

The Influence of the REMAP-GI Learning Model (Reading, Concept Map-Group Investigation) on the Activities and Learning Outcomes of Eleventh Grade Students on Cell and Bioprocess Material at SMA Negeri 10 Gowa

Pengaruh Model Pembelajaran REMAP-GI (*Reading, Concept Map-Group Investigation*) Terhadap Aktivitas dan Hasil Belajar Peserta Didik Kelas XI Pada Materi Sel dan Bioproses Di SMA Negeri 10 Gowa

Andi Nurmiati^{1*}, Muh. Khalifah Mustami¹, Ainul Uyuni Taufiq¹

¹) Pendidikan Biologi, Fakultas Tarbiyah dan Keguruan, Universitas Islam Negeri Alauddin Makassar, Indonesia.

* Corresponding Email: nurmiatiandi51@gmail.com

Abstract	Article Information
<p>This study aims to determine the implementation of the REMAP-GI learning model in class XI SMAN 10 Gowa; learning activities of class XI students of SMAN 10 Gowa who are taught with the REMAP-GI learning model; learning outcomes of class XI students of SMAN 10 Gowa who are taught with the REMAP-GI model; the effect of the REMAP-GI learning model on the learning activities of class XI students of SMAN 10 Gowa; and the effect of the REMAP-GI learning model on the learning outcomes of class XI students of SMAN 10 Gowa. The method used is a quasi-experiment with a nonequivalent control group design. The results of the study showed that the average learning activity of students in the control class was 80.50 (active category), while the experimental class was 83.00 (very active category). The average learning outcome of the control class was 79.50 (high category), and the experimental class was 85.83 (very high category). The significance value of T count is <0.001 for learning activities and 0.035 for learning outcomes.</p>	<p>Keywords: Concept Map; Group Investigation,; Learning Activity; Learning Outcomes; Reading.</p>
<p><i>Penelitian ini bertujuan untuk mengetahui keterlaksanaan model pembelajaran REMAP-GI pada kelas XI SMAN 10 Gowa; aktivitas belajar peserta didik kelas XI SMAN 10 Gowa yang dibelajarkan dengan model pembelajaran REMAP-GI; hasil belajar peserta didik kelas XI SMAN 10 Gowa yang dibelajarkan dengan model REMAP-GI; pengaruh model pembelajaran REMAP-GI terhadap aktivitas belajar peserta didik kelas XI SMAN 10 Gowa; dan pengaruh model pembelajaran REMAP-GI terhadap hasil belajar peserta didik kelas XI SMAN 10 Gowa. Metode yang digunakan adalah quasi experiment dengan desain nonequivalent control group. Hasil penelitian menunjukkan bahwa rata-rata aktivitas belajar peserta didik kelas kontrol sebesar 80,50 (kategori aktif), sedangkan kelas eksperimen sebesar 83,00 (kategori sangat aktif). Rata-rata hasil belajar kelas kontrol sebesar 79,50 (kategori tinggi), dan kelas eksperimen 85,83(kategori sangat tinggi). Nilai signifikansi T hitung sebesar <0,001 untuk aktivitas belajar dan 0,035 untuk hasil belajar</i></p>	<p>Kata kunci: Peta Konsep; Grup Investigasi; Aktivitas Belajar; Hasil Belajar; Membaca</p> <p>History Manuscript : 09/04/2026 received : 16/04/2026 Revised : 27/04/2026 Accepted : 30/04/2026 Published</p>

A. INTRODUCTION

Biology is often viewed as a subject consisting of facts, concepts, laws, principles, and theories; therefore, appropriate teaching methods are needed to make biology easy to understand. As extrinsic factors, the roles of educators and teaching methods must be maximized to ensure that students achieve the expected learning outcomes. Students should be aware of what they need to master from the material presented. To assess students' mastery of a subject, educators need assessment tools. This process should be accompanied by discussions with other educators. By consistently applying a particular method or approach, students will become accustomed to it, so that educators no longer blame students for failing to meet learning objectives (Sani et al., 2021).

