# Prospective Elementary School Teachers' Reading Literacy Profile Based on Minimum Competency Assessment with the Implementation of the Discovery Learning Model

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**Abstract.** Every student needs to have learning and innovation skills, media, information, and technology literacy, as well as life skills so they can work and survive in the 21st century. Reading literacy skill is required for developing 21st-century life skills. According to empirical data from the PIRLS test in 2011 and the PISA test in 2018, Indonesian students' reading literacy skill is still subpar worldwide. High reading literacy skill is required of prospective elementary school teachers. Utilizing a discovery learning approach that strengthens prospective elementary school teachers and students reading literacy skills can help reduce these issues. The two main objectives of this study are: 1) to profile the reading literacy skill of prospective elementary school teachers based on the Minimum Competency Assessment and 2) to analyze the effectiveness of implementing the discovery learning model on prospective elementary school teachers' reading literacy skill. The research method used is a mixed method with a sequential explanatory design that sequentially combines quantitative and qualitative research methods. The results showed that: 1) based on the Minimum Competency Assessment, prospective elementary school teachers' reading literacy profile was still relatively low (i.e., average score: 54.03, average score for each indicator—finding information, understanding, evaluating and reflecting: 48, 51.8, and of 56.3 respectively); 2) based on the average score of the prospective elementary school teachers' reading literacy skill before and after the implementation of discovery learning model (54.03 and 72.18 respectively), the implementation of the discovery learning model is effective in improving the reading literacy skills of prospective elementary school teachers who are included under the moderate criteria. This outcome is a result of the integration of the discovery learning model of each syntax training with reading literacy activities, which stimulates students' reading literacy skills.

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# 1 Introduction

The educational paradigm that is the frame of reference for education today will undergo fundamental changes to adapt to the demands of education in the 21st century. Education in the 21st century must be able to ensure that every individual has learning and innovation skills as well as skills to use technology and information media and can work and survive with life skills. These life skills have come to be called 21st-century skills. Several organizations and institutions have attempted to present and explain the skills and abilities needed to deal with life in the 21st-century world. Every aspect of the education system must prepare individuals with the 21st-century skills they need to compete [1,2].

One of the prerequisites for realizing 21st-century life skills is the reading literacy skills of each individual. Literacy is a person's ability to read, write, speak, calculate, and solve problems with the level of proficiency required in work, family, and society [3,4]. Basic literacy is divided into six literacies, namely (a) literacy, (b) numeracy literacy, (c) scientific literacy, (d) digital literacy, (e) financial literacy, and (f) cultural and civic literacy [5]. To prepare students for 21st-century skills, in 2021, the government carried out a minimum competency assessment, one of which is an assessment of reading literacy, namely an assessment of the ability to reason using language. Reading literacy is not just the ability to read literally without knowing the content/meaning of the reading but the ability to understand reading concepts.

Empirically, the reading literacy skills of Indonesian students in the international world still need to improve. The results of literacy-measuring tests conducted by the Progress in International Reading Literacy Study (PIRLS) in 2011 suggested that our 4th-grade elementary school students could only answer some of the questions on reading literary texts and informational texts perfectly [6,7]. This problem can also be seen from the results of a survey conducted by the OECD. In the Program for International Student Assessment (PISA) 2018, Indonesia is ranked 74th out of 79 PISA participating countries in the category of reading literacy skills [8]. In addition, for the reading ability category, Indonesia ranked 74th in PISA 2018, far behind Thailand, which was ranked 68th, Malaysia, which was ranked 58$^{th}$, and Singapore, which was ranked second [9]. 70% of Indonesian students' reading literacy skills are below the minimum competency required. However, the difference in scores with the OECD average score has increased slightly [10,11].

