Reading Comprehension Skills of Scientific Texts with Natural Sciences Content of Junior High School Students in Magelang City

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Abstract

The study analyzes the achievement of reading comprehension skills of scientific texts with IPA content of junior high school (SMP) students in Magelang City. The study is a quantitative study using a survey approach method. It is conducted in four SMPs in Magelang City. The population of 8th-grade junior high school (SMP) students in Magelang City consists of 95 students. Data are generated through an objective test on the students. The analysis results indicate that the average reading comprehension skills of the SMP students in Magelang City are within the fair criteria, with an average score of 65. In the literal level comprehension, the average score is 71; the inferential level comprehension receives an average score of 65; and in the critical level comprehension, the average score is 58; therefore, all comprehension levels are in the fair category. Factors affecting the reading comprehension skills of the SMP students in Magelang City include environmental and psychological factors.

Keywords: Critical, Inferential, Literal, Reading Comprehension Skills

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INTRODUCTION

Reading is an essential foundation skill to be mastered by each individual (Sudarsana, 2014; Maryono et al., 2022). Through reading, people can develop knowledge through the information acquired (Patiung, 2016). (Rojas Rojas et al., 2019) opine that the activity is often used to facilitate students' interest in sciences and understanding of phenomena and scientific processes.

Reading skills have an effect on the education field as well as on broader fields, such as social and economic. Reading is not merely an activity of converting words into information. Reading a text involves deep and complex cognitive processes (Concannon-Gibney & Murphy, 2012). The mental process in sciences comprises observing, classifying, predicting, formulating hypotheses, asking, and concluding (Rojas Rojas et al., 2019).

Reading is a complex process that requires intense student activities (Laily, 2014; Ganie & Syahputra, 2022). It is elaborated by (Nigro & Trivelato, 2012), stating that the reading comprehension process demands skills in linking information contained in the texts to knowledge owned that leads to an ability to conclude and evaluate comprehension during the reading. A study by PISA that measures students' reading skills suggests that the result of Indonesian students' reading skills was the 27th of 77 countries with a score of 371 (OECD, 2019). The result indicates a low level of reading skills among Indonesian students.

An initial survey conducted in one of the junior high schools in Magelang indicated that students received less attention from teachers; thus, a detailed description of their mastery level of reading comprehension skills of scientific texts has not been mapped. Moreover, strategies applied by the teachers in scientific text reading activities were less varied. Based on the initial interview with the teachers, the learning process related to reading skills is merely instructing the students to read texts in the learning and answering questions provided by the teachers.

The authors also performed a study on several research results. The study indicated that only a few studies were found related to mapping students' reading comprehension skills in the IPA learning process. The mapping is essential to facilitate teachers in determining learning strategies; hence, the current study aims to analyze the achievement of reading comprehension skills of scientific texts with IPA content of the SMP students in Magelang City.

METHODS

The research was quantitative research using a survey approach method. The method was selected since a survey approach could produce data naturally, yet researchers can provide non-experimental treatments (Sugiyono, 2009).

The research population consisted of 4 SMPs in Magelang City. The research employed a simple random sampling technique to determine samples that resulted in sample data of 95 students at 8th-grade junior high school (SMP) in Magelang City as a subject.

A test method was used for data collection in the research. An objective test was used to identify the students' reading comprehension level. The objective test was selected due to its ability to measure learning outcomes in a complex way since it contains several aspects related to reading comprehension skills. Grids of test questions of the reading comprehension skills based on the OECD reading comprehension level (2019) are presented in Table 1.

Table 1. Test Grids Based on Reading Comprehension Levels of OECD 2019

Comprehension Level	Indicator	Question Item	Number of Question
Literal Level	Connect written information in discourse	1, 17	
	Summarize the content of the discourse	2, 13	8
	Identify reasons stated explicitly	7, 22	
	Identify written main ideas	8, 21	
Inferential Level	Create a hypothesis on the possibility.	3, 14	
	Connect additional facts	4, 23	
	Compile information that is not written in the discourse	9, 15	8
	Estimate conclusion in the discourse	10, 18	
Critical Level	Describe the supporting evidence from the discourse	5, 24	
	Express opinions related to the emotional impacts of the discourse	6, 20	
	Describe whether the information is valid or not	11, 19	8
	Assess the discourse according to student knowledge	12, 16	

To ensure the instruments' accuracy in identifying the students' reading skills, validity tests, reliability tests, discrimination power, and difficulty level tests of the test questions contained in the instruments were conducted before the instrument application. The validity test of the test instrument is described in Table 2.