Biology is a subject with a very broad scope that relates to everyday life, so most students tend to view biology classes as primarily involving memorization, note-taking, and listening to the teacher's explanations. This learning process is referred to as teacher-centered learning, in which the teacher plays a more active role than the students (Fadly, 2022). The students' lack of engagement makes them prone to boredom and unable to follow the lesson effectively, leading to the primary problem of low student engagement and poor learning outcomes (Oktarika and Dharmayanti, 2018).

The REMAP-GI learning model combines three core activities: reading, concept mapping, and a learning process that utilizes the Group Investigation cooperative learning model. The reading and concept mapping activities are conducted before the classroom lesson begins. When creating concept maps, students become aware of how well they understand the text. In addition, classroom instruction using the group investigation (GI) model trains students to gather information to solve problems. During the learning process, students reflect on the steps they took to solve problems. This helps students deepen their understanding and master the material they are studying, resulting in more optimal learning outcomes (Basam, 2022).

Learning activities are deliberate exercises designed to bring about changes in students' knowledge, values, attitudes, and skills. Learning activities encompass all actions taken during the interaction between teachers and students in order to achieve learning objectives. Student engagement during the teaching and learning process is one indicator of students' desire or motivation to learn (Hasmianti et al., 2017). Learning outcomes are a measure of the level of success a student can achieve based on the experiences gained following an evaluation in the form of a test; they are typically expressed as a specific grade and result in cognitive, affective, and psychomotor changes (T. Aulia et al., 2024).

Based on observations of the learning process and an interview with a biology teacher who teaches 11th-grade students at Gowa State High School No. 10, conducted on June 10, 2025, it was found that students prefer discussion-based or group learning methods because they feel more engaged when using these methods. This is supported by the results of a survey I distributed to students on July 6, 2025, which showed that 52.7% of students preferred the discussion-based learning method, which is expected to help improve student engagement and learning outcomes. Up until now, students have complained that the learning methods are monotonous; it seems students are not given the opportunity to think about what, why, and how things happen, so they are unable to hone their thinking skills more deeply and broaden their perspectives (Zubaidah et al., 2023). This fact is further supported by a learning process dominated by note-taking, memorization, and brief explanations from educators, resulting in students merely receiving information without engaging in fact-finding or problem-solving. One alternative educators can adopt to address this issue is to employ creative teaching methods. The success of the learning

process is closely tied to educators' ability to develop learning models designed to effectively increase the level of student engagement (Tamrin et al., 2011).

Based on the background of the problem, an educational study was conducted with the title: "The Effect of the REMAP-GI Learning Model on the Learning Activities and Outcomes of 11th-Grade Students in the Subject of Cells and Bioprocesses." It is hoped that the implementation of this learning model will help improve learning activities and outcomes and encourage students who are passive in learning activities to become active—both for themselves, their teachers, their peers, and their learning environment.

B. METHOD

This study employs a quasi-experimental research design. A quasi-experiment is defined as an experiment that includes a treatment, impact measurement, and experimental units but does not use random assignment to create a comparison group in order to draw conclusions about the changes caused by the treatment. The experimental class will be taught using the REMAP-GI learning model, while the control class will be taught using the direct instruction model. Data will be collected through pretests and posttests. The total population for this study consisted of 164 students, and a sample of 64 students was selected using purposive sampling.

The research instruments included expert validation forms, observation sheets, and learning assessment questions. The collected data were then analyzed using descriptive analysis and inferential statistical analysis.

Descriptive statistical analysis was conducted to provide an empirical overview or description of the data collected in the study. Descriptive statistics involve presenting numerical values, either as counts or percentages. The results of the descriptive statistical analysis are useful for providing information on the frequency distribution of respondents' answers and the average scores obtained for each variable indicator in the study.