Problems regarding students' low reading literacy skills are influenced by habituation, which can be imitated by the teacher. Elementary School Teacher Education Study Program students who are prospective elementary school teachers must have high reading literacy skills. These problems can be minimized using the right learning model. The Discovery learning model will assist students in empowering reading literacy skills. Discovery learning is a learning model in which students construct their knowledge by conducting experiments to discover the principles of the experiment [12,13]. Bruner said that the discovery learning model is a model in which students are allowed to discover new rules and new ideas, not memorizing what is said or conveyed by educators [14,15]. The six syntaxes of the Discovery Learning model include 1) Stimulation; 2) Problem Statements; 3) Data Collection; 4) Data Processing; 5) Verification; and 6) Generalization [16]. Students are given problems with the lecture material's concept, and the lecturer acts as a supervisor and allows the students to discover the concept on their own. Students who use the discovery learning approach can locate and read different books or articles in particular journals. Students are free to look for different reading sources when the discovery learning model is operating [17,18]. The purpose of this study is to describe the reading literacy skill profile of students preparing to become elementary school teachers and the impact of the discovery learning model on those students' reading literacy skills.

# 2 Methods

The research method in this study is a mixed method with a sequential explanatory design that combines quantitative with qualitative research methods sequentially. The first stage used quantitative methods, and the second stage used qualitative methods [19]. The application of sequential explanatory design begins with the collection and analysis of quantitative data, followed by the collection and analysis of qualitative data, which is built on the results of quantitative data [20]. An overview of the sequential explanatory research design by Creswell is as follows:

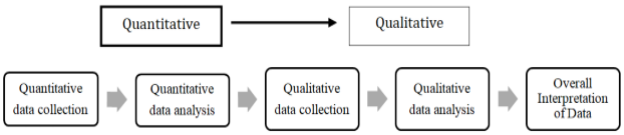


**Fig. 1.** Sequential Explanatory Research Design [20]

Priority is given to quantitative data methods. While quantitative methods are used to obtain descriptive quantitative data, qualitative methods are used to prove, deepen, and add quantitative data. Quantitative methods are used to obtain data on students' reading literacy skills. The data are taken by giving pre-test and post-test before and after learning. Qualitative methods were used to obtain in-depth data on students' reading literacy skills in the learning process of the basic concepts of physics in elementary school science.

The quantitative research design used is pre-experimental with a one-group pre-test and post-test design. This type of research uses experiments by manipulation, which aims to determine the effects of manipulation on the observed individuals' behavior [21]. This research design is pre-experimental, namely an experimental design that does not meet all the requirements of an actual experimental design. The pre-experimental design consists of 3 categories, namely, one shot case study, one group pre-test, and post-test design, as well as randomized control group only design" [22]. This study includes the One Group Pre-Test-Post Test Design that encompasses one measurement before the treatment (pre-test) and another after the treatment (post-test). The qualitative research design used is descriptive qualitative, which aims to analyze students' reading literacy skills through students' answer sheets. Data collection techniques encompass tests to measure students' reading literacy skills and interviews. Quantitative data analysis techniques used normality tests, paired sample t-tests, and N-gain tests.

# 3 Result and Discussion

## 3.1 Result

### *3.1.1 Student Reading Literacy Skills*

Based on the results of the analysis of students' reading literacy tests based on the Minimum Competency Assessment in the Basic Concepts of Physics in elementary school sciences, it was discovered that the average score of students' reading literacy skills was still relatively low, namely 54.03. The average scores for each indicator of students' reading literacy skills can be seen in **Table 1** and **Fig 2**.

**Table 1.** Results of Data Analysis for Indicators of Students' Reading Literacy Skills.

| No | Indicators of Student Reading Literacy Skills | Average Score | Category |
|---|---|---|---|
| 1 | *Access and retrieve* | 48 | Low |
| 2 | *Interpret and integrate* | 51.8 | Low |
| 3 | *Evaluate and reflect* | 56.3 | Low |

Based on **Table 1**, the data can be described in a graph as follows:

