.100		
	Total	305.986	71			

In Table 5 it can be concluded that the analysis using one-way ANOVA shows the significance value of communication skills, namely 0.035, this value is <0.05, so H_0 is rejected. So, it can be concluded that the hypothesis has been proven correct, there is a significant influence of differentiation learning on students' communication skills. Then the results of the analysis of students' collaboration skills, have a significance value of 0.001, the value is <0.05, so H_0 is rejected. So, it can be concluded that the hypothesis has been proven correct, there is a very significant influence of differentiation learning on students' collaboration skills.

To find out whether there is a joint or simultaneous influence of differentiation learning on communication and collaboration skills, it is necessary to carry out an F test, whereby looking at the F value in the ANOVA table, the level of significance used in this test is 0.05. Data from the F-test analysis results with the help of SPSS Version 29 For Windows software can be seen in Table 6.

Table 4
F Test Collaboration Skills and Communication Skills

| Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	643.516	2	321.758	60.006	.000b
	Residual	369.984	69	5.362		
	Total	1013.500	71			

a. Dependent Variable: Collaboration Skills
b. Predictors: (Constant), Communication Skills

Based on Table 6, it can be obtained that the decision H0 is rejected. It can be seen from the F count of 60.006 with the resulting significance being 0.000 which is smaller than 0.05. This means that there is a very significant influence of differentiation learning on communication and collaboration skills.

The Effect of Differentiated Learning on Collaboration Skills

After processing the data, the research results prove that there is an influence of the use of differentiation learning strategies on students' collaboration skills. The results of data processing using the one-way ANOVA test of students' collaboration skills have a significance value of .001, this value is less than 0.05, so H_0 is rejected, which means that there is a very significant influence of differentiation learning on the collaboration skills of grade X. Apart from that, in Picture 1 you can also see that there is a difference of 2.89 compared to the average CSAT questionnaire score for the experimental class which has a higher average score of 32.86, compared to the control class which has a lower average score. namely 29.97. This is in line with the statement from (Almujab, 2023) which states that differentiated learning can answer current educational challenges by helping students to complete 21st-century skills, including problem-solving, creativity, communication, and collaboration. By paying attention to the interests and potential of each student.
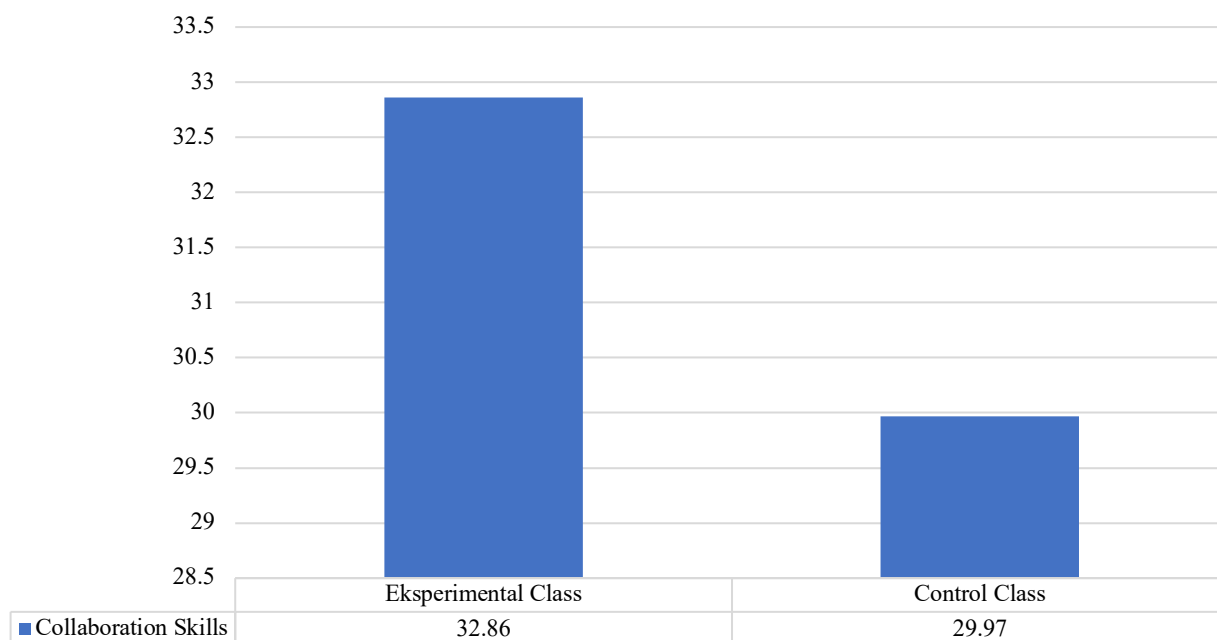
Figure 1. Comparison of Average Student Collaboration Questionnaire Scores

