JURNAL
Pendidikan, Sains, Sosial dan Agama
SEKOLAH TINGGI AGAMA BUDDHA NEGERI RADEN WIJAYA WONOGIRI

Analysis Of Students' Mathematical Literacy Abilities Using Discovery Learning-Based Student Worksheets (LKPD) On Algebra Material In Grade VII

Venti Br Ambarita[1], Ruth Mayasari Simanjuntak[2], Golda Novatrasio Sauduran[3]
Pendidikan Matematika, Fakultas Keguruan Dan Ilmu Pendidikan Universitas HKBP Nommensen Medan, Indonesia
Email: venti.ambarita@student.uhn.ac.id

Article History:
Received: 11 January 2025 *Revised: 16 May 2025* *Published: 31 August 2025*

Abstract

This study aims to analyze the mathematical literacy skills of grade VII students at SMP Negeri 5 Percut Sei Tuan in algebra using Discovery Learning-based worksheets (LKPD). The research employed a qualitative design with a descriptive qualitative approach. The research subjects were determined based on student's levels of mathematical literacy skills, consisting of two high-achieving, two moderate, and two low-achieving students. The results showed that high-achieving students were able to accurately identify information, construct mathematical models, compile calculations throughly, and interpret results in context. Moderate-achieving students demonstrated adequate ability in identifying information and engaging in modeling but still made errors in calculations and interpretation. Meanwhile, low-achieving students were only able to recognize simple information and encountered difficulties from the modeling stage, which prevented them from completing solutions successfully. Overall, the use of Discovery Learning-based worksheets facilitated active engagement, encouraged critical thinking, and connected mathematics with real-life contexts, although its effectiveness varied according to students' initial abilities, thus requiring differentiated instructional strategies for low-achieving groups.

Keywords: Mathematical Literacy Skills, Discovery Learning, Worksheets, Algebra.

INTRODUCTION

In the world of education, mathematics is a compulsory subject in schools, from elementary to higher education (Tambunan, 2021:70) . One of the important fields of science to support the realization of a developed nation is mathematics. According to Jumarniati et al., (2021) , "Mathematics is a universal science that underlies the development of modern technology, plays a vital role in various disciplines, and advances human thought." One characteristic of mathematics is its abstract nature. Therefore, in mathematics learning, some students experience difficulties in understanding mathematical concepts.

Mathematics learning is closely related to mathematical literacy skills (Ananda & Wandini, 2022). However, in reality, the mathematical literacy skills of students in Indonesia are still low and unable to compete with other countries. Based on the results of the PISA

survey by the Ministry of Education, Culture, Research, and Technology (2023), the mathematical literacy score in 2018 was 379 and decreased to 366 in 2022. Meanwhile, Indonesia's PISA literacy comprehension ranking rose from 74th in 2018 to 71st in 2022, and its mathematics ranking rose from 73rd in 2018 to 70th in 2022. Indonesia also participated in PISA. The aim was to understand the curriculum development process in Indonesia and measure students' mathematical literacy skills.

Literacy is a skill that supports daily human activities, such as writing and reading. Without literacy, humans would have difficulty communicating with each other. In today's rapidly developing era, literacy rates are low due to the seemingly indulgent technology that often overwhelms its users. The implementation of mathematical literacy is called mathematical literacy. Mathematical literacy is defined as a person's ability to formulate, apply, and interpret mathematics in various situations, including the ability to reason mathematically and the ability to use concepts, procedures, and facts to describe, explain, or predict phenomena or events (Jumarniati et al., 2021) . Mathematical literacy skills are crucial for students because they contain important aspects that enable them to express ideas, construct, and activate mathematical concepts, use reasoning to generate ideas, and communicate each idea to interpret a solution to a problem effectively (Widdah & Faradiba, 2022) . Realizing this, learning mathematics should be a necessity and an enjoyable activity. However, until now, mathematics education is still problematic due to the low mathematics learning outcomes of students.

From the above problems, mathematics learning outcomes are still lacking. As in the results of observations conducted by Fikri et al., (2023) researchers found several mathematical problems specifically in students' mathematical literacy abilities where many students still have difficulty understanding problems to be recounted in mathematical form students by choosing subjects with different levels of mathematical ability. According to Kholifasari et al., (2020) that "Low mathematical literacy abilities can be caused by the rareness of students being given problems that refer to mathematical literacy."

