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THE RELATIONSHIP BETWEEN 21ST CENTURY SKILLS AND STUDENT LEARNING OUTCOMES THROUGH THE APPLICATION OF PROBLEM BASED LEARNING MODELS IN CLASS X ENVIRONMENTAL CHANGE MATERIALS AT SMA NEGERI 5 MEDAN T.P 2023/2024

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This study aims to find out 21st century skills and student learning outcomes, determine the relationship between 21st century skills and student learning outcomes, and its contribution through the application of problem based learning models on environmental change materials. The population in this study is all class X students at SMA Negeri 5 Medan. The sample in this study is students in grades X-4 and X-7 totaling 71 students determined using random sampling techniques. This study uses a quantitative descriptive research method. The research instruments used are in the form of observation sheets, objective tests, and documentation. Data analysis consists of normality, linearity, correlation, hypothesis, and determination tests. The results of the study show that: 1) the 21st century skills of grade X students of SMA Negeri 5 get an average score of 2.65 included in the "Moderate" criterion. Communication skills obtained the highest score of 3.49 and creative thinking skills obtained the lowest score of 0.94. 2) The students' learning outcomes received an average posttest score of 73.75 in the "Not achieved" category. 3) The relationship between 21st century skills and student learning outcomes through the application of the problem-based learning model based on the Pearson correlation test obtained a correlation value of 0.554 which proves that 21st century skills and learning outcomes have a positive relationship. 4) The contribution of 21st century skills to student learning outcomes is 30.7%.

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INTRODUCTION

Good learning objectives are already listed in the educational curriculum. One of the curricula that is currently being implemented is the independent curriculum. The Independent Curriculum emphasizes improving 21st century learning skills, namely critical thinking skills, creative thinking skills, communication skills, and collaboration skills (Hanipah, 2023). These four skills are important 21st century skills for students to master.

Critical thinking and problem-solving skills are one of the important skills that students must have so that they acquire skills in analyzing, solving problems, expressing opinions, and making conclusions based on the knowledge they master. (Aliftika et al., 2019). Communication skills are students' skills in providing their ideas, ideas, and opinions during the learning process, namely in discussion activities with groups and teachers (Salim Nahdi, 2019). Thus, through communication, students will have skills in processing thoughts, data, and phenomena to then be expressed orally or in writing (Aliftika et al., 2019). Communication skills are skills that encourage students to build relationships with others and be responsible for themselves and others. Creative and innovative skills are important skills for students to master so that they have an open and sensitive attitude in finding or presenting new ideas, ideas or opinions to others (Yusliani et al., 2019).

As a result of an interview with a biology teacher at SMA Negeri 5 Medan, he said that 21st century skills in learning activities are still lacking due to the low level of critical thinking understanding, absorption, and focus during biology learning, as well as the number of students who rely on mobile phones during the learning process. So that this affects student learning outcomes in biology subjects. Student learning outcomes are still low and far from what is expected when viewed from the test scores in biology subjects are still below the average KKTP (Learning Goal Achievement Criteria).

Based on previous research related to the relationship between several components of 21st century skills and learning outcomes carried out by (Annisa et al., 2020), (Yuono, 2019), and (Roswati et al., 2019), It is said that there is a positive and significant relationship between critical thinking skills and student learning outcomes. Furthermore, the results of the study (Mutsaqofah, 2019) also said that creative thinking skills contributed 4.84% to learning outcomes. Furthermore, research by (Ningrum & Putri, 2021) and (Mulyani, 2021) which said that communication skills affected student learning outcomes by 59.4%, and included in the medium category. Through some of these studies, it can be seen that there is a positive relationship between 21st century skills and student learning outcomes, which means that the higher the 21st century skills that students have, will also have a great influence on their learning outcomes. However, existing research has only examined one or a few of the four components of 21st century skills and their relationship to learning outcomes.