In addition to the difference in the average score of the CSAT questionnaire, the questionnaire also produced 3 groups of students, namely emerging, developing, and developing collaboration skills. The experimental class consisted of 36 students divided into 23 students in the developing collaboration

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skills category and 13 students in the developing collaboration skills category. While in the control class, there were 4 students in the emergent category, 26 students in the developing category and 6 students in the very developing category. This comparison strengthens the evidence that the application of differentiation learning strategies affects collaboration skills. The effect of differentiated learning on collaboration is due to the opportunities provided by teachers for students in the form of freedom in determining the collaboration process according to their learning styles and interests. Husni (2022) stated that the differentiated learning process is implemented to be able to liberate students in learning because students do not have to be the same as each other in all respects.

Before carrying out learning activities with differentiated learning strategies, researchers carried out a diagnostic assessment which aims to determine the diversity of students. This is in line with the statement from Kusumastuti (2017) which states that teachers must understand the nature of education where teachers are not only tasked with transferring knowledge but also forming and developing students in a better direction but by paying attention to the diversity of learning styles of each student, in order to obtain more meaningful results for students.

The results of the non-cognitive diagnostic assessment that show diversity are aspects of interest. Therefore, based on these results, groups were formed in this experimental class according to student interests. The experimental class consisted of 6 groups, group 1 was interested in concept maps, group 2 was interested in simple animations, group 3 was interested in mind mapping, and groups 4 5 6 were interested in PowerPoint. The selection of group divisions based on interests was determined because, in the results of the non-cognitive diagnostic assessment between students' interests and learning styles, interests were the most diverse. In addition, interests were chosen with the aim that students in one group have the same interests so that they will have the same enthusiasm for learning and the same end goal. This is in line with some research that when students have a high interest in learning, it will affect the teaching and learning process and also learning outcomes (Aguanda et al., 2023; DEMİR, 2021; Insani & Munandar, 2023; Meyad et al., 2014; Nur'aini et al., 2023). In addition, the selection of group divisions based on interests aims to allow students to express themselves according to their own characteristics, in line with the opinion of (Andajani, 2022) who stated that in differentiated learning, students are not required to be the same in everything but are freed according to their respective uniqueness as a form of expression of their own uniqueness.

The division of groups into experimental classes based on interests does not force students to provide the same product output during the diagnostic assessment. Researchers free students and their groups if they find difficulties in making products at the beginning and replace them with other types of products. The implementation of process differentiation activities takes place at the stage or syntax of project planning design. During the differentiation process, students who are already in groups are freed by the teacher to carry out the search process with an interest in choosing a workflow with the help of a material contract as a reference for data that must be searched for to help answer essential questions. This is in line with the statement from Purba et al., (2021) who said that one example of implementing a process differentiation strategy that can be carried out by teachers based on their interests is by using learning contracts. Students have the freedom in their learning process, allowing them to be more active(Maxwell, 2015; Wardani et al., 2023). The freedom to choose the process in completing group material contract assignments means that students are given the freedom to work together with all their group members to search for data, or they will form small teams again within the group. With the freedom given by the teacher, each group of students in the experimental class can find their own way to determine discussion methods when collecting data.