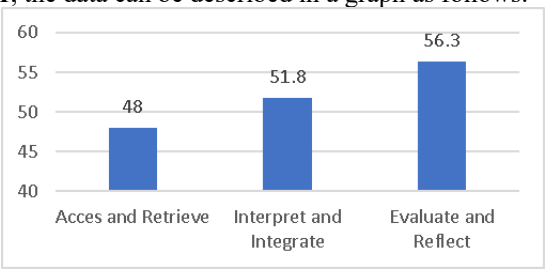


**Fig. 2.** Graph of the Average Score of Students' Reading Literacy Skills

Based on the results of the analysis of students' reading literacy skills based on the Minimum Competency Assessment in the Basic Concepts of Physics in natural science courses in elementary school in **Table 2** and **Fig. 3**, the student's reading literacy skills are still relatively low. The indicator with the highest average score for students' reading literacy skills is the evaluate and reflect indicator, while the indicator with the lowest average score is the access and retrieve indicator.

### *3.1.2 Pretest-Posttest Analysis and N-gain*

The results of the study on the effectiveness of the implementation of the discovery learning model on students' reading literacy ability based on the Minimum Competency Assessment in the Basic Concepts of Physics in natural sciences in elementary school are generated by using t-test and N-gain analysis tools. The discussion on the results of this data analysis consists of data description, analysis prerequisite test, and analysis test.

Data description is a statistical tool that describes the characteristics of data used for research, including the mean, standard deviation, and the lowest and highest total score of each of the variables in the study. The description of the research data is shown in **Table 2**.

**Table 2.** Description of Pretest-Posttest Data for Students' Reading Literacy Ability.

| Research Variable | Mean | SD | Min | Max |
|---|---|---|---|---|
| Pre-test | 54.03 | 2.918 | 48 | 60 |
| Posttest | 72.18 | 4.064 | 63 | 80 |

The analysis prerequisite test used in this study is the normality test and homogeneity test. Data normality test based on Kolmogorov-Smirnov can be seen in **Table 3**.

**Table 3.** Normality Test Results.

| Research Variable | Sig. |
|---|---|
| Pre-test | 0.200 |
| Post-test | 0.067 |

Based on **Table 3**, the pre-test of students' reading literacy ability has a sig. Value. of 0.200 > 0.05, then Ho is accepted so that the pre-test data on students' reading literacy ability are normally distributed. The post-test of students' reading literacy ability has a sig. 0.067 > 0.05, then Ho is accepted so that the post-test of students' reading literacy ability is normally distributed.

The homogeneity test of the data based on the Levene Test can be shown in **Table 4**.

**Table 4.** Homogeneity Test Results.

| Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|
| 3.954 | 1 | 66 | 0.051 |

Based on **Table 4**, it is obtained that the pretest-posttest of students' reading literacy ability has a sig value. 0.051 > 0.05, it can be concluded that Ho is accepted, Ho is accepted, so that the results of the pretest-posttest students' reading literacy ability are stated to contain elements of similarity or homogeneity.

The test results use the Paired Sample T-test with the help of the SPSS version 21 program. The results of the Paired Sample T-test are in **Table 5** as follows:

**Table 5.** Results of Paired Sample T-test.

| | ***Paired Differences*** | | | ***T*** | ***df*** | ***Sig. (2-tailed)*** |
|---|---|---|---|---|---|---|
| | ***Mean*** | ***Std. Deviation*** | ***Std. Error Mean*** | | | |
| *Pair 1 Pretest-Posttest* | -18.15 | 3.519 | 0.602 | -30.16 | 33 | 0.000 |

**Table 5** shows that the calculation of t is -30.16 with sig. (2-tailed) of 0.000 < 0.05. These results state that Ho is rejected, and it can be concluded that there are differences in students' reading literacy ability based on the Minimum Competency Assessment before and after the implementation of the discovery learning model in the Basic Physics Concepts course in natural science in elementary school.

**Table 2** shows that the average score of students' reading literacy ability based on the Minimum Competency Assessment before the implementation of the discovery learning model is 54.03, and after the implementation of the discovery learning model is 72.18. These results indicate that there is a difference in the average score of students' reading literacy ability based on the Minimum Competency Assessment before and after the implementation of the discovery learning model, and the average score increases.

