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Improving Learning Achievement Through Jigsaw Type Cooperative Learning Model By Considering The Level of Misconception and Learning Motivation

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Abstract

This study aims to improve learning achievement through a jigsaw cooperative learning model by paying attention to the level of misconceptions and learning motivation on learning achievement in the Indonesian language subject at SDN Seruni 01, Jember Regency. Jigsaw is a multifunctional structure of cooperative learning structures. The research subjects were grade II students at Seruni 01 Public Elementary School in the eighth semester of the 2022/2023 academic year. The research subject is success in learning Indonesian. Methods of data collection is done through tests. The data analysis method used is descriptive analysis. The success criterion is a minimum class average according to the KKM score and a minimum classical advantage of 65%. In the first period, the willingness to learn increased from 56 percent to 83 percent in the second period. Data from Cycle II shows that the expected success achieved even exceeds the proposed learning success indicator. From this, the researcher concluded that Jigsaw cooperative learning applied in the learning process can improve learning.

Keywords: Misconception, Jigsaw, Learning Achievement.

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1. Introduction

Knowledge can be acquired through learning activities. With learning activities, students will learn the knowledge they have. Knowledge can be evaluated based on the ability of the learners, namely through the level of learning achievement. teaching activity is a very important activity in achieving educational goals. Good learning activities can help students in learning the expected knowledge, skills, and attitudes. The learning achievements of learners can be used as a benchmark for the success of the education received. Because of that, it is important for learners to have high learning motivation and exert maximum learning effort to achieve optimal learning achievement. In addition, the guidance and learning environment are also very important in creating optimal learning conditions for students (Alismaiel et al., 2022).

Motivation to learn is very important to the activity of learning. A person who has a high motivation to learn will be enthusiastic about learning so that he will have a lot of energy to carry out learning activities and analyze his competencies. Students who are motivated will be able to participate in learning activities in Class (Ahmar et al., 2020). Each concept in the subject is interrelated with each other. When a student's concept is well understood, the student can continue and understand other concepts because the initial concept is needed for the next concept

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(Banihashem et al., 2022). On the other hand, if there is a mistake in understanding one concept, it can affect the understanding of other concepts. Inteirpreitation or students' understanding of a concept is differentiated by the concept. Students must have a clear understanding. Students' readings or concepts may be different and some of them may be different from the concepts recognized by experts (Gilroy, 2022). If the student's understanding is not in line with the understanding defined by experts, then the student is experiencing misconception.

Learning outcomes are actual changes in student behavior after the teaching and learning process is completed in accordance with educational objectives. The puzzle collaborative learning model can increase student motivation and learning outcomes. The jigsaw learning model is also called expert collaboration because each group member faces different problems, but the problem is the same in each group (Panut, 2022). Jigsaw is a multifunctional structure of learning cooperation structure. Jigsaw can be used in a number of ways to achieve various goals but is mainly used for presentations and gaining new material, this structure creates interdependence.

The jigsaw method is a cooperative learning technique in which students, rather than the teacher, have greater responsibility for carrying out the learning. The goal of jigsaw is to develop teamwork, cooperative learning skills, and a depth of knowledge that would not be possible if they tried to learn all the material on their own. jigsaw Each student in the "starting group" specializes in one part of a unit of study. The students then meet with members of another group who are assigned to work on another section, and after mastering this other material they will return to their original group and inform the other members of the material (Ainscow, 2020). All students in the "home group" have read the same material and they meet and discuss it to ensure understanding. Jigsaw is a commonly used active learning technique as it maintains a high level of personal responsibility.

Misconceptions usually arise along with learning. When students are unaware of misconceptions, confusion arises and the process of knowledge formation becomes difficult. Students who are aware of their misconceptions find it easier to change and correct their perceptions. Students can decide whether the concept is wrong or right. The misconceptions experienced by each student can be different. Identifying misconceptions is essential to develop correct conceptual understanding in students. Misconceptions Researchers have found various reasons for misconceptions among students (Lestari et al., 2021).

Based on these problems, a jigsaw cooperative learning model was applied. Jigsaw type cooperative learning model is a form of group learning where the group consists of several students who are responsible for completing part of the subject and then for teaching the subject to their group (Azzajjad et al., 2020). Stated that the Jigsaw learning model is quite effective in learning, because in Jigsaw small groups can be formed to discuss and learn together. Innovation is an important factor in learning.