As can be seen in Table 4, there are differences in the choice of workflow in each group. Group 1 determines the workflow by searching for data together, and then they create a concept map together. Then, in group 2, the workflow they chose was to look for material together, after getting material that could answer the essential questions, they started making posters together too. For group 3, they chose a workflow by dividing their group members to search for the data they needed. Once the data was complete, they began to combine the results of the data we obtained and created a pop-up book as a product to answer essential questions. Next, in groups 4 and 5, they chose a workflow by dividing the tasks of group members to find the required data. The results of the data found would be collected via WA and they discussed together to create a PPT to answer essential questions. Then in group 6, it was almost the same as groups 4 and 5, namely they divided group members to look for data and material to be presented and made a PPT, after the material in the PPT had been made they together made a video presentation of the PPT they had made.

Implementation with different stages in making products makes students more challenged to find new information related to their interests, students also do not feel burdened because in the process they collaborate with friends who have the same interests. This proves that with differentiated learning, students find it easier to collaborate and improve which is supported by the statement by (Andajani, 2022) which states that making products with groups with the same interests will affect collaboration skills so that they can be provisions in the future.

Students' freedom in determining the collaboration process is included in one of the differentiation elements, namely process often called process differentiation. In line with the statement Purba et al., (2021) that process differentiation is a meaningful activity for students as a learning experience in class. The implementation of process differentiation in experimental classes based on interests occurs because before implementing teaching and learning activities the teacher carries out a diagnostic assessment and produces several variations in student learning readiness, student interests, and student learning styles. The diagnostic assessment is the initial reference for teachers to plan appropriate differentiation strategies according to students' needs. This is supported by the principle of differentiation teaching (Tomlinson, 1999) namely teaching that recognizes the diversity of students in learning according to students' learning needs and preferences.

Based on the description above, it can be seen that the application of differentiated learning influences students' collaboration skills. Differentiated learning provides equal opportunities for all students without having to be the same as each other (Sirait & Amnie, 2023). And with the existence of differentiated learning, students find it easier to collaborate because they are in the same scope of interest so that the need for learning and friends to exchange ideas can be met.

The Effect of Differentiated Learning on Communication Skills

After processing the data, the research results prove that there is an influence of the use of differentiation learning strategies on students' communication skills. It can be seen from the results of data processing using the one-way ANOVA test that it shows that students' communication skills have a significant value, namely 0.035, this value is <0.05, so H0 is rejected. So it can be concluded that the hypothesis has been proven correct that there is a significant influence of differentiation learning on the communication skills of class X students at SMA. This is in line with the statement from (Amin, 2019) namely, by providing space in the differentiation learning process, it can be beneficial for students, one of which is useful for communicating the findings and information they have.

A comparison of the average scores on the observation sheets can also be evidence that shows that there is an influence of differentiated learning on students' communication skills. In Picture 2 it can be seen that there is an average difference of 1,33, namely experimental class students have a higher average score of 10,72, while the control class had an average score of 9.39.
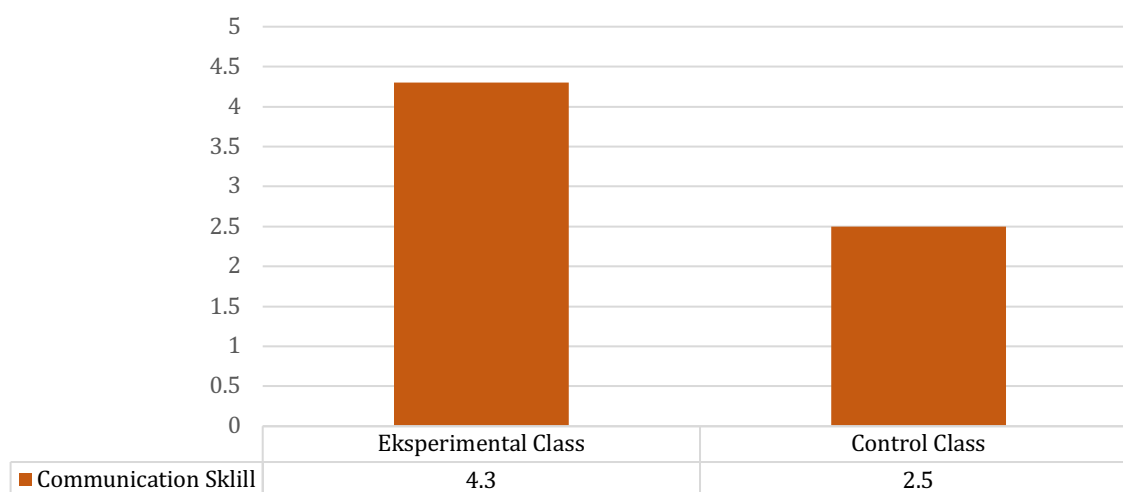

