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# Pre-Service Physics Teachers' Reading Comprehension Ability on the Concept of Statistical Physics Delivered in English Textbook

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**Keywords:** Concept, English textbooks, Pre-service teachers, Reading comprehension, Statistical physics.

**Abstract:** The unavailability of statistical physics books delivered in Bahasa Indonesia has encouraged students to learn and understand the concept of statistical physics delivered in English textbooks. This study was aimed at investigating pre-service physics teachers' summarising ability, reading comprehension ability to understand statistical physics textbooks delivered in English and their difficulties concerning reading comprehension. The study involved 76 pre-service physics teachers. A test was constructed with nine items to measure their reading comprehension. Also pre-service teachers were given questionnaire to investigate their reading comprehension difficulties. The results show that they had not summarized the passage but translated them. When it came to reading comprehension, they performed low ability in English reading comprehension. Their reading comprehension difficulties had something to do with the vocabulary mastery as the most significant burden and their low reading habit. There is a need to improve pre-service physics teachers English textbook reading habit and their vocabulary mastery to boost their reading comprehension on concepts of statistical physics delivered in English textbook.

## 1 INTRODUCTION

Higher education requires great reading assignment for pre-service teachers. Unlike primary and secondary school, University delivers more challenging reading task to students to accomplish their study. It promotes reading comprehension for pre-service teachers for them to successfully deal with the university academic life.

Reading activities cannot be separated from the learning process in higher education. They become paramount and play pivotal role to assist students in fulfilling their study in university. Many projects and assignment are requiring their reading comprehension skill. Reading becomes very important to the university students regarding

understanding the concepts being explored by them when reading a particular text (O'Reilly and McNamara, 2007; Cromley, Snyder-Hogan and Luciw-Dubas, 2010).

Reading comprehension is at the heart of reading activities. One is not considered successful reader when he or she has not performed his/ her comprehension on the text.

Several studies reported reading comprehension benefits for students throughout their academic life. Reading activities can improve the conceptual performance on the field they were studying (O'Reilly and McNamara, 2007; Cromley, Snyder-Hogan and LuciwDubas, 2010) and can improve student achievement in their field (Law, Chan and Sachs, 2008), (Savolainen *et al.*, 2008).

Reading comprehension requires readers to construct meaning from the text they are dealing with. It implies that there should be interaction between readers, text and the knowledge of the reader. These interactions are paramount for reading comprehension to exist. They constitute reading comprehension and this interaction is considered as a complex process since it consists of several sub-processes that influence each other (Aarnoutse and Schellings, 2003).

What makes successful reading comprehension? Scholars have one thing in common that reading comprehension requires reading strategies and several sub-skill like summarizing activity. Reading strategies do not belong to read objectives in a particular reading activity. This has something to do with the means or ways to achieve the reading objectives (Aarnoutse and Schellings, 2003). One of the ways to make reading comprehension is summarizing skill.

Summarizing activity helps students to build reading comprehension. In University level, it is considered difficult activity when it comes to reading comprehension. It is hard to summarize a particular reading paragraph for example because students face obstacle in identifying main idea and significant detail within paragraph they are reading. Summarizing activity is considered the most challenging task for teachers to deliver to their students. Teachers usually find what students write for their summary redundant ideas and irrelevant ideas when summarizing paragraph (Olson and Valeri-Gold, 1991).

In Indonesian higher education context, reading has not become a culture among pre-service physics teachers. Instead of reading their academic material, they prefer to listen to their lecturer's explanation in the classroom to learn the material on physics. In several occasion, according to interview with them, they expressed one problem in common. The problem happens because they do not possess reading habit for physics textbook delivered in foreign language like English. This situation is not in line with the importance of reading benefits and advantages for pre-service physics teachers in developing their knowledge and competencies.

In addition to reading comprehension difficulties, other challenging task for the students to achieve is summarizing ability. Summarizing requires several things to accomplish by students when dealing with particular paragraph or text. According to some interview, they thought that summarizing has something to do with translation the text from English to Indonesian. This happens because they do not

know how to summarize a particular text.

The problems faced by students in reading comprehension activities have been well-documented in several journal publications. Numerous studies have been conducted concerning reading comprehension and some investigated reading comprehension difficulties (Kozminsky and Graetz, 1986), other studied intervention for reading comprehension teaching (Woolley, 2008). Other studies investigated reading strategies to be implemented by students (Muijselaar *et al.*, 2017), and some studied on measuring reading comprehension (Fletcher, 2009). Other issues to consider when it comes to reading comprehension is summarizing ability. Studies on summarizing have been investigated by various scholars. Summarizing boosts students reading comprehension (Bensouan and Kreindler, 1990), teaching summarizing can be delivered in cooperative learning among students to perform summarizing activity (Olson and Valeri-Gold, 1991).