Student achievement is usually assessed according to the value created in school teaching. This grade can be used as an indicator to assess students' success in learning new knowledge and life skills (Pongkendek et al., 2021). In addition, grades can also be used as a reference to determine whether a student deserves to continue to the undergraduate level or to graduate from school. However, it must be remembered that academic achievement is not only determined by grades, but also by the ability of students to apply the knowledge and skills learned in daily life. Listening is the process of listening carefully to the symbols that are spoken, understanding the imagery, and understanding the meaning of communication conveyed by the speaker through language or spoken language.

In addition to motivation to learn, there are many other internal factors that affect students' learning, such as the understanding of concepts and principles, as well as the balancing of knowledge and self-confidence as prerequisites for continuing education to a higher level and balancing knowledge. The concepts that students understand affect their performance. When the concepts learned are understood, it can be said that the student's performance improves. The better students understand the subject, the less misunderstanding of the subject they experience and the better their academic performance (Bansal, 2021).

Indonesian language teaching in elementary schools teaches children to communicate in the Indonesian language. The teaching of Indonesisian language in elementary schools is intended to improve students' ability to communicate in Indonesisian language both orally and verbally.

Based on the results of the observation at SD Seruni 01, it was found that in the implementation of Indonesian language learning (describing objects) in class II it was seen that the proportion of classical accuracy was only 40%,

which is very. far from that is the minimum. usually 75%. In relation to this problem, the researcher wants to improve the performance of students through the means of improving teaching.

Teachers are an important factor in the learning innovation process. The learning model designed by the teacher is adjusted to the characteristics of the objectives, students, materials and resources (Atenas et al., 2023). The cooperative learning model is a teaching system that offers students the opportunity to work together with fellow students on structured tasks. The characteristics of a good learning model: (1) logical theoretical rationale compiled by the author or developer, (2) rationale for what and how students learn (achievable learning outcomes), (3) teaching behaviors required to implement the model correctly, (4) learning environment required to achieve learning objectives.

Based on the description above, the researcher raised the title "Improving Learning Achievement Through the Jigsaw Type Cooperative Learning Model by Paying Attention to the Level of Misconception and Motivation to Learn Indonesian Language at SDN Seruni 01". With such actions, it is expected that the learning achievement of students will be improved. In this study, the formulation of objectives is to improve the learning achievement of Indonesian language students in grade II semester II of SD Negeri Seruni 01 in the 2022/2023 academic year after applying the jigsaw cooperative learning model in learning. It is hoped that this research will be useful as a reference to enrich the theory in order to improve teacher competence. Although in its implementation, it is hoped that this research will benefit schools, especially SD Negeri Seruni 01 because it will improve teacher competence in teaching students. In addition, this research is expected to provide valuable information for teachers and school leaders so that teachers do not just teach at will.

2. Methods

This study aims to conduct an action research in the classroom which is intended to improve the quality of teaching in the classroom. Action research in keilas is very emphasized on process and production, during the process of action the researcher must consider all the consequences of the actions taken. That action research is a cross-sectional study of teaching activities beiruipa keigiatan keilas that are intentionally modified and integrated.

Language teaching methodology is a methodology that is defined as a process that is deliberately designed to achieve a goal. On the other hand, the method is defined as a teaching plan that includes the selection of the subject matter, the subject matter to be taught systematically and the possibility of further refinement and balancing. In the description of the beirikuit, the peinting of the method is more focused on the process, the systematic way of working to achieve the goal. Formal instruction is the classic and traditional instruction for language learning. It is based on the assumption that language learning is a normal routine activity, following conventional learning methods. Because of this, it has no theoretical background. The teaching is based solely on the guiding experience and what the auidieins like. In this kind of instruction, the instruction is assessed through theoretical formulation and the skill of applying examples of training (Korniawan, 2022).