	Eksperimental Class	Control Class
■ Communication Sklill	4.3	2.5

Figure 2. Comparison of Average Student Communication Scores

The average indicator score in the experimental class is the highest, namely the first indicator. The first indicator of conveying ideas orally has an average score of 2.47. Meanwhile, in the control class, the first indicator of conveying ideas orally had an average of 2.28. Anxiety when wanting to make a

presentation is one of the things that students often experience, in line with West & Turner's statement in (Khairunisa, 2019) which revealed that speaking anxiety is fear in the form of negative feelings from individuals such as tension, nervousness, or panic when communicating. This anxiety can indicate immature communication skills, supported by Aydin's statement in (Khairunisa, 2019) Even though students have mature ideas and mature thinking, if there is anxiety that causes communication concerns, students will find it difficult to communicate in real terms with other people.

Then, the indicator that has the lowest average in the experimental class, namely the fourth indicator, positively influences the interlocutor, has an average score in the experimental class, namely 1.92, which is higher than the control class which has an average value of 1.50. This is related to indicator number one, where when students can overcome anxiety in communicating, they can have a positive influence on the person they are talking to by conveying motivation using the right words. The use of positive words through motivation can be a step for successful communication, this is in line with (Ratnasari, 2020) which reveals that the choice of words in communication messages has an important role in achieving successful communication, this is because negative sentences used in communication will cause communication problems.

The average difference occurred because in the experimental class, through product differentiation learning, differences were made in the product presentation of the project that had been given. In the experimental class, students are given freedom in terms of presentations according to what they are interested in, this can be done directly in front of the class using a projector, showing video presentations with a projector, as well as direct presentations by bringing the product and showing it in front of the class. This freedom is directed by the teacher so that students can carry out demonstrations according to what they and the group are interested in. So that ideas can be easily conveyed without students feeling anxious during the presentation. This is supported by a statement from (Rahmatia & Hilumalo, 2022) which states that interest and talent guidance can build students' confidence because it can help them socialize by communicating directly with all other group members. The groups in the experimental class have different presentation methods. In groups 1, 4, and 5 they used a projector to show the product results they made and made a presentation directly in front of the class. For groups 2 and 6, they made products and presented them through video media shown via a projector. And finally, group 3, where they did not use the help of a projector but they presented their products directly in front of the class. Meanwhile, in the control class, the delivery of product demonstrations is the same for each student, namely through direct presentations in front of the class, so that when conveying ideas orally, students tend not to be able to convey the material freely due to feelings of anxiety and nervousness.

The similar interests that students have with their group friends also influence the way they plan and prepare their products. If they feel it is something they like, they will get better results and tend to be more effective. This is also the effect of the freedom for students to Determine products that suit their interests. As explained (Erhansyah, 2020) which says that interest can influence the achievement of learning outcomes in certain subjects.

The freedom given to students to carry out demonstrations according to their interests influences them to become more confident in what they are demonstrating. So that when interaction occurs in the form of questions and answers, students can provide appropriate responses because they also understand the product. This is in line with the goal of product differentiation expressed by (Putriana Naibaho, 2023) where the product is created to determine students' broad understanding of the material being studied.

Besides that, (Sulistyos et al., 2022) also revealed that differentiated learning creates a pleasant learning atmosphere, and students can freely express their potential according to their interests. In contrast to the control class where demonstrating the product is required directly, certainly not all students in the control class have an interest in presenting directly. This will affect planning and delivery which will be less than optimal because it does not come from the students' abilities and desires.