According to the National Literacy Agency of the Ministry of Education and Culture, one of the factors causing low mathematical literacy skills of students is that students are not accustomed to facing problems that have contextual substance, demanding reasoning, argumentation, and creativity in solving them. The above also certainly becomes a problem for students in working on problems in algebra material, because working on algebra material requires reasoning, problem-solving skills and the ability to solve problems by connecting mathematical concepts to everyday life. One of the materials most often associated with everyday life is algebra material. (Zulmi & Akhlis, 2020) .

One of the main causes of weak mathematical literacy is learning that is still conventional and lacks contextualization. Many teachers do not provide questions or teaching materials that require reasoning, argumentation, or the application of mathematics in everyday life and are still procedural without directing students (Kholifasari et al., 2020) . In fact, meaningful learning will be more optimal if students are actively involved in

discovering the concepts being learned. Encouraging mathematical literacy is an effort made to optimize children's reading, writing, and arithmetic skills, the patterns and methods of development are adapted to the needs of junior high school students. This is in accordance with research results that mathematical literacy is stated as a process of providing stimulus to develop reading and arithmetic skills, especially with an emphasis on letter knowledge and phonological awareness. The method of development can be done by inviting children to read (Sitepu, Panjaitan, Situmorang, & ..., 2022) . To overcome this problem, a learning approach and teaching materials that support active student involvement are needed. One alternative is the use of *Discovery Learning- based Student Worksheets (LKPD*). Through LKPD, student activity and creativity in learning can be enhanced, and the delivery of learning materials can be facilitated (Dinda et al., 2021). Student involvement in active learning activities is emphasized in directed learning, so that various knowledge is acquired in a holistic, meaningful, authentic, and active manner (Nurhayati & Langlang Handayani, 2020) .

Research by Zulmi & Akhlis (2020) shows that *Discovery Learning - based worksheets (LKPD*) can significantly improve students' critical thinking skills and understanding of mathematical concepts. This finding aligns with Diana et al.'s (2022) findings , which state that worksheets with this approach encourage students to be more active and independent in discovering the mathematical concepts they are learning. This model is highly relevant for accustoming students to solving literacy-based problems, particularly in algebra, which requires conceptual understanding, reasoning, and real-life application. (Santoso, 2022) .

Based on information obtained from the school, specifically one of the mathematics teachers at SMP Negeri 5 Percut Sei Tuan, until now there has been no research that specifically examines the use of *Discovery Learning- based LKPD* in mathematics learning, especially in algebra material. From the results of the information obtained, that most students still experience difficulties in understanding concepts, especially when linked to real-life contexts. The teacher stated that students have not been able to utilize their mathematical abilities in everyday life such as problem solving, mathematical reasoning and conceptual understanding and have not been able to analyze a mathematical problem well such as in mathematical problems in the form of story problems. One of the teachers also stated that learning in the classroom generally still uses conventional methods and the LKPD used is more filled with procedural practice questions without directing students and does not require students to think independently (Simamora & Saragih, 2019) .

Thus, the use of *Discovery Learning- based Student Worksheets (LKPD)* is a potential alternative solution for developing active learning methods through self-discovery and self-investigation. Through discovery learning, students can also learn, think analytically, and try to solve problems themselves. This LKPD is designed so that students not only work on problems but also go through the stages of identifying problems, formulating hypotheses, exploring data, and concluding concepts. This process aligns with the OECD's mathematical literacy indicators *(formulate, employ, interpret)* , which emphasize students' ability to

understand, apply, and interpret mathematics in everyday life contexts (Ananda, 2023). In this study, researchers used *Discovery Learning -based Student Worksheets* that have been validated by experts, making them feasible and appropriate for implementation in learning. (Pasaribu, 2019) .

Based on the explanation above about the importance of students' mathematical literacy skills, the researcher is interested in conducting research using *Discovery Learning -based Student Worksheets (LKPD) as teaching materials in the learning process with the title "Analysis of Students' Mathematical Literacy Skills Using Discovery Learning* -Based Student Worksheets (LKPD) on Algebra Material in Class VII of SMP Negeri 5 Percut Sei Tuan in the 2025/2026 Academic Year"

METHOD

The type of research used by the researcher is descriptive qualitative research. Descriptive research is research that collects data based on the facts, then organizes, processes, and analyzes it to provide an overview of the existing problem. According to Ramdhan (2021) , descriptive research is research that uses a method to describe research results. As the name suggests, descriptive research aims to provide descriptions, explanations, and validation of the phenomenon being studied. According to Sugiyono (2019), qualitative research is data in the form of words, sentences, and images, which are a collection of non-numerical data that are descriptive in nature. (Fithriyah, Wibowo, & Octavia, 2021) .