Furthermore, problems related to the low 21st century skills of students can be caused by the strengthening of 21st century skills, which are not optimal, students do not have the flexibility to optimize 21st century skills in their learning and the learning models or methods applied are still weak (Ramdiah et al., 2019). Therefore, improving 21st century skills is important to be optimized in learning. 21st century skills can be improved by applying a variety of learning models, strategies, and methods. The results of the study (Meilani & Aiman, 2020) explain that the application of learning based on the 4Cs can affect student learning outcomes. So, one of the efforts to improve students' 21st century skills that will have an influence on improving learning outcomes is to apply an appropriate learning model.

The learning model is an important element in classroom learning. Abas Asyafah explained the important reasons for implementing the learning model in the classroom, namely: 1) the application of an appropriate learning model will help the learning process so that it can achieve educational goals, 2) useful information can be obtained by applying a learning model for students, 3) learning really needs a variety of learning models that can arouse students' enthusiasm for learning so that students are not easily bored, 4) 4) students have different characteristics and learning styles, so the application of various learning models is needed (Asyafah, 2019). The 21st century skill-based

learning model is a student-centered learning mode (Angga et al., 2022).

The various materials studied in biology subjects each have different characteristics, one of which is environmental change material. In environmental change materials, there are many contextual problems in daily life that require students to be active in analyzing and solving problems and providing solutions related to environmental change problems. Through this material, it can foster an attitude of caring for the environment in students which will further form an understanding to protect the surrounding environment (Hamia et al., 2023).

In the above problems, a more effective learning model is needed to be able to guide students to solve a contextual problem and be actively involved in learning activities with environmental change materials. A learning model that is considered to be able to improve 21st century skills and learning outcomes and is suitable for use in environmental change materials is the Problem Based Learning model.

The Problem Based Learning learning model is a student-centered learning model that presents contextual problems so that it will spur students to actively learn. Students are faced with a problem before they begin to find out and understand the concept of material related to problem solving. Thus, students are required to have the ability to acquire subject matter concepts, the ability to think critically, identify and solve given problems, and the ability to participate in groups (Astuti, 2019). According to research (Suharyat et al., 2022), the problem-based learning model is a learning model that is able to improve students' 21st century skills in science learning. This is evidenced by the effect size (ES) of 0.68 in a very high category. The average student who had critical thinking skills was 72.5, creative thinking was 70, collaboration was 74, and communication was 71. Research (Habibah et al., 2022) which said that the problem-based learning model has a positive influence in helping students collaborate, identify problems, and solve problems. In addition, the problem-based learning model is proven to make students more active and creative in their learning.

The problem-based learning model has also been proven to improve student learning outcomes and activities. This is in line with relevant research by (Dewi et al., 2019) who said that the problem-based learning model can effectively improve student learning outcomes. The learning outcomes have met the KKM score and achieved success performance indicators.

Based on the description above, researchers have previously only examined the relationship between one or a few of the 21st century skills and learning outcomes, and not many have added learning models to their research. For this reason, this study seeks to improve the quality of learning by researching *"The Relationship between 21st Century Skills and Student Learning Outcomes Through the Application of Problem Based Learning Models in Class X Environmental Change Materials at SMA Negeri 5 Medan T.P 2023/2024*".

METHOD

This research was carried out at SMA Negeri 5 Medan which is located on Jalan Siswa No. 17, Medan Kota District, Medan City. The time of this research is in the even semester of the 2023/2024 Academic Year, taking place in May-July 2024. This study uses a quantitative approach and includes a type of correlation research. The population in this study is all students of class X MIPA SMA Negeri 5 Medan for the 2023/2024 academic year consisting of 12 classes with a total of 431 students. From the pollution, two classes were taken as samples with random sampling techniques, namely classes X-4 and X-7 with a total of 71 students.

The research instruments used are in the form of observation sheets, objective tests, and documentation. Data analysis consists of normality, linearity, correlation, hypothesis, and determination tests.