The grouping of students' learning activity levels in both the control and experimental classes can be seen in the categories below

Table 1: Categories of Student Learning Activity

Percentage Range	Category
0%-20	Very inactive
21%-40%	Inactive
41%-60%	Moderate
61%-80%	Active
81%-100%	Very active

To categorize the levels of learning outcomes achieved by students in both the control and experimental classes, please refer to the categories below

Table 2: Student Learning Outcome Categories

Score Range	Category
≤ 40	Very Poor
41-55	Poor
56-70	Fair
71-85	Good
85-100	Very Good

Inferential statistics is a branch of statistics that provides rules or methods that can be used as tools to draw general conclusions from a set of data that has been collected and analyzed. In addition, inferential statistics provide specific rules for drawing conclusions, making predictions, conducting estimations, and so on. In this study, it was used to determine whether the Reading, Concept Map-Group Investigation (REMAP-GI) learning model has a significant effect on student engagement and learning outcomes at SMA Negeri 10 Gowa.

a. Normality test

A normality test is used to determine whether the sample follows a normal distribution or not. The data must follow a normal distribution in order for parametric methods to be used in the analysis. If the data does not follow a normal distribution, then nonparametric statistical methods must be used.

b. Homogeneity Test

A homogeneity test is used to determine whether two or more data sets in a sample come from populations with the same variance. The purpose of a homogeneity test is to determine whether the variances of various research data groups are equal. Homogeneity can also indicate that the data sets under consideration share the same characteristics.

c. Hypothesis Testing

The hypothesis of this study is that the REMAP-GI (Reading, Concept Map-Group Investigation) learning model has a significant effect on the learning activities and outcomes of 11th-grade students in the subject of Cells and Bioprocesses.

C. RESULTS AND DISCUSSION

1. Implementation of the REMAP-GI (Reading, Concept Map-Group Investigation) Learning Model

The study conducted at SMA Negeri 10 Gowa in class XI KM 4 (the experimental class) yielded the following results from the instrument assessing the implementation of the REMAP-GI (Reading, Concept Map-Group Investigation) learning model, which was taught using the REMAP-GI learning model:

Table 3 Descriptive Statistical Analysis of the Implementation of the REMAP-GI Learning Model in Class XI KM 4 (experimental)

Learning Stages	Number of Indicators	Number of "YES"	Responses Percentage (%)
Orientation (initial activities)	4	4	100
Apperception	2	2	100
Elaboration	2	2	100
Core Activities (REMAP-GI)	3	3	100
Closing Activities	3	3	100
Total	14	14	100

Based on the lesson implementation observation sheet, the REMAP-GI instructional model for the topic of cells and bioprocesses in Grade 11 KM 4 at SMA Negeri 10 Gowa demonstrated a very high level of implementation. Of the total 14 indicators observed, all indicators achieved a 100% score, indicating that all stages of the lesson were implemented in accordance with the procedures outlined in the observation instrument.

The results of the study indicate that the implementation of the REMAP-GI learning model falls into the "very high" category, with all stages of the learning process—from

orientation, apperception, and elaboration to core activities (reading, concept mapping, and group investigation) and closing activities—carried out optimally in accordance with the learning syntax. These results demonstrate that the REMAP-GI model can be implemented systematically and consistently in accordance with the established lesson plans.

Theoretically, the high level of implementation of the REMAP-GI model indicates that learning has taken place in accordance with the principles of constructivism, which emphasizes that students actively construct their knowledge through learning experiences, social interaction, and independent information processing. During the reading stage, students acquire preliminary knowledge through reading activities that help build an initial understanding of the concepts covered in the material. The concept map stage allows students to systematically organize and connect the concepts they have learned, while the group investigation stage encourages students to discuss, exchange ideas, and solve problems collaboratively. The combination of these three stages supports the creation of meaningful, learner-centered learning. As students acquire knowledge of concepts, the resulting behavioral changes involve not only mastery of those concepts but also the development of skills and attitudes (Umasangadji et al., 2024).