From the description above, it can be concluded that qualitative descriptive research is a type of research that describes an event or phenomenon in real terms based on facts or data in the form of sentences or pictures.

This research will be conducted at SMP Negeri 5 Percut Sei Tuan located at Jl. Cucak Rw. II No. 03, Tegal Sari Mandala II, Medan Denai District, Medan City, North Sumatra in the Odd Semester of Academic Year 2025/2026.

The research subject is an informant, meaning a person in the research who is used to provide information about the situation and conditions of the research background (Amallia & Unaenah, 2018) . The research subject defines the research subject as an object, thing, or person where the data for the research variables are attached, and which is the subject of the problem (Arikunto, 2016). The research subject in this study is one of the seventh grade students of SMP Negeri 5 Percut Sei Tuan.

The object of research is a scientific target to obtain data with a specific purpose and use about something objective, valid and reliable about something (Sugiyono, 2019) . The object of research in this study is the mathematical literacy ability of students using LKPD based on *Discovery Learning*.

The data collection techniques used in this study are as follows:

A test is a measurement method in which researchers use various questions to assess students' ability to write answers. The test used is an essay *test* . This test is given to obtain

data and measure students' mathematical literacy skills by solving word problems in Algebra material. Then, researchers will create or compile word problems that will be given to students to answer and solve. From the results of students' answers, researchers can determine how students' mathematical literacy skills are by observing students' errors in solving the problems that have been given based on the steps of indicators of students' mathematical literacy skills. (Saputra, 2016) .

Documentation is a data collection activity carried out by recording data from documents or results in the form of photos, videos, or other audio recordings that support the activity. Documentation in research is used to obtain data about students and photos of student job test results. All documentation obtained will serve as evidence that a naturalistic research has been conducted on grade VII students of SMP Negeri 5 Percut Sei Tuan.

Interview According to (Sugiyono, 2019) an interview is a conversation with a specific purpose conducted by two parties, namely the interviewer (*interviewer*) who asks questions and the interviewee (*interviewer*) to provide answers to the questions given. In this study, the interviewer was the researcher and the research subjects were grade VII students of SMP Negeri 5 Percut Sei Tuan. The interview was conducted to find out more in-depth things from the research subjects regarding initial data on how students' mathematical literacy abilities are, whether they have ever used LKPD during learning.

Research instrument testing is the process of testing the tools or instruments used in research to ensure they are *valid* and *reliable.* The research instruments used are tests that are prepared in advance for trial and error before being administered to students. The results of these trials are then analyzed using validity and reliability tests. Therefore, the questions tested are those that have been declared valid and *reliable.*

RESULTS AND DISCUSSION

Time and Place of Implementation

This research was conducted at SMP Negeri 5 Percut Sei Tuan, located at Jl. Cucak Rw. II No. 03, Tegal Sari Mandala II, Medan Denai District, Medan City, North Sumatra. The students studied in this study were 31 seventh grade students. The research was conducted from July 16, 2025, to July 29, 2025, for two weeks in the odd semester of the 2025/2026 academic year.

Instrument Trial Results

Before collecting data, the questions will be tested first. The goal is to determine each question's validity, reliability, discriminatory power, and difficulty level. (Azmy, 2023) . From the results of the research test trial, the calculation of validity, reliability, level of difficulty, and test discrimination power was obtained with the following analysis Based on the results of the validity calculation using the Product Moment formula in processing the researcher's data using Microsoft Excel, it was obtained that of the 4 questions tested, 4 questions had a value of r_hitung> r_tabel at a significance level of $\alpha = 5\%$ so that the questions were declared valid because they met the validity criteria. From these results, it

can be shown that the test instrument used has met the validity standards required to obtain accurate research data.