In Indonesian higher education context, there is a lack of research investigating pre-service physics teacher reading comprehension on statistical physics concept delivered in English. The present study tries to fill in the gap. There are several research questions that the present study addresses: How do pre-service physics teachers perform in summarizing reading passage? How do students perform in reading comprehension on statistical physics concept? What are the difficulties that pre-service teachers encountered in reading comprehension?

## 2 LITERATURE REVIEW

### 2.1 Reading Comprehension

In University context, reading comprehension is crucial because the central purpose of reading activity is comprehension - constructing meaning from text (Luckner, John L. & Handley, 2008). Reading comprehension carries many benefits that student can gain for their academic life. Its benefits have been reported in several publications. There are many benefits of reading comprehension namely: It improve the conceptual performance (O'Reilly and McNamara, 2007; Cromley, Snyder-Hogan and Luciw-Dubas, 2010) and improve student achievement (Law, Chan and Sachs, 2008) (Savolainen *et al.*, 2008). These two benefits are helpful for students to deal with the assignment on campus. Reading becomes very important to the university students regarding understanding the

concepts being explored by them when reading a particular text (O'Reilly and McNamara, 2007; Cromley, Snyder-Hogan and Luciw-Dubas, 2010).

Reading comprehension is the ultimate goal for readers in every reading activity. It requires readers to perform high order thinking skill. It means that readers need to construct meaning of the text. This can be done by building interaction between readers, text and the knowledge of the reader (Aarnoutse and Schellings, 2003). This interaction is considered as a complex process since it consists of several sub-processes that influence each other when performing reading activity (Aarnoutse and Schellings, 2003).

Considering the immense challenge of reading comprehension in building interaction among, reader, text and the knowledge, readers should be taught to apply reading strategies to achieve reading comprehension. Without proper competence in performing reading strategies, it is difficult for students to achieve reading comprehension. These reading strategies should be taught and trained in the classroom (Muijselaar *et al.*, 2017).

Reading strategies do not belong to read objectives in a particular reading activity. These have something to do with the means or ways to achieve the reading objectives (Aarnoutse and Schellings, 2003). Since they are means and ways to achieve reading objectives, students should be taught how to perform these strategies to achieve reading objectives. They are crucial to be taught so that students can overcome reading comprehension difficulties by offering appropriate principles and strategies (Woolley, 2008).

Reading strategies have been investigated by many scholars in their publications. Some scholars have proposed several reading strategies to boost students' reading comprehension. These include applying DIME (the direct and inferential mediation) in reading activity, using a question for reading activity to improve comprehension (Koch and Eckstein, 1991), (Smith, Holliday and Austin, 2010), (Cromley, Snyder-Hogan and Luciw-Dubas, 2010), summarizing, making conceptual maps, and applying comprehension monitoring (Cromley, Snyder-Hogan and Luciw-Dubas, 2010).

Based on the previous research it can be concluded that there are several reading strategies to implement in the classroom namely DIME, questioning, making conceptual map and summarizing. This study investigated pre-service teachers' ability in summarizing strategy on reading

passages to improve their reading comprehension.

Students reading comprehension can be measured by several approaches. Educational experts and psychologists have offered multiple approaches to measurement for reading comprehension. Measuring reading comprehension is not an easy task because it measures the product of the process of reading comprehension and the quality of comprehension (Cutting, Laurie E.; Scarborough, 2006; Fletcher, 2009).

There are two types of readers in the context of reading comprehension. Koch and Eckstein, (1991) found that there are two types of readers when dealing with reading passage, namely over optimism and over pessimism. The former refers to those students who are very confident in their reading skills, while the latter refers to students who are not confident and strongly disbelieve their reading skill. These two types of readers exist in the classroom.

Students can be taught to be skilled readers in reading activity. Skilled readers are able to draw upon their knowledge of the topic and guide their decision in dealing with reading difficulties. They also apply traditional self-regulated reading process meaning they set the goal, predict, monitor and evaluate information for their reading purposes (Coiro and Dobler, 2007). These abilities enable readers to be skilled readers because they can predict, monitor and evaluate information from the text they read.