Improved jigsaw-type learning misconceptions can be caused by several factors. The following are some common causes: Lack of prior understanding: Jigsaw misconceptions occur when students do not have a solid understanding of the previous material. If students do not have a good foundation, they are likely to have difficulty in understanding more complex concepts, thus increasing the likelihood of misconceptions. Lack of emphasis on deep understanding: Jigsaw misconceptions can also occur if learning only focuses on surface understanding without encouraging students to understand concepts deeply. If students only memorize facts without understanding the concepts behind them, they might develop misconceptions. Ineffective teaching methods: Inadequate or inappropriate teaching methods can also lead to an increase in misconception jigsaws. If teachers cannot communicate concepts clearly, do not provide appropriate examples, or do not provide opportunities for students to actively interact with the material, students may develop misconceptions. Miscommunication or misinformation: Sometimes, students may develop misconceptions due to receiving incorrect information or miscommunication. This can happen if the source of information they use is inaccurate or if there is a misunderstanding in the communication between the teacher and the student. Conflicting everyday experiences: Students may bring in understandings from everyday experiences that are inconsistent with the concepts taught in class. If their own experiences conflict with the concepts being taught, they may develop misconceptions.Lack of reflection and correction: If students are not given the opportunity to reflect on their

understanding and correct their misconceptions, misconceptions may persist and develop into deeper misconceptions. It is important for teachers to understand these factors and try to overcome them through effective teaching methods, encouraging deep understanding, providing appropriate feedback, and providing opportunities for students to reflect and refine their understanding.

The subjects of this study were 18 students and 1 teacher at UPTD Class II Education Unit SD Negeri Seruni 01 District Jeinggawah and 1 teacher. The subject of this research is the learning outcomes of Indonesian language subjects whose subject matter is describing being through class. stem method. This research was conducted in two periods of one session. The research process used consists of four stages, namely: planning 1 and 2, observation, and reifleiction.

Plan means strategy / planning, and learning means effort to teach students, while learning is a activity / process carried out systematically by several inseparable components, namely teachers, students, teaching activities/strate and teaching tuition/teaching planning is one of the activities that are carried out at the same time. The teacher prepares everything that is related to the success of the teaching process so that the teaching objectives are well achieved.

The guided observation report, student observation report and teaching performance report were used as research instruments. The data analysis technique used in the research on the action of the students of the second grade of Elementary School Negeri Seruni 01 district Jeinggawah is data that is recorded in numbers and analyzed descriptively by using averages and percentage. The data analysis technique of this research is based on the results.

$$P = \frac{JS}{SS} \times 100\%$$

Description: P = Percentage Value
JS = students who scored ≥ 65
SS = all students

3. Results and Discussion

3.1. Cycle I

Student learning completeness is strongly influenced by a number of interacting factors. Students' level of motivation to learn plays an important role in determining learning completeness (Lince, 2022). Well-motivated students tend to be more focused and strive to achieve good results. Teacher competence and the teaching methods used can affect student understanding. An effective teacher can help students understand the material better. The use of learning methods that suit students' learning styles can improve their understanding. Diverse and interactive methods can also help students be more engaged in learning (Ifandi et al., 2016).

Table 1. In the form of value/score distribution Cycle I

No.	Score (S)	Frequency (F)	%	S X F
1	100	0	0	0
2	90	0	0	0
3	80	3	17	240
4	70	4	22	280
5	60	1	6	60
6	50	3	17	150
7	40	7	39	280
	Total	18	100	1010

The following are the general steps that can occur in Cycle I of research using the jigsaw model: Planning: In the initial stage of cycle I, the researcher or educator plans the implementation of the jigsaw model in the classroom. This includes the selection of the subject matter to be taught, the division of student groups, and the planning of activities to be carried out. Group Formation: Students are divided into small groups consisting of diverse members. Each group member will be responsible for understanding and mastering a specific portion of the subject matter. Material Distribution: Each small group will be given a different section of the subject matter. This may mean that each group member will be an "expert" in a particular sub-topic. Small Group Learning: Each small group will work together to understand and master the piece of material they received. They may conduct discussions, research, or other activities according to the prescribed learning method. Material Understanding: Group members must understand and master the material they have learnt well. Jigsaw Group Selection: One member from each small group will be moved to a different jigsaw group. Each jigsaw group will consist of members representing different sub-topics of the material. Discussion and Collaboration: In a jigsaw group, each member will share his or her knowledge of their sub-topic with the rest of the group. The aim is to create a more thorough understanding of the subject matter. Presentation: After the discussion in the jigsaw group, group members may be asked to make a presentation or share their learning outcomes to the whole class. This allows students to learn from each other and gain a more complete understanding of the entire subject matter. Evaluation: After Cycle I is completed, the researcher or educator can conduct an evaluation of the implementation of the jigsaw model and student learning. This involves analysing the extent to which the jigsaw model was successful in achieving the desired learning objectives.