The results of testing its effectiveness using the N-gain test. Based on the calculation of the N-gain formula, the result is 0.395, if the value is consulted with **Table 1** the effectiveness criteria mean that the implementation of the discovery learning model is effective on students' reading literacy ability based on the Minimum Competency Assessment in the Basic Concepts of Physics in natural sciences in elementary school on medium criteria.

### *3.1.3 Interview Result*

Analysis of qualitative data from the results of student interviews related to the reading literacy skill test based on the Minimum Competency Assessment obtained the following results:

**Table 6.** Student Responses in Answering Reading Literacy Skill Test Questions based on Minimum Competency Assessment.

| Question | Answer |
|---|---|
| How can you answer that question? Which part was the most difficult? | In some parts, I can, but mostly I can't because it requires thoroughness and in-depth understanding before answering. |
| How did you answer questions about Intelliplug? Did you have any trouble answering this question? | I had difficulty answering this question because it requires carefulness in understanding the reading to find the keywords that distinguish Intelliplug and ordinary sockets. |
| How would you answer the question of how to prevent flooding? Did you any having trouble solving it? | This question was not difficult to do, but there needs to be thoroughness in describing some of the more specific things about how to prevent flooding. |
| Were the questions about growing and caring for aloe vera plants in the text difficult for you? Why is that? | Yes, these questions do not only require understanding but also the ability to reflect specific and detailed new information/knowledge contained in the text. |

The results of the interviews showed that the students still regard the Minimum Competency Assessment-based reading literacy skill test questions as being extremely difficult. This is shown by some students needing help finding information from the informational text that has been given. In addition, students still need help in comparing or distinguishing the main things in an informational text. In addition, students' ability to reflect new knowledge or information in an informational text still needs to improve. Students are still able to understand informational texts, but they need to have reading literacy skills.

## 3.2 Discussion

### *3.2.1 Students' Reading Literacy Skill Profile*

#### *Access and Retrieve*

In question number 8, students are expected to be able to access and find information in texts about flooding. The results of one of the student's answers can be seen in the following **Fig. 3**.

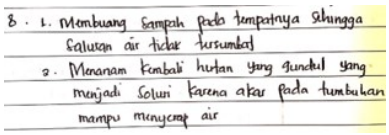


**Fig. 3.** A Student's Answer to Question Number 8

**Fig. 3** shows that students could answer the questions but could only find the information about how to prevent flooding that is written in the text. The students had yet to find all information about how to prevent flooding that is implied in the text. The average score on this indicator is under the low category—the lowest compared to other indicators. This happens because students are still not used to finding expressed and implied information in the text. Similar research on the indicator of finding information (access and retrieve) states

that students had not been able to find and specifically as well as clearly disclose information obtained from information texts [23]. Indonesian students' ability to solve information text questions that measure their ability to remember, mention, find, and use information is below the average score worldwide [7].

### *Interpret and Integrate*

In question number 1, students are expected to be able to compare the main things (e.g., differences in events, procedures, characteristics of objects) in the information text about Intelliplug, which continues to increase according to level. The results of one of the student's answers can be seen in the following **Fig. 4**.

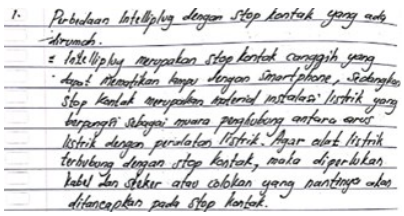
1. Perbedaan Intelliplug dengan stop kontak yang ada di rumah.
= Intelliplug merupakan stop kontak canggih yang dapat dihubungkan juga dengan smartphone, sedangkan stop kontak merupakan material instalasi listrik yang berfungsi sebagai muara penghubung antara arus listrik dengan peralatan listrik. Agar alat listrik terhubung dengan stop kontak, maka diperlukan kabel dan steker atau colokan yang nantinya akan ditancapkan pada stop kontak.