Discussion

This study aims to analyze the mathematical literacy skills of seventh-grade students of SMP Negeri 5 Percut Sei Tuan on algebra material using *Discovery Learning-based Student Worksheets (LKPD).* Data were obtained from written tests, interviews, and documentation of student work. The research subjects consisted of six students grouped into three categories of mathematical ability, namely high (KT1 and KT2), medium (KS1 and KS2), and low (KR1 and KR2). Based on the results of tests, interviews, and documentation, significant differences were found between categories in mastering three indicators of mathematical literacy, namely *formulate* , *employ* , and *interpret* .

Table 1. Results of Students' Mathematical Literacy Indicator Abilities Based on Category

Category	***Formulate*** **(Formulate)**	***Employ*** **(Apply)**	***Interpret*** **(Interpret)**
KT1	Able to write down question information correctly, write down what is known and asked from the question	Able to use complete solution strategies (elimination, substitution)	Able to correctly relate the final result to the context of the problem
KT2	Can formulate problems well but is less careful in writing the final calculations	Systematic steps, there is only an error in the calculation, bro.	Interpreting the answers is quite good, although it doesn't reach the final stage of the results.
KS1	Able to write information clearly and create appropriate mathematical models	Able to solve problems completely with the right steps	Can interpret results and write final conclusions according to the context of the problem
KS2	Can write down what is known and asked, but still make mistakes in modeling	The strategy was used quite well but did not reach the final resolution.	The interpretation is incorrect because the previous

			procedure was not completed completely.
KR1	Difficult to write initial information, confused in modeling it	The solution strategy is not right, there are many wrong formulas.	Almost unable to interpret results in context
KR2	Only able to write information on some questions	Unable to continue the completion steps, stopped at the beginning due to not being able to design an initial strategy	Unable to interpret the solution because the initial stage of modeling was not understood

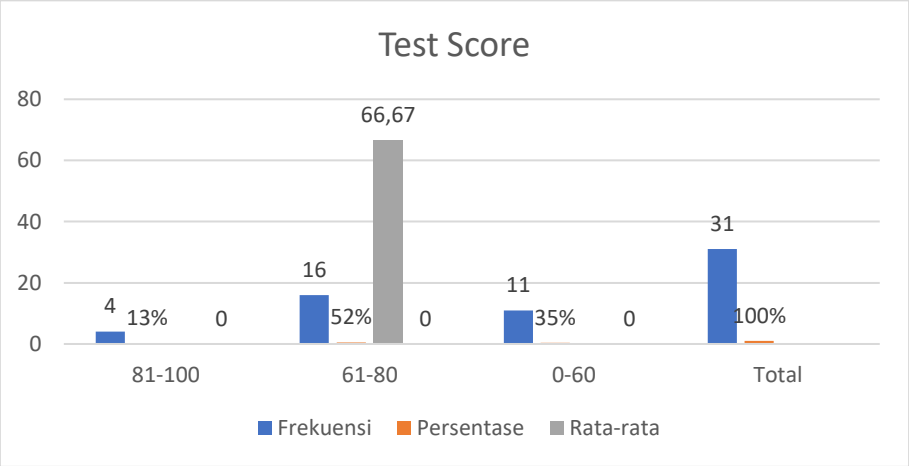

Figure 1. Histogram of Test Score Results

Based on the analysis of student answer sheets and interviews, it can be seen that students' mathematical literacy skills using *Discovery Learning- based LKPD* on algebra material in the three steps of the PISA mathematical literacy ability indicator: *formulate, employ,* and *interpret* (Widyatnyana, 2021) . They are able to identify important information in the problem correctly, separate mathematical elements such as variables, coefficients and constants correctly, and transform contextual information into an appropriate mathematical model (Sartinah, 2022) . The solution strategies used tend to be systematic, involving the use of variable examples, the application of algebraic methods such as elimination and substitution, but there are still some students who still make mistakes in the interpretation stage that are less precise so that they do not reach the final solution result (Arif & Muchlash, 2021) .

findings reinforce the concept put forward in the PISA mathematical literacy framework, that mathematical literacy skills depend not only on mastery of formulas or procedures, but also on the ability to connect real-world situations with appropriate mathematical representations, process them systematically, and reinterpret the results within the context of the problem. The results of this study align with the findings of Rahmawati & Anawati (2021) , which showed that students with moderate literacy skills were able to master the indicators of mathematical literacy skills, namely formulating problems, applying mathematical concepts, facts, procedures, and reasoning, and interpreting and evaluating the results of the solutions. However, some students still focused on examples of problems they had studied, resulting in difficulties when working on new, different problems. (Ariyanto, Aditya, & Dwijayanti, 2019) . Furthermore, the results of this study are consistent with the findings of Yusuf (2021), who found that some students performed better in solving problems in the knowledge aspect (writing down known and asked information) than in the reasoning aspect (using formulas and performing arithmetic operations). Therefore, it can be concluded that students' mathematical literacy skills are not yet fully optimal and need to be improved, especially in the aspects of applying and interpreting the results of the solution.