Measuring the level of student misconceptions in the Jigsaw method can be done in various ways. Misconceptions are incorrect or inaccurate understandings of concepts in a particular subject matter (Jensen et al., 2014). In the context of the Jigsaw method, measuring misconceptions can help identify areas where students may have inaccurate understandings so that they can be addressed effectively. Measuring student learning motivation in the Jigsaw method or in any learning context is important to understand the extent to which students are motivated to learn and participate in learning activities.

Measuring student misconceptions can identify areas where students may have an inaccurate understanding of the subject matter. The results of misconception measurement can be used to design appropriate interventions, such as re-delivery of the material or additional learning activities, to help students overcome their misconceptions. Analysis of the data may suggest a relationship between students' level of misconceptions and their motivation to learn. Students who have fewer misconceptions or who successfully overcome misconceptions may be more motivated to learn (Uwineza et al., 2023). This suggests the importance of accurate understanding in nurturing students' learning motivation. The results of measuring students' learning motivation can help in understanding the extent to which students are motivated to participate in the Jigsaw method. A high level of motivation can result in better learning outcomes, as students are more likely to be active in the learning process.

The information gained can be used to design more effective learning experiences. By properly addressing misconceptions and motivating students, the Jigsaw method and other learning strategies can become more efficient in achieving educational goals (Table 2).

Table 2. Achieving educational goals

Completed	Not Completed	Total
8	10	18
56 %	44 %	100 %

Description: Description. Classically this learning was not completed

The information obtained from measuring misconceptions and learning motivation can be used to evaluate the effectiveness of the Jigsaw method in achieving learning objectives. If the results show that the Jigsaw method successfully reduces students' misconceptions and increases their learning motivation, it can be an indication that the method is effective. Conclusions can be used to formulate recommendations for improvements in the implementation of the Jigsaw method. For example, if there are persistent misconceptions, it may be necessary to make changes in

teaching or emphasise certain concepts. Also, if learning motivation is low, recommendations may include strategies to increase student motivation.

3.2. Cycle II

At this stage, problems or learning challenges in Cycle I have been identified, and actions have been taken to overcome these problems. The expected outcome is an improvement in student learning. This may be reflected in improved student understanding, skills or achievement. Cycle II involves an evaluation of the actions taken in Cycle I. You will measure the impact of those actions on student learning. This may involve data analysis, classroom observations, tests, or other evaluation tools to assess the extent to which improvements have occurred.

Table 3. Evaluation Score of Indonesian Language Learning Cycle II

No.	Score (S)	Frequency (F)	%	S X F
1	100	0	0	0
2	90	10	56	900
3	80	5	28	400
4	70	1	6	70
5	60	2	11	120
6	50	0	0	0
7	40	0	0	0
	Total	18	100	1490

The results of measuring the improvement of learning outcomes in Cycle II using the Jigsaw method, based on the analysis of students' misconceptions and learning motivation, can provide a clearer picture of the impact of the Jigsaw method on students' understanding and their motivation. The measurement results showed that the level of students' misconceptions reduced in Cycle II, this can be considered as an indication that the Jigsaw method has been effective in helping students understand the subject matter better. This improved understanding can be reflected in better test or assignment results. Analysing the results of students' misconceptions and learning motivation in Cycle II can help understand whether there is a relationship between these two factors. If students who successfully overcome misconceptions tend to have higher learning motivation, this could indicate that accurate understanding can increase learning motivation. As the measurement results showed an increase in students' learning motivation in Cycle II, this can be taken as an indication that the Jigsaw method has been successful in stimulating students' interest in learning. This could be reflected in more active participation in Jigsaw sessions, more productive discussions, or improvement in the completion of assignments.

Table 4. Achieving educational goals

Completed	Not Completed	Total
16	2	18
83 %	17 %	100%
Description: Classically this learning was completed		

In the overall analysis, it can assess the effectiveness of the Jigsaw method by comparing the results in Cycle I and Cycle II. If there is a significant increase in student understanding and/or learning motivation, this can be considered as evidence that the Jigsaw method is effective in achieving the learning objectives. The measurement results can be used to formulate further recommendations. If there are still misconceptions that need to be addressed or if learning motivation still needs to be improved, you can plan next steps to refine the Jigsaw method or involve additional strategies. Based on the results, you can identify the elements of the Jigsaw method that are most effective in improving students' understanding and their motivation to learn. This information can help you develop further learning methods or adapt existing approaches for the purposes of a particular class or subject matter.