The 100% implementation rate also indicates that educators were able to consistently follow the entire instructional sequence, enabling students to actively participate in every stage of the learning process. The optimal implementation during the orientation phase demonstrates the educators' readiness to create a conducive learning environment from the very beginning, as the initial stages of learning play a crucial role in building students' motivation and readiness to learn. The findings of this study are consistent with the research by Oktarika & Dharmayanti (2018), which states that educators need to create a comfortable and enjoyable learning environment to ensure that the learning process takes place effectively. Furthermore, the results of this study also reinforce the notion that the implementation of the REMAP-GI model can support active, collaborative, and meaningful learning processes in line with the characteristics of 21st-century learning.

2. Student Learning Activities Taught Using the REMAP-GI Instructional Model

Table 4. Learning Activities of Grade 11 Students in Class KM 4 (Experimental)

No	Activity Components	Score 2		Score 3		Total Score	
		F	%	F	%	F	%
1	Reading the material	18	60	12	40	72	80
2	Searching for information	14	76,67	16	53,33	76	84,44
3	Creating a concept map	9	30	21	70	81	91
4	Taking notes on group discussions	18	46,67	16	53,33	76	84,44
5	Analyzing questions	19	63,33	11	36,67	71	78,89
6	Solving problems in the worksheet	11	36,67	19	63,33	79	87,78
7	Expressing opinions	11	36,67	19	63,33	79	87,78
8	Discussing with group members	10	33,33	20	66,67	80	88,89
9	Asking questions	14	46,67	16	53,33	76	84,44
10	Being enthusiastic during learning	10	33,33	20	66,67	80	88,89
11	Staying calm during learning	8	26,67	22	73,33	82	91,11

Based on Table 4 above, it can be concluded that regarding the experimental class students' learning activities, 80% of students were in the "very active" category when reading materials related to the lesson content. Regarding the aspect of searching for information or reading materials from various sources, 84.44% of students were in the "active" category. Regarding the aspect of creating concept maps related to the lesson content, 90% of students were in the "active" category. Regarding the aspect of recording the results of group discussions, 84.44% fell into the "active" category. Regarding the aspect of analyzing questions on the worksheets, 78.89% fell into the 'active' category. Regarding the aspect of solving problems on the worksheets, 87.78% fell into the "active" category. In the aspect of expressing opinions during the learning process, 87.78% fell into the very active category. In the aspect of discussing with group members, 88.89% fell into the active category. In the aspect of asking questions, 84.44% fell into the active category. In the aspect of being enthusiastic during learning, 88.89% fell into the very active category. Regarding the aspect of remaining calm during learning, 91.11% fell into the active category.

Theoretically, the high level of student engagement indicates that the REMAP-GI model aligns with constructivist theory, which emphasizes that knowledge is actively constructed through learning experiences and social interaction. In the reading stage, students build prior knowledge through reading activities; then, in the concept map stage, students organize information into relationships between concepts; and in the group investigation stage, students actively discuss, express opinions, and solve problems collaboratively. These conditions demonstrate that the REMAP-GI framework is capable of creating student-centered learning and supports the development of critical thinking and collaboration skills.

This finding is consistent with the theory proposed by Widya (2019), who states that when it comes to conceptual understanding, people often find it relatively easy to grasp new concepts by constructing a hierarchical concept map, which can serve as a tool for actively integrating concepts. In addition, the theory proposed by Herbart Thelent outlines a group learning model that encourages students to construct their own knowledge through inquiry and discovery from various sources, while also fostering their ability to think independently. The group investigation learning model is a process of independently discovering information through group learning or discussion (Yamin, 2024)

3. Student Learning Outcomes Achieved Through the REMAP-GI Instructional Model

Table 5: Categories and Percentages of Biology Learning Outcomes Grade 11 KM 4 (Experiment)

No	Score	Category	Frequency		Percentage (%)	
			Pretest	Posttest	Pretest	Posttest
1	40	Very low	6	0	20%	0%
2	41-55	Low	14	0	46,7%	0%
3	56-70	Moderate	10	0	33,3 %	0%
4	71-82	High	0	5	0%	16,7%
5	85-100	Very high	0	25	0%	83,3%

From the table above, the researcher can conclude that regarding the learning outcomes of students in the experimental class, the pretest results showed that 6 students (20%) fell into the very low category, 14 students (46.7%) into the low category, 10

students (33.3%) into the adequate category, and none achieved scores in the high or very high categories.