**Fig. 4.** A Student's Answer to Question Number 1

**Fig. 4** shows that students can provide a long answer to the questions but have yet to be able to clearly distinguish the function of Intelliplug and socket in a specific and clear manner, so they tend to be long-winded. The average score on this indicator is in the low category, though it is still higher than the first indicator. This happens because students are still accustomed to describing answers to long essay questions but not focusing on keywords that match the essence of the problem. Research on the indicators of understanding (interpret and integrate) shows that students need to be maximal in developing interpretations of an information text [23]. Indonesian students' ability to solve information text questions that require them to combine facts, interpret and integrate ideas and information, make inferences, and assess the benefits of returning information could be stronger, scoring below the average score worldwide [7].

### *Evaluate and Reflect*

In question number 5, students are expected to be able to reflect on new knowledge obtained from informational texts on planting and caring for aloe vera plants to their knowledge, which continues to increase according to their level. The results of one of the student's answers can be seen in the following **Fig. 5**.

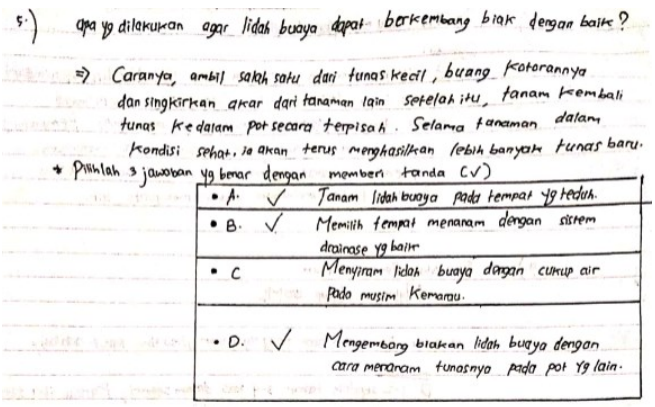


**Fig. 5.** A Student's Answer to Question Number 5

**Fig. 5** shows that students still need to be able to answer questions correctly because there are still errors in the answers. Therefore, the students have not been able to reflect on the new knowledge obtained from the informational texts on how to plant and care for aloe vera plants using their previous knowledge. The average score on this indicator is under the low category, even though the average score is the highest compared to other indicators. This happens because students still need to be focused on integrating and interpreting new knowledge with previous knowledge. Research on the indicators of evaluation and reflection shows that students still need help to evaluate an information text [23]. One difficulty that the students face in the reading literacy test is relating the contents of the information text to other things outside of the information text [24].

### *3.2.2 The Effectiveness of the Implementation of the Discovery Learning Model on Students' Reading Literacy Skills*

The results showed that based on the Minimum Competency Assessment, there were differences in students' reading literacy skills before and after the implementation of the discovery learning model in the Basic Physics Concepts course in elementary school sciences. This is indicated by the average score for students' reading literacy skills before and after the implementation of the discovery learning model (i.e., before implementation: 54.03; after implementation: 72.18). The difference in the average scores of students' reading literacy skills shows that the implementation of the discovery learning model is effective in improving students' reading literacy skills under the moderate criteria.

Improvement in students' reading literacy skills after the implementation of the discovery learning model is visible in the final results of the post-test for reading literacy skills based on the Minimum Competency Assessment. It should be noted that the increase in reading literacy skills is not measured by reading ability alone. Reading literacy skills are tested by measuring aspects of the ability to understand, use, and reflect on the results of the reading in written form [25]. There is a construction-integration model for reading literacy skills to explain the process of understanding the text. This concept describes that in the first stage of construction, the reader focuses on understanding the text at the word and sentence level to determine the ideas or ideas in each sentence. Meanwhile, in the integration stage, the reader focuses on correlating and integrating the content of the text with knowledge outside the text so that the understanding of the text becomes more comprehensive and real [26].