CONCLUSION

Based on the formulation of the problem and the results of the research obtained from the data analysis conducted, it can be concluded that the percentage results of the level of students' mathematical literacy abilities using Discovery Learning-based LKPD in solving algebra problems at SMP Negeri 5 Percut Sei Tuan through the PISA mathematical literacy indicators (formulate, employ, interpret) by administering tests show that out of 31 students, there are 13% or as many as 4 people who are classified in the high-ability group, 52% of students who are classified in the medium-ability group and 35% or as many as 11 students who are included in the low-ability group. Based on the percentage level, it can be concluded that students' mathematical literacy abilities are classified in the medium-ability category. The results of the analysis of the answer sheets show that students with high categories (KT1 and KT2) are able to master the three indicators of mathematical literacy, namely formulate, employ, and interpret. The difference only lies in the accuracy of KT2 in the final results, while students with low categories (KR1 and KR2) experience significant obstacles. KR1 still tried to solve the problem despite using the wrong strategy, while KR2 was unable to write down the information or complete the initial steps. In general, the implementation of Discovery Learning-based worksheets facilitated active student engagement, encouraged critical thinking skills, and helped connect mathematics to real life. However, its effectiveness varied depending on the student's initial abilities, so differentiated learning strategies were needed to optimize learning outcomes, especially for lower-class students who needed additional guidance.

REFERENCES

Amallia, N., & Unaenah, E. (2018). Analisis Kesulitan Belajar Matematika Pada Siswa. *Attadib Journal Of Elemetary Education*, *3*(2), 123–133.

Arif, S., & Muchlash, I. (2021). Pengaruh Penggunaan Metode Discovery Learning Dengan Teknik Buzz Group Terhadap Keterampilan Berpikir Rasional Siswa. *Journal Of Natural Science And Integration*, *4*(2), 253–267. Https://Doi.Org/Http://Dx.Doi.Org/10.24014/Jnsi.V4i2.12252

Ariyanto, L., Aditya, D., & Dwijayanti, I. (2019). Pengembangan Android Apps Berbasis Discovery Learning Untuk Meningkatkan Pemahaman Konsep Matematis Siswa Kelas Vii. *Edumatika: Jurnal Riset Pendidikan Matematika*, *2*(1), 40. Https://Doi.Org/10.32939/Ejrpm.V2i1.355

Azmy, B. (2023). Discovery Learning Dan Kemampuan Berpikir Kritis Matematis Siswa Sekolah Dasar. *Jurnal Inovasi Dan Teknologi Pendidikan (Jurinotep)*, *1*(3), 289–295. Https://Doi.Org/Https://Doi.Org/10.46306/Jurinotep.V1i3.128

Diana, A., Tahir, M., & Khair, B. N. (2022). Pengambangan Lembar Kerja Peserta Didik (Lkpd) Berbasis Discovery Learning Pada Pembelajaran Ipa Materi Sumber Daya Alam Untuk Kelas Iv Sdn 23 Ampenan. *Jurnal Ilmiah Profesi Pendidikan*, *7*(1), 141–150. Https://Doi.Org/10.29303/Jipp.V7i1.419

Fikri, A., Shalihah, I., Aini, J., Shalihah, M., Kiamuddin, M., Syanqaiti, M., … Alwan, M. (2023). Pendampingan Gerakan Literasi Anak Melalui Rumah Baca Desa Sembalun Lawang Kecamatan Sembalun. *Jurnal Pengabdian Kolaborasi Dan Inovasi Ipteks*, *1*(5), 753–764. Https://Doi.Org/10.59407/Jpki2.V1i5.149

Fithriyah, R., Wibowo, S., & Octavia, R. U. (2021). Pengaruh Model Discovery Learning Dan Kemandirian Belajar Terhadap Hasil Belajar Siswa Di Sekolah Dasar. *Edukatif : Jurnal Ilmu Pendidikan*, *3*(4), 1907–1914. Https://Doi.Org/10.31004/Edukatif.V3i4.894