RESULTS AND DISCUSSION

21st Century Skills of Students Through the Application of Problem Based Learning

This 21st century skill observation data was obtained using the 21st century skill observation sheet. The following is the data from the observation results of 21st century skills of students in grades X-4 and X-7

Table 1. Results of 21st Century Skills Observation through the Application of Problem Based Learning

No	Types of Skills	Score	Avrg	Criteria
1.	Critical Thinking	218	3,07	Medium
2.	Creative Thinking	67	0,94	Low
3.	Communication	248	3,49	Medium
4.	Collaboration	221	3,11	Medium
Σ		754	10,61	
Overall average			2,65	Medium

Based on the data above, it can be known that the 21st century skill criteria are adjusted to the 21st century skill criteria index on page 45. Students' critical thinking skills obtained an average of 3.07 so that they were included in the "medium" criteria, students' creative thinking skills obtained an average of 0.94 so that they were included in the "low" criteria, communication skills obtained an average of 3.49 so that they were included in the "medium" criteria, and collaboration skills obtained an average of 3.11 so that they were included in the "moderate" criteria. So, overall, 21st-century students earned an average of 2.65 so they fell into the "moderate" criteria.

Communication skills are the type of skills that get the highest average score, this is because communication is the most widely done activity by students. During learning with the problem-based learning model, students responded to the material given by the teacher about environmental changes. Especially when students are asked to analyze various pictures of environmental changes, carry out practicum activities and discussions in groups, students respond by expressing their ideas and opinions clearly and well. This is also supported by the application of a problem-based learning model which includes the stage of presenting results or making presentations. During the presentation, students are able to convey the results in an easy-to-understand, not rigid and confident language in front of their teachers and classmates. Through this presentation activity, students' communication skills can be observed and measured.

According to Maridi in her journal entitled Improving Oral and Written Communication Skills through the Problem Based Learning Learning Model for Grade X High School Students, stated that activities in the stage of the problem based learning model will encourage students to be careful in observing and working together when conducting experiments and discussions with group friends. Students who are actively involved in learning will improve students' scientific attitude and also greatly enable students to interact with communication and collaboration activities, so this will improve these skills in students (Maridi et al., 2019).

In critical thinking and collaboration skills, students are required to carry out systematic learning activities starting from analyzing problems, making problem formulations to conveying conclusions. Group learning also encourages the emergence of collaboration skills. Through the provision of LKPD, students are trained to complete assignments together, so that students are actively involved in discussions and open up to each other with their group mates. All of these activities are contained in the syntax of the problem-based learning model, which shows that students are encouraged to have critical thinking skills and collaborate in carrying out learning. The same thing in the research conducted by Fitriyani et al. that the use of the problem-based learning model was proven to improve students' collaboration skills and higher-level thinking, according to the analysis obtained in the experimental class which was higher than the control class. This is because the learning stages of problem-based learning are able to train students' ability to find problems and find solutions by collaborating. All activities in it train students to contribute, compromise, be responsible, exchange opinions, and organize. So that it gives rise to high-level thinking skills and student collaboration (Fitriyani et al., 2019).

The lowest 21st century skill in this study is creative thinking skills. This is because to encourage this skill to appear, students are required to understand deeply first related to something given to students, be able to see problems from various different perspectives, including finding and examining additional information to solve problems. In fact, many students have difficulty doing this, the opinions and ideas given still tend to be simple and need to be further developed. Of

course, this is also influenced by the teacher's performance and strategy in delivering learning in the classroom. Teachers must be able to build a learning atmosphere that stimulates students' knowledge and creativity through creative thinking activities, so that students dare to show various ideas and are not shy to express them, such as making a project assignment design, which can help students to be more creative.

This is in line with research conducted (Putri & Alberida, 2022), that the creative thinking skills of class X students of MIPA at SMAN 1 Pariaman obtained a very low category. This is possible because teachers do not provide interactive learning in the classroom, so students are less trained to think creatively. Therefore, there is a need for activities that encourage students to better understand problems, fluency, and renewal in solving a problem. Activities such as training students by asking questions in the form of problem solving, giving open-ended questions more intensively are efforts that can be made so that students can be encouraged to think systematically and complexly, and can stimulate students to put forward various ideas. Finally, all of these things are expected to have an impact on the development of students' creative thinking skills.

Student Learning Outcomes Through the Application of Problem Based Learning

Based on data obtained from the student learning outcome postest which amounted to 25 multiple-choice questions, the following is data on the achievement of student learning outcomes in accordance with the Learning Goal Achievement Criteria (KKTP).