Important knowledge for skilled readers to achieve reading comprehension is vocabulary knowledge. Vocabulary mastery is crucial for successful reading comprehension to take place. In academic context there is a growing need to teach academic vocabulary. It serves as tool for communication in the disciplinary content. Teachers are expected to provide more exposure toward vocabulary use. In addition it requires students to have ample opportunities to use the vocabulary as they learn it (Nagy *et al.*, 2012).

## 2.2 Summarizing

Summarizing trains readers to differentiate between main and subordinate ideas in a particular paragraph. It also promotes readers ability to draw inferences and make judgment on a particular text. It belongs to whole text and super macro level skill that readers must learn (Bensousan & Kreindler 1990). It might be harder for foreign language learners to summarize because of their lack of confidence, slow reading, concentration on micro level and ignorance of schemata and ideas of macro level (Bensousan and

Kreindler, 1990). These problems cause summarizing difficulties on the parts of students. Once they are able to manage these burdens they can perform summarizing ability.

In higher education, summarizing is a need for students to deal with academic material by summarizing it. The challenge is bigger for the students when they deal with foreign or second language when summarizing a particular text. Second language learners' performance in summarizing academic material is usually challenged by their competence to apply bottom up and top down reading activities (Kozminsky and Graetz, 1986). Bottom-up and top-down reading ability help students to summarize well a particular text. To summarize successfully, students should focus on the core of the problem by finding both: keywords to find the essence of the problem and the main idea in each paragraph to relate it to the main idea in another paragraph (Wormeli, 2005; Jones, 2006). In other words, students will be successful in summarizing a text when they are able to identify keywords and main idea of a particular paragraph.

Teachers can teach their students how to summarize effectively. They can train their students several strategies for summarizing. These strategies include: (1) Selecting content for reading passages to summarize. Read the passages with students or give students assignments; (2) Asking them to experience reading the section passage and train them to decide and erase minor or pointless parts of the paragraph; (3) Telling students to erase excessive parts in the passage they read; (4) Reminding your students to substitute superordinate terms or paraphrase (for instance, they can change word flower by selecting daisies, tulips, and roses); (5) Asking students to choose or create topic sentence for their summary (Marzano, Pickering and Pollock, 2001). This study applied summarizing activity by applying these 5 steps offered.

### 3 METHOD

This study employed descriptive since it was aimed at investigating: pre-service physics teacher performance in reading comprehension on concept of statistical physics concept; and their difficulties in reading comprehension. There were 76 participants involved in this study. They were pre-service physics teachers and were following the statistical physics course in the seventh semester. They had taken English subject delivered in the first semester.

Data were collected through test, questionnaire and interview. Before administering test, participants were trained to apply summarizing reading strategy to accomplish English reading material (Cromley, Snyder-Hogan and Luciw Dubas, 2010). They were asked to summarize assignment taken from the book Introduction to statistical physics (Huang, 2010). Furthermore they presented and discussed the summary in the class. After three meetings had been conducted, their reading comprehension ability was measured using the description test of nine questions. In the test, each item contained a paragraph of reading material related to statistical material physics and it was followed by questions consisting from two to four items. Test result data was processed and presented for analysis. A questionnaire was also conducted to find out their reading comprehension difficulties.

## 4 FINDINGS AND DISCUSSION

There are several findings concerning pre-service physics teacher performance in summarizing reading passage, reading comprehension on concept of statistical physics concept; and their difficulties in reading comprehension. They will be organized into three sections.

### 4.1 Summarizing Ability on Physics Reading Passage Delivered in English

This study found that all the students did not summarize the reading passage. Instead of summarizing, they did translate the reading passage. They rewrite down everything that was printed on the textbook. They provided Indonesian translation for the English text that was supposed to be summarized. It turned out that what students submitted was not the summary but the translation.

Their summarizing performance was poor because they have several obstacles. Students did not have a good command of English text reading comprehension. Once they were asked to summarize English statistical physics textbook, what they did was not summarizing but translating the English passage into Indonesia. Things got worse since they used online translate application to accomplish their assignment. This can be found from the erroneous available in the result they submitted. There were some improper sentence structures and some statistical physical terms were misrepresented.

They failed to summarize the reading passage because they did not apply summarizing steps. To summarize successfully, students should focus on keywords, main idea in each paragraph (Jones and Bray, 1986; Wormeli, 2005). In the assignment they fail to identify keywords and main ideas in a particular paragraph. Based on this finding, teachers are expected to overcome their summarizing problem. Lecturers may offer student several strategies like selecting content of reading, training them to read and erasing excessive parts, paraphrasing and creating topic sentence for their summary (Marzano, Pickering and Pollock, 2001).