Jumarniati, J., Baharuddin, M. R., & Firman, S. (2021). Deskripsi Kemampuan Literasi Matematis Pada Materi Aritmatika Sosial Berdasarkan Gender. *Equals: Jurnal Ilmiah Pendidikan Matematika*, *4*(2), 123–132. Https://Doi.Org/10.46918/Equals.V4i2.1094

Kholifasari, R., Utami, C., & Mariyam, M. (2020). Analisis Kemampuan Literasi Matematis Siswa Ditinjau Dari Karakter Kemandirian Belajar Materi Aljabar. *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika*, *7*(2), 117–125.

Nurhayati, H., & , Langlang Handayani, N. W. (2020). Jurnal Basicedu. Jurnal Basicedu,. *Jurnal Basicedu*, *5*(5), 3(2), 524–532.

Pasaribu, O. L. (2019). Ability To Writing Text Fable Learning Using Discovery Learning. *Proceedings Of The 4th Progressive And Fun Education International Conference (Pfeic 2019)*, 88–93. Paris, France: Atlantis Press. Https://Doi.Org/10.2991/Pfeic-19.2019.18

Rahmawati, L. N., & Anawati, S. (2021). *Analisis Kemampuan Literasi Matematika Siswa Kelas Vii Pada Materi Aljabar*. (94), 83–90.

Ramdhan, M. (2021). *Metode Penelitian* (Pertama; A. A. Effendy, Red). Surabaya.

Santoso, R. P. (2022). *Application Of Discovery-Inquiry Learning Strategy In Tajweed Learning To Improve Al- Qur ' An Reading Skills For High School Students : Penerapan Strategi Discovery- Inquiry Learning Pada Pembelajaran Ilmu Tajwid Dalam Meningkatkan Kemampuan Baca Al-Qur . 19*, 1–6.

Saputra, S. (2016). Pengaruh Model Pembelajaran Discovery Learning Berbasis Lingkungan Sekolah Terhadap Hasil Belajar Siswa Pada Materi Keanekaragaman Hayati. *Jesbio: Jurnal Edukasi Dan Sains Biologi*, *5*(2).

Sartinah. (2022). Penerapan Model Discovery Learning Dengan Media Model Pembelajaran Matematika Tentang Bangun Ruang. *Jurnal Sosialita*, *7*(1), 5.

Simamora, R. E., & Saragih, S. (2019). Improving Students' Mathematical Problem Solving Ability And Self-Efficacy Through Guided Discovery Learning In Local Culture Context. *International Electronic Journal Of Mathematics Education*, *14*(1), 61–72. Https://Doi.Org/Https://Www.Iejme.Com

Sitepu, C., Panjaitan, S., Situmorang, A. S., & ... (2022). Menggiatkan Literasi Matematika Di Smp Hkbp Sidorame Medan Bersama Mahasiswa Dari Republik Ceko. *Martabe: Jurnal …*.

Sugiyono. (2019). *Metode Penelitian Pendidikan Kuantitatif, Kualitatif, R&D Dan Penelitian Pendidikan* (Ketiga; A. Nuryanto, Red). Bandung: Afabeta.

Tambunan, H. (2021). Belanajr Online Dlm Peningkatan Literasi. *Jurnal Pendidikan Matematika Indonesia*, *6*(2), 70–76.

Widdah, H., & Faradiba, S. S. (2022). Analisis Literasi Matematika Pada Pembelajaran Matriks Menggunakan Mind Mapping. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *6*(2), 1670–1681. Https://Doi.Org/10.31004/Cendekia.V6i2.1374

Widyatnyana, K. N. (2021). Penerapan Model Discovery Learning Pada Materi Teks Cerpen Dengan Menggunakan Media Canva For Education. *Jurnal Pendidikan Dan Pembelajaran Bahasa Indonesia*, *10*(2), 229–236. Https://Doi.Org/Https://Doi.Org/10.23887/Jurnal_Bahasa.V10i2.695

Zulmi, F. A., & Akhlis, I. (2020). Pengembangan Lkpd Berekstensi Epub Berbasis Discovery Learning Untuk Mengembangkan Keterampilan Berpikir Kritis Peserta Didik. *Unnes Physics Education Journal*, *9*(2), 209–216.