Based on the description above, it can be seen that differentiation learning has an effect on students' communication skills with the average posttest score in the form of an observation sheet on oral communication skills for each indicator in the experimental class being higher than in the control class.

The Effect of Differentiated Learning on Students' Communication and Collaboration Skills

After processing the data, the research results prove that there is an influence of the use of

differentiation learning strategies on students' communication and collaboration skills. The results of data processing using the F test show that the calculated F is 60.006 with the resulting significance being 0.001b which is smaller than 0.05. This means that there is an influence of differentiation learning on the communication and collaboration skills of students at SMA Negeri 1 Padamara. This influence is due to the use of differentiation learning strategies. Differentiated learning provides a unique student learning experience, where students are given the freedom to study according to their interests, learning style, or learning readiness. This is in line with Ki Hajar Dewantara's philosophy (Putriana Naibaho, 2023) that education guides all the natural strengths that students possess so that they can achieve the highest safety and happiness, both as human beings and as members. What this means is that the teacher's job as an educator is only to direct students to improve their behavior (not its basics) and develop their natural strengths. Here the teacher is just a guide and directs students, so they don't lose direction. A teacher must provide guidance to students so that they can find their independence. This is also supported by a statement from (Suprapto et al., 2020) who said that the choice of appropriate learning strategies by teachers is very influential for their students.

In implementing differentiated learning at school, the freedom given by teachers to students includes process and product elements. These elements differentiate by adapting to the diversity of students, namely their interests. The selection to waive based on interest in the experimental class is carried out regarding data when carrying out diagnostic assessments and is adjusted to the KD that will be taught namely environmental change. The diversity of students' interests provides the basis for differentiation of processes and products based on their interests. Deep Puspitasari (Putriana Naibaho, 2023) said that the solution to solving human diversity with a fun, collaborative learning atmosphere, speaking practice, material selection and the learning process is to carry out differentiated learning. This reinforces that one solution that can be done to overcome diversity and lack of collaboration skills is differentiated learning.

Groups formed based on students' shared interests will provide a pleasant learning atmosphere because there is no compulsion to carry out these learning activities. This is in line with Slameto's opinion in (Sapbrina et al., 2021) which says that when someone is interested, they will automatically pay attention to the activity or object that makes them interested, without any external coercion. In implementing collaboration, of course there is also communication that must run smoothly so that the collaboration achieves its goals. This is supported by Marzano's statement in (Hayat et al., 2019) which describes that communication and collaboration are important aspects of lifelong learning, because someone can learn for their future life, requiring communication in expressing their thoughts and collaborating with other people.

In the second differentiation element, namely process differentiation, diversity of interests becomes the basis for teachers to form groups. When groups are formed based on interests, students have the same desires, this will make communication easier. In the CSAT questionnaire, one of the indicators of collaboration skills is interaction. According to Nasehudin in (Qisthi et al., 2021) Communication elements can form widespread interactions between teacher-student, student-student, student-material, student-media, student-environment. This can be proven by looking at the scores on the CSAT questionnaire indicators which measure collaboration skills, with the highest average scores in the experimental and control classes being the "Interaction" indicator, namely 3.61 and 3.42. The difference in the average score. The difference in the interaction scores between the experimental and control classes proves that differentiation learning has an effect on collaboration and indirectly also has an effect on student communication. Based on the description above obtained from the results of data processing and hypothesis testing, it can be seen that the learning process and product differentiation based on student interests can influence students' collaboration and communication skills.

CONCLUSION

Based on the data analysis, it can be concluded that Differentiated Learning influences the communication and collaboration skills of grade X students on environmental change material. Collaboration skills can be seen from the average score obtained on the CSAT questionnaire, which in the experimental class is higher than in the control class. This happens because the experimental class applies a process differentiation strategy which frees students to choose ways of collaborating that suit their interests. In communication skills, the application of differentiation learning strategies in the form of freedom in determining the process and demonstration methods based on interest, produces an influence on students' communication skills which can be proven when the average score on the oral

communication skills observation sheet for each indicator of the experimental class is higher than that of the control class.

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