Summarizing skill boosts reading comprehension as one of its advantages. Summary writing offers several advantages. One of its advantages is that students have to compile and recall the information they got from reading sources. It measures students' comprehension when they are reading. This comprehension is crucial because the central purpose of reading activity is comprehension - constructing meaning from text (Luckner, John L. & Handley, 2008)

#### 4.2 Reading Comprehension Ability on Reading English Passages Test

There were nine items of questions in the test to measure students' reading comprehension on the reading passages provided in the test. Those nine items referred to the reading passage content taken from the textbook of classical statistics delivered in English (statistics Maxwell Boltzmann). Students' performances on the test would yield their reading comprehension ability on the reading passages. Their reading comprehension ability can be proven by their performance in accomplishing the nine test items questions. The value of the test results is shown in Table 1.

Table 1: Students' Reading Comprehension Scores on Reading Passages concerning statistic Maxwell Boltzmann Using Scale 100.

N	76	Median	51.4
Mean	54.2	Mode	47.2
		Std. deviation	20.5
		Variance	421.0
		Minimum	0.0
		Maximum	97.2

The average ability of students' reading comprehension on English reading passages is still in the low category and it shows an average rating of 54.2. When viewed individually, it is found that the

students with the lowest score having the value of 0.0 and the highest score acquiring the value of 97.2. To get the clear picture of the value distribution, a frequency distribution is shown in Table 2.

Table 2: Frequency distribution of Students' Reading Comprehension Ability on Reading Passages concerning Statistic Maxwell Boltzmann.

Interval	Frequency	Cumulative percent	Percent
<54	39	51.3	51.3
55-59	11	14.5	65.8
60-64	5	6.6	72.4
65-69	3	3.9	76.3
70-74	2	2.6	78.9
75-80	6	7.9	86.8
81-85	3	3.9	90.8
86-90	5	6.6	97.4
91-95	1	1.3	98.7
96-100	1	1.3	100

The largest number of students falls in the value interval below 54. This shows that there are a large number of students who had poor reading comprehension ability on English reading passage. Students had trouble in understanding the content of the reading passage which in turn affected their performance to digest the content. To investigate the cause of their poor reading comprehension, this study investigated their difficulties in reading comprehension on statistic physics book reading delivered in English. The data concerning their reading difficulties is shown in the following section.

#### 4.3 Difficulties in Reading Statistical Physics Textbooks Delivered in English

To investigate students' difficulties in reading comprehension on English textbook for statistical physics, this study conducted questionnaire distributed to the students involved in this study. The question says: "What are your difficulties in understanding the statistical physic concepts delivered in English textbook?" There are several responses to this question and the most frequent answers concerning lack of vocabulary. This study found that students' difficulties in understanding the statistical physics concept of English textbook is due to their lack of vocabulary. Their vocabulary mastery is far below the requirement to achieve reading comprehension ability on the reading passage.

As a result of students' low vocabulary mastery, they become pessimistic to read and try to understand the content delivered in English textbooks. Things get worse when students avoid English textbooks for learning resources. In line with this situation, Koch and Eckstein (1991) found that there are two types of readers when dealing with reading passage, namely over optimism and over pessimism. The former refers to those students who are very confident in their reading skills, while the latter refers to students who are not confident and strongly disbelieve their reading skill.

To overcome students' difficulties on their low vocabulary mastery, they translate English textbooks using the online application such as google translate (translate.google.co.id). Unfortunately the application can meet the accuracy demand to transfer the text meaning. Most of the time, the application delivers inappropriate meaning for particular terms. Having taken the wrong translation, students risk themselves in comprehending the content of the reading passages.

## 5 CONCLUSION

This study was aimed at investigating students' summarizing ability, reading comprehension ability and their difficulties in reading comprehension. Participants in this study did not perform well in summarizing the English passage. Instead of summarizing, students translated the content of reading they deal with. In a reading test, they had poor performance to accomplish reading comprehension test. This happened because they were lack of vocabulary mastery and failed to perform reading strategies to achieve solve reading test. Last findings concern their difficulties to read English textbook. They had one thing in common, they had poor vocabulary comprehension.

Based on the findings of this study, there is a need to improve pre-service physics teachers competence in reading comprehension on Physics concept delivered in English textbook. Their poor performance might affect their future academic achievement. There is a need on the part of the university to solve these reading comprehension problems. One of the possible effort is that English subject should be designed to meet the objectives of boosting pre-service physics teachers reading comprehension ability.

This study has several limitations. Future study can investigate pre-service physics teachers using large-scale participants and different research

method to gain proper and sound findings concerning pre-service physics teachers' reading comprehension ability

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