Table 2. Achievement of Student Learning Outcomes through the Application of Problem Based Learning

Student Grades	Number of Students	Percentage (%)	Accessibility
Grade < 78	46	64,79	Not Achieved
Grade > 78	25	35,21	Achieved
Sum	71	100	

Based on the data above, it can be seen that students who obtained learning outcome scores reached KKTP 78, namely 25 people or 35.21% and students who obtained scores below KKTP 78, namely 46 people or 64.79%. The average student learning outcome was 73.75 which was included in the category of "not achieved"

When doing posttest questions, many students do not look serious and still look at other friends. This shows that students' enthusiasm to learn and struggle is still low. When the teacher brought the class to carry out observations and actively discuss, many students looked active, as evidenced by the number of students who dared to express their opinions. Although the situation does not last long, because students tend to get bored easily and return unfocused. This certainly affects 21st century skills and student learning outcomes.

According to (Nabillah & Abadi, 2019), low student learning outcomes can be caused by students' difficulty in understanding the material being taught and also students who are less motivated to learn due to poor study habits. Among the factors that cause low student learning outcomes are the lack of student activity during learning and the teacher's skills in presenting learning materials that are still lacking. The inconsistency of teachers in planning and carrying out learning activities is one of the factors causing low student learning achievement. Because learning achievement is something that is acquired that is closely related to a person's understanding of knowledge and skills, it is necessary to implement the right learning strategies to improve students' skills and learning outcomes.

The Relationship Between 21st Century Skills and Learning Outcomes through the Application of Problem Based Learning

To find out whether there is a relationship between 21st century skills and student learning outcomes through the application of a problem-based learning model, it is necessary to conduct a hypothesis test consisting of a correlation test and a significance test (T test). However, before the test is carried out, a statistical prerequisite test is first carried out which includes a normality test and a linearity test.

Table 3. Normality Test Results

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		71
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	6.05719798
Most Extreme Differences	Absolute	.074
	Positive	.074
	Negative	-.074
Test Statistic		.074
Asymp. Sig. (2-tailed)		.200[c,d]
Exact Sig. (2-tailed)		.800
Point Probability		.000

Based on the table 3, it can be seen that the significance value is 0.200 which means that the significance value > 0.05. So from this, it can be concluded that the data obtained from the 21st century learning outcome test and skill observation through the application of problem-based learning, the two data are normally distributed.

Table 4. Linearity Test Results

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Hasil Belajar * Keterampilan Abad 21	Between Groups	(Combined)	1751.456	21	83.403	2.094	.017
		Linearity	1135.161	1	1135.161	28.496	.000
		Deviation from Linearity	616.294	20	30.815	.774	.730
	Within Groups		1951.981	49	39.836		
	Total		3703.437	70			

Based on the table 4, it can be seen that the significance value of deviation from linearity is 0.730 which means it is greater than 0.05 (sig > 0.05). Therefore, it can be concluded that 21st century skills and student learning outcomes through the application of the problem-based learning model have a linear relationship.

Table 5. Correlation Test Results

Correlations

		Keterampilan Abad 21	Hasil Belajar
Keterampilan Abad 21	Pearson Correlation	1	.554**
	Sig. (2-tailed)		.000
	N	71	71
Hasil Belajar	Pearson Correlation	.554**	1
	Sig. (2-tailed)	.000	
	N	71	71

**. Correlation is significant at the 0.01 level (2-tailed).

The results of the correlation test show that there is a relationship between 21st century skills and student learning outcomes through the application of the problem-based learning model. The pearson correlation value is 0.554 with the direction of a positive relationship and also the significance value of 0.000 is less than 0.05, which means that there is a unidirectional relationship between variable X and variable Y because the pearson correlation (r) value is positive. The level of relationship between 21st century skills and learning outcomes through the application of problem-based learning is moderately correlated, which is at the criterion of 0.40-0.599.