A teacher's ability to deliver subject matter clearly and effectively can influence students' understanding and their motivation to learn. Competent teachers can help prevent misconceptions and stimulate student interest. The use of learning methods that are interactive, engaging and suitable for students' learning styles can increase their learning motivation. Methods that promote problem solving and critical thinking can also help prevent misconceptions. The subject matter presented should be appropriate to the students' level of understanding and avoid confusing language or concepts. Relevant and interesting material can increase learning motivation. The environment at home and at school plays an important role. Good facilities, a conducive atmosphere and access to supporting resources can influence motivation and reduce misconceptions. Students' mental and emotional health also plays a role in their motivation to learn and their ability to understand the material. Students who feel good emotionally are more likely to learn well (Marpaung et al., 2021).

Rewards, praise and positive feedback from teachers and parents can increase students' learning motivation. They feel valued and motivated to keep trying. Students' learning abilities, such as the ability to organise information, independence in learning and critical thinking skills, can influence the extent to which they overcome misconceptions and are motivated to learn. Providing challenges that match students' level of understanding can increase their motivation. Challenges that are too easy or too difficult can reduce motivation (Kusuma & Ramadhani, 2021).

In Cycle II of the Jigsaw method, measuring students' misconceptions and motivation to learn can provide important information that can be used to evaluate the effectiveness of the Jigsaw method in improving learning outcomes. Measuring misconceptions can help identify whether the Jigsaw model has been successful in reducing students' misconceptions related to a particular subject matter. The lower results of the misconception test in Cycle II compared to Cycle I suggest that the Jigsaw method may be effective in helping students overcome their misconceptions. If students show improvement in their understanding of the subject matter in Cycle II, this can be taken as an indication that the actions that have been taken in Cycle I, such as the use of the Jigsaw method, have successfully improved their understanding. The measurement of students' learning motivation in Cycle II can provide insight into the extent to which students are motivated to learn using the Jigsaw method. If students show higher motivation, this can be taken as an indication that the Jigsaw method has stimulated their interest in learning.

4. Conclusions and Recommendation

Based on the results, it can be concluded that overall, the jigsaw learning method is an effective approach in building cooperation, improving concept understanding, developing individual responsibility, preventing misconceptions, and broadening students' perspectives. By actively involving students in the learning process, the jigsaw method helps to create a collaborative, responsive and student-centred learning environment. The application of the Jigsaw type coopeirative learning mode can improve the learning outcomes of Indonesian language students at Negeri Seruni Elementary School 01, 2022/2023. The results of the research The information obtained on the results of the study can make students more active and enjoyable. For this purpose, the following suggestions should be made: a) Efforts to improve the quality of education require optimal preparation. Oleih kareina itui, it is recommended that teachers can define or choose modes that can beinar-beinar diguinakan in seikolah and diseisuiaikan deingan karakteiristik siswa, so that the results juiga optimal. b) In order to improve the effectiveness of teaching, the teacher should pay more attention to students' motivation to learn, and train students with a variety of teaching methods, so that students are not bored when they are learning. c) Other researchers are encouraged to investigate by using other methods, modes and bonds as well as investigating the parts that can be investigated in the future.

References

Ahmar, D. S., Azzajjad, M. F., & Syahrir, Muh. (2020). Students' Representation Ability in Chemistry. *Journal of Applied Science, Engineering, Technology, and Education*, *2*(2), 181–187. https://doi.org/10.35877/454RI.asci22124

Ainscow, M. (2020). Promoting inclusion and equity in education: Lessons from international experiences. *Nordic Journal of Studies in Educational Policy*, *6*(1), 7–16. https://doi.org/10.1080/20020317.2020.1729587

Alismaiel, O. A., Cifuentes-Faura, J., & Al-Rahmi, W. M. (2022). Online Learning, Mobile Learning, and Social Media Technologies: An Empirical Study on Constructivism Theory during the COVID-19 Pandemic. *Sustainability*, *14*(18), 11134. https://doi.org/10.3390/su141811134

Atenas, J., Havemann, L., & Timmermann, C. (2023). Reframing data ethics in research methods education: A pathway to critical data literacy. *International Journal of Educational Technology in Higher Education*, *20*(1), 11. https://doi.org/10.1186/s41239-023-00380-y