The post-test results showed that in the very low category there were 0 students (0%), in the low category there were 0 students (0%), in the adequate category there were 0 students (0%), in the high category there were 5 students (16.7%), in the very high category, there were 25 students with a percentage of 83.3%.

Theoretically, this improvement in learning outcomes indicates that the REMAP-GI model aligns with constructivist theory, which emphasizes that knowledge is actively constructed through learning experiences (Karomika, 2019). The reading stage helps students build prior knowledge; the concept map stage facilitates students' ability to organize and understand relationships between concepts; and the group investigation stage encourages students to discuss, analyze, and solve problems collaboratively (Hasmiati et al., 2017). This process enables students to gain a deeper conceptual understanding, thereby leading to improved learning outcomes.

The results of this study are consistent with the theory proposed which states that cooperative learning—particularly the Group Investigation method is effective in improving student learning outcomes because it actively engages students in discussions, investigations, and problem-solving; consequently, students' learning outcomes are influenced by the learning process they experience (A. Aulia et al., 2024). If the learning process is able to engage students, the learning outcomes achieved will be more optimal.

4. The Effect of the REMAP-GI Instructional Model on Students' Learning Activities

a. Normality Test

Table 6: Test of Normality for Student Learning Activities Using the Shapiro-Wilk Test

Variable	Sign	α	Notes
Experimental Class Pretest	0,128	0,05	Normal
Experimental Class Posttest	0,092	0,05	Normal
Control Class Pretest	0,082	0,05	Normal
Control Class Posttest	0,053	0,05	Normal

Table 6 above shows the results of the Shapiro-Wilk test, which indicate that the significance value for Grade 11 KM 4 (experimental group) was 0.128 on the pretest and 0.092 on the posttest, whereas α is 0.05. This means that the p-value is greater than α , or in other words, the performance of students in Class XI KM 4 (experimental group) taught using the REMAP-GI learning model follows a normal distribution.

The analysis of Class XI KM 5 (control group) yielded a significance value of 0.082 for the pretest and 0.053 for the posttest, with α set at 0.05. This indicates that the data on student activity in the class taught without using the REMAP-GI model is normally distributed. It can be concluded that the data from both the experimental and control classes are normally distributed.

The results of this study are consistent with the findings of Siti Zubaedah et al. (2023), who assert that cooperative learning can enhance student engagement when implemented with a focus on group goals and individual accountability. REMAP-GI is a

form of cooperative learning that requires active student engagement from the beginning to the end of the learning process. The findings of this study are also consistent with those of Zubaidah, who demonstrated that REMAP-GI has a significant effect on improving critical thinking skills and learning outcomes among biology students.

b. Homogeneity Test

Table 7: Test of Homogeneity of Student Learning Activities

Variable	Based on Mean		Notes
	Sign	α	
Learning Activity	0,706	0,05	Homogeneous

The results of the homogeneity test analysis show that the sig. based on mean is 0.338, while the significance level is 0.05. Therefore, it can be concluded that sig. based on mean $> \alpha$ (0.706 is greater than 0.05). This means that the selected sample comes from a homogeneous population.

c. Hypothesis Testing

Table 8: Hypothesis Testing of Student Learning Activities

Variable	F	Sign	t	df	Sig
Learning Activities	0,182	0,671	-1,522	58	0,0133
			-1,522	57,998	0,0133

Table 8 above shows that the significance value obtained in the hypothesis test is a two-tailed p-value of 0.0133. A hypothesis is accepted if the significance value is less than 0.05 ($p < 0.05$). Thus, since 0.05 ($0.0133 < 0.05$), this means that hypothesis H1 is accepted and H0 is rejected. This implies that there is a significant effect between the learning activities of students taught using the REMAP-GI learning model and those of students taught without using the REMAP-GI learning model.