Table 6. T Test Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	66.498	1.499		44.362	.000
	Keterampilan Abad 21	.683	.124	.554	5.522	.000

a. Dependent Variable: Hasil Belajar

Based on the significance level of 0.05 and df = 71-2 = 69, then the t of the table is 1.667. Therefore, from the table and calculation above, the value of t calculation > t table (5.522 > 1.667) is obtained, then H0 is rejected, Ha is accepted. This means that there is a significant relationship between 21st century skills and student learning outcomes through the application of the problem-based learning model.

The data above shows that there is a relationship between 21st century skills and student learning outcomes through the application of the problem-based learning model. The problem-based learning model requires students to actively learn and be fully involved through activities to analyze, solve problems, evaluate, and create a solution to problems from the activities that have been carried out. This model can stimulate students to grow independence but still collaborate with their group mates.

This is in line with the results of research conducted (Suharyat et al., 2022), the problem-based learning model is a learning model that is able to improve students' 21st century skills in science learning. Just like the results of the study (Habibah et al., 2022) which said that the problem-based learning model has a positive influence in helping students collaborate, identify problems, and solve problems. In addition, the problem-based learning model is proven to make students more active and creative in their learning. The problem-based learning model has also been proven to improve student learning outcomes and activities. This is evidenced by (Dewi et al., 2019) in her research which said that the problem-based learning model can effectively improve student learning outcomes. Based on the above studies, it can be seen that the problem-based learning model has an important influence on the emergence of 21st century skills and student learning outcomes, so that 21st century skills have a relationship with learning outcomes through the application of the problem-based learning model.

The Contribution of 21st Century Skills to Learning Outcomes Through the Application of Problem Based Learning

Table 7. Determination Coefficient Test Results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.554[a]	.307	.296	6.101

a. Predictors: (Constant), Keterampilan Abad 21

Based on the calculation of the previous correlation test, a correlation coefficient (r calculation) was obtained of 0.554. Then the value of the calculated r is included in the following determinant test equation.

$Kd = r^2 \times 100\%$

$= 0{,}554^2 \times 100\%$

$= 0{,}307 \times 100\%$

$Kd = 30{,}7\%$

Based on the test using SPSS, an R square value of 0.307 was obtained, which was then converted into a percentage to 30.7%. Likewise, the results of the calculation of the determinant test formula show the same results. Thus, the contribution made by variable X (21st century skills) to variable Y (student learning outcomes) through the application of problem-based learning is 30.7%. While the remaining 69.3% is influenced by other factors.

Skills are indispensable to support the learning process. 21st century skills are needed as a provision for students in facing the challenges and demands of the times. 21st century skills include 4C

skills, namely critical thinking skills, creative thinking, communication and collaboration are important to be integrated in learning to encourage students to obtain good learning outcomes. Another factor that contributes greatly to learning outcomes is learning motivation. According to (Romadhoni et al., 2019), Learning motivation has a great influence on student learning outcomes. The higher the student's learning motivation, the better the learning results obtained, so that the quality of learning achievement will also be high, and vice versa.

CONCLUSION

Based on the results of the research and discussion, a conclusion was obtained: 21st century skills through the application of the problem-based learning model in class X environmental change materials at SMA Negeri 5 Medan received an average score of 2.65 so that it was included in the "Medium" criterion. The highest type of 21st century skills is communication skills with a score of 3.49 and the lowest is creative thinking with a score of 0.94. Student learning outcomes through the application of the problem-based learning model in class X environmental change materials at SMA Negeri 5 Medan received an average posttest score of 73.75 so that the learning outcomes were included in the "Not Achieved" category. The learning outcomes of students who achieved KKTP were 25 students, and those who did not achieve KKTP were 46 students. The results of the hypothesis test showed the value of t calculation (5.522) > t table (1.667) so that H0 was rejected and Ha was accepted. This means that there is a relationship between 21st century skills and learning outcomes through the application of the problem-based learning model in class X environmental change materials at SMA Negeri 5 Medan T.P 2023/2024. The contribution of 21st century skills to student learning outcomes through the problem-based learning model in class X environmental change material at SMA Negeri 5 Medan is 30.7%. The rest is influenced by other factors.

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