Azzajjad, M. F., Ahmar, D. S., & Syahrir, Muh. (2020). The Effect of Animation Media in Discovery Learning Model on Students' Representation Ability on Chemical Equilibrium Materials. *Journal of Applied Science, Engineering, Technology, and Education*, *2*(2), 204–209. https://doi.org/10.35877/454RI.asci22125

Banihashem, S. K., Farrokhnia, M., Badali, M., & Noroozi, O. (2022). The impacts of constructivist learning design and learning analytics on students' engagement and self-regulation. *Innovations in Education and Teaching International*, *59*(4), 442–452. https://doi.org/10.1080/14703297.2021.1890634

Bansal, C. (2021). Digital Literacy of School Students in India: A Study. *Learning Community: An International Journal on Educational and Social Development*, *12*(2). https://doi.org/10.30954/2231-458X.02.2021.3

Gilroy, M. (2022). Reading the Global City: Crisis, Cognitive Mapping and the "Urban Sensorium" in Tom McCarthy's Satin Island and Ben Lerner's 10:04. *CLCWeb: Comparative Literature and Culture*, *24*(1). https://doi.org/10.7771/1481-4374.4285

Ifandi, S., Jumari, J., & Suedy, S. W. A. (2016). Knowledge Understanding and Utilization of Medicinal Plants by Local Community Tompu District of Kaili, Sigi Biromaru, Central Sulawesi. *Biosaintifika: Journal of Biology & Biology Education*, *8*(1), 1. https://doi.org/10.15294/biosaintifika.v8i1.4529

Jensen, J. L., McDaniel, M. A., Woodard, S. M., & Kummer, T. A. (2014). Teaching to the Test…or Testing to Teach: Exams Requiring Higher Order Thinking Skills Encourage Greater Conceptual Understanding. *Educational Psychology Review*, *26*(2), 307–329. https://doi.org/10.1007/s10648-013-9248-9

Korniawan, R. (2022). *ANALYSIS OF DIGITAL EDUCATION CONSTRAINTS DURING THE COVID-19 PANDEMIC IN G-20 MEMBER COUNTRIES*. *16*(01).

Kusuma, Y. W. A., & Ramadhani, S. (2021). *Penggunaan Game Simcity Sebagai Pengimplementasian Model Belajar Gamification Guna Meningkatkan Motivasi Belajar Siswa*. *1*(4).

Lestari, L. A., Subandi, S., & Habiddin, H. (2021). Identifikasi Miskonsepsi Siswa pada Materi Laju Reaksi dan Perbaikannya Menggunakan Model Pembelajaran Learning Cycle 5E dengan Strategi Konflik Kognitif. *Jurnal Pendidikan: Teori, Penelitian, dan Pengembangan*, *6*(6), 888. https://doi.org/10.17977/jptpp.v6i6.14876

Lince, L. (2022). Implementasi Kurikulum Merdeka untuk Meningkatkan Motivasi Belajar pada Sekolah Menengah Kejuruan Pusat Keunggulan. *Prosiding Seminar Nasional Fakultas Tarbiyah dan Ilmu Keguruan IAIM Sinjai*, *1*, 38–49. https://doi.org/10.47435/sentikjar.v1i0.829

Marpaung, D. N., Pongkendek, J. J., Azzajjad, M. F., & Sukirno, S. (2021). Analysis of Student Motivation using Chemsketch on Hydrocarbon Topic in SMA Negeri 2 Merauke. *Journal of Applied Science, Engineering, Technology, and Education*, *3*(1), 69–73. https://doi.org/10.35877/454RI.asci105

Panut, P. (2022). Meningkatkan Hasil Belajar Hidrokarbon dengan Model Cooperative Integrated Reading And Composition (Circ) Berbantuan Media Buletin. *Jurnal PTK dan Pendidikan*, *7*(2). https://doi.org/10.18592/ptk.v7i2.5664

Pongkendek, J. J., Ahmar, D. S., Munandar, H., & Azzajjad, M. F. (2021). Student Perceptions of Online Learning During the Covid-19 Pandemic. *EduLine: Journal of Education and Learning Innovation*, *2*(1), 1–16. https://doi.org/10.35877/454RI.eduline607

Uwineza, I., Uworwabayeho, A., & Yokoyama, K. (2023). Grade-3 Learners' Performance and Conceptual Understanding Development in Technology-Enhanced Teaching With Interactive Mathematics Software. *European Journal of Educational Research*, *12*(2), 759–774. https://doi.org/10.12973/eu-jer.12.2.759