The results showed that the implementation of the discovery learning model was effective in improving students' reading literacy skills based on the Minimum Competency Assessment. Similar research states that the implementation of a media literacy tree-assisted

discovery learning model is proven to be able to improve students' reading literacy skills at STKIP Kusuma Negara's Elementary School Teacher Education Study Program [17]. This is because the syntax in the discovery learning model trains and stimulates students' reading literacy skills. The discovery learning model emphasizes direct learning experiences through investigating, finding concepts, then applying the concepts obtained in everyday life [27,28]. The discovery learning model provides students with enthusiastic and positive aspects of the learning process where students must explore and find answers to problems posed by lecturers, which enables them to learn and express their opinions and views [29]. The process of applying this model includes encouraging students to learn actively, training students to think critically to solve problems, and encouraging students to find general concepts or principles based on the material/data provided by the lecturer [30,31]. Based on the 21st-century skills framework, reading literacy skills are not only limited to reading and writing skills; it also encompasses thinking skills to become academically literate [32].

The results showed that the implementation of the discovery learning model was effective in improving students' reading literacy skills based on the Minimum Competency Assessment (moderate criteria). This happens because the implementation of the discovery learning model encompasses: 1) the Stimulation Stage (students are faced with various problems, and organizing readings from various thematic sources is a prerequisite for preparing problem-solving); 2) Problem Statement stage (the lecturer provides opportunities for students to identify various problems related to the problems presented at the initial stage and generate problem hypotheses to reveal the truth); 3) Data Collection stage (exploration of various reading sources involved in identifying student-defined problems. This stage is also carried out to answer the positions and hypotheses made by students. It is important to gather various supporting sources to answer and test hypotheses); 4) Data Processing stage (various information obtained by students is reduced, processed, classified, tabulated, and even calculated using certain formulas to be interpreted with a certain level of confidence); 5) Verification stage (this stage is carried out to carefully examine and validate the data obtained as well as formulate formulas and data to be presented. New knowledge about alternative problem solving is essential at this stage); and 6) the Generalization stage (concluding is the last process in this stage. Conclusions are used as a general rule for similar problems).

Each syntax of the discovery learning model trains and stimulates students' reading literacy skills by integrating each syntax with reading literacy activities. From the perspective of reading and writing, students have broad knowledge and understanding. Therefore, it is wiser to look for alternative solutions to the problems caused by providing a variety of reading sources. With diverse reading sources, it is possible to make reading a culture. As a culture, reading arises out of habit. Reading habits exist if reading plans and reading habits are carried out regularly and routinely [33].

## 4 Conclusion

Based on the results of data analysis and discussion, it can be concluded that: (1) The profile of students' reading literacy skills in the Basic Concepts of Physics in elementary schools science, based on the Minimum Competency Assessment, is still relatively low, with an average score of 54.03. Based on the results of the analysis of each indicator of students' reading literacy skills, it was discovered that for the indicators access and retrieve, the average score was 48 (low); for the indicators interpret and integrate, the average score was 51.8 (low); and for the indicators evaluate and reflect, the average score was 56.3 (low); (2) There is a difference in students' reading literacy skills that are based on the Minimum Competency Assessment before and after using the discovery learning model in the Basic Physics Concepts course in elementary schools' science. This can be seen from the results of the Paired Sample T-test, which show that the t calculation is -30.16 with sig. (2-tailed) of

0.000 <0.05. In addition, it can also be seen from the average score of students' reading literacy skills before the implementation of the discovery learning model (54.03) and after the implementation of the discovery learning model (72.18). The implementation of the discovery learning model is effective in improving students' reading literacy skills in the Basic Concepts of Physics in elementary school science based on the Minimum Competency Assessment. This is indicated by the results of the calculation of the N-gain formula, which is 0.395—meaning that the effectiveness of the implementation of the discovery learning model in improving students' reading literacy skills in the Basic Concepts of Physics in elementary schools' science falls under moderate criteria. This result is because each discovery learning model syntax trains and stimulates students' reading literacy skills by integrating each syntax with reading literacy activities,

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