5. The Effect of the REMAP-GI Instructional Model on Student Learning Outcomes

a. Normality Test

Table 9: Test of Normality of Student Learning Outcomes Using the Shapiro-Wilk Test

Variable	Sign	α	Notes
Experimental Class Pretest	0,086	0,05	Normal
Experimental Class Posttest	0,805	0,05	Normal
Control Class Pretest	0,089	0,05	Normal
Control Class Posttest	0,195	0,05	Normal

Table 9 above shows the results of the Shapiro-Wilk test, indicating that the data for Class XI KM 4 (experimental group) had a significance value of 0.086 on the pretest

and 0.805 on the posttest, while the significance level was set at 0.05. This indicates that the significance value is greater than the significance level, meaning that the learning outcomes of students taught using the REMAP-GI learning model are normally distributed. As for the analysis of the results for Class XI KM 5 (Control), the significance value was 0.089 on the pretest and 0.195 on the posttest, while the alpha value was 0.05, meaning that the learning outcome data of students taught without using the REMAP-GI learning model are normally distributed. It can be concluded that the data from the experimental and control classes are normally distributed.

b. Homogeneity Test

Table 10: Test of Homogeneity of Student Learning Outcomes

Variable	Based on Mean		Notes
	Sig	α	
Learning Outcomes	0,076	0,05	Homogeneous

The results of the homogeneity test analysis show that the sig. Based on Mean value is 0.076, while the α value is 0.05. It is concluded that the sig. Based on Mean value is greater than α ($0.076 > 0.05$), meaning that the sample used comes from a homogeneous population.

c. Hypothesis Testing

Table 11 Hypothesis Testing of Student Learning Outcomes

Variabel	F	Sig.	t	Df	Sig. (2- tailed)
Learning Outcomes	3,273	0,076	-3,194	58	0,002
			-3,194		

Table 11 above shows that the significance value obtained in the hypothesis test is a two-tailed p-value of 0.002. A hypothesis is accepted if its significance value is less than 0.05 ($p < 0.05$). Thus, 0.05 ($0.002 < 0.05$), which means that hypothesis H1 is accepted and H0 is rejected. This implies that there is a significant effect between the learning outcomes of students taught using the REMAP-GI learning model and those taught without using the REMAP-GI learning model.

The implementation of the REMAP-GI model in the classroom also helps boost students' motivation to learn. Students become more actively engaged, whether in seeking information, organizing ideas, or in group collaboration. This leads to increased interest and engagement in the learning process. When students feel directly involved, their understanding of the material becomes stronger, and their learning outcomes improve. This situation differs from conventional learning, which tends to position students as passive recipients of information, resulting in less optimal retention of the material compared to interactive learning.

The findings of this study are also consistent with previous research indicating that the use of concept map-based learning models and group investigations can improve learning outcomes. For example, the study conducted by Atiek Rohmiyati (2024)

represents an important new innovation for helping students achieve meaningful learning in the classroom. Concept maps provide concrete visual aids to help organize information before it is studied.

D. CONCLUSION

Based on the research findings, it can be concluded that the implementation of the REMAP-GI (Reading, Concept Map-Group Investigation) learning model for the cell and bioprocesses curriculum in Grade 11 KM at State Senior High School 10 Gowa was optimal across all implementation indicators. The learning activities of students taught using the REMAP-GI (Reading, Concept Map -Group Investigation) on the subject of cells and bioprocesses in Class XI KM at SMA Negeri 10 Gowa, with an average score of 83.00, fall into the “very active” category, The learning outcomes of students taught using the REMAP-GI (Reading, Concept Map-Group Investigation) learning model on cell and bioprocesses material in Grade XI KM at SMA Negeri 10 Gowa, with an average score of 85.83, fall into the “very good” category, The application of the REMAP-GI (Reading, Concept Map-Group Investigation) learning model in the cell and bioprocesses subject for Grade XI KM at SMA Negeri 10 Gowa has a significant effect on student learning activities, and the application of the REMAP-GI (Reading, Concept Map-Group Investigation) learning model in the cell and bioprocesses subject for Grade XI KM at SMA Negeri 10 Gowa has a significant effect on student learning outcomes

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