Table 2. Results of the Validity Test

Criteria	Question Items
Very High	1, 9, 15, 16, 17, 20
High	2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 18, 19, 21, 22, 23, 24
Moderate	-
Low	-
Very Low	-

Table 2 indicates that six questions were within the very high criteria, and 16 were in the high criteria. The results of the validity of the questions that were in the very high and high categories were used in the data collection. An advanced reliability test was conducted on the data results.

The reliability test of the test instruments employed SPSS version 22 for Windows. The test ensures that the instruments used consistently assess research (Nugriyantoro, 2009). The test results indicated that 24 questions received an alpha value of 0.880. The value suggested the r value < r table; therefore, the instruments were reliable.

The discrimination power test of the research used SPSS 22 for Windows. The test aimed to assess the ability of the questions to identify differences in the student's skill levels (Arikunto, 2010). The results of the discrimination power test are presented in Table 3.

Table 3. Results of Discrimination Power Test Analysis of Reading-Comprehension Skill Test

Criteria	Question Item
Excellent	-
Good	1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24
Fair	7, 21
Poor	-

(Source: Arikunto, 2010)

Of the 24 questions, 22 were in a suitable category, and two were in the fair category. The results implied that the question's ability to distinguish the students' skill levels was good.

The difficulty test is intended to identify the difficulty index of a question (Arikunto, 2010). The test employed SPSS version 22 for Windows, resulting in data as indicated in Table 4. The results in the table suggest that 7 question items were in the problematic criteria, 17 were in the medium criteria, and none were in the easy category. The results can be inferred that the test instrument difficulty in those categories can be used to identify student skills accurately. The results are elaborated in Table 4.

Table 4. Results of Difficulty Level Test of the Test Instruments

Criteria	Question Item
Difficult	3, 7, 8, 11, 14, 16, 18
Medium	1, 2, 4, 5, 6, 9, 10, 12, 13, 15, 17, 19, 20, 21, 22, 23, 24
Easy	-

The data analysis technique used in the research was quantitative descriptive analysis. The research data originated from the answer sheets of the scientific texts reading comprehension test with IPA content of the SMP students in Magelang City. The data were analyzed according to the reading comprehension levels, namely literal, inferential, and critical, using the following steps.

a. Data Scoring

The objective test scoring is a score of one (1) if the answer is correct and zero (0) if the answer is wrong. The obtained score results become the total score of the students.

b. Percentage in each reading comprehension level

The total score results were used to determine the percentage of the achievement of the scientific article reading comprehension skills. Next, the criteria were determined based on the rate. The calculation used the theory of Nurgiyantoro (2016). The results were determined based on the assessment criteria as indicated in Table 5.

Table 5. Criteria of Reading Comprehension Skill Scoring

Interval of Mastery Level Percentage (%)	Scale Change Value	Criteria
86 – 100	A	Excellent
76 – 85	B	Good
56 – 74	C	Fair
10 – 55	D	Poor

Percentage calculation at each level of mastery students obtain determines the criterion level of students' reading comprehension ability. The percentage level at this stage of mastery will be calculated using the formula:

$$\frac{\text{the scores obtained by students}}{\text{the number of questions}} \times 100\%.$$

Furthermore, these results will be included in the mastery level interval according to the percentage of results obtained.

The hypothesis testing of scientific text reading comprehension skills with IPA content of SMP students in Magelang City was conducted using a one-sample t-test analysis technique. The test requires data with prerequisite tests of homogeneity and normality tests. The tests aim to identify whether the distribution of the research data was normal or homogeneous so that a hypothesis testing t-test can be performed.

The homogeneity test of the research data produced a significance of 0.856. The result indicated a significance of 0.856>0.05; therefore, it can be interpreted that the student's reading skill data originated from a homogenous population.

The normality test that employed a significance level of 0.05 used a hypothesis formula: if the significance $p < 0.05$, then Ho is rejected, and if the significance $p > 0.05$, then Ho is accepted. The test results using a one-sample Kolmogorov-Smirnov indicated a

significance value of 0.082. Hence, the significance value was 0.082>0.05, and the reading comprehension skill data was normally distributed (Ho was accepted).

RESULTS & DISCUSSION

Results

The research involved a total sample of 95 8th-grade SMP students in Magelang City. Samples taken were from several schools, SMP N 3 Magelang, SMP N 9 Magelang, SMP N 11 Magelang, and SMP IT Ihsanul Fikri Kota Magelang. The research employed an instrument of multiple-choice questions (objective test) that experts tested and generated data on general, literal, inferential, and critical reading skills.

The general reading skill of the 95 respondents received a student reading skill score of 65 with fair criteria. Based on the average scores, the highest score was 92, and the lowest score was 29. The research results are presented in Table 6.

Table 6. Distribution of Reading Comprehension Skill Scores of SMP Students in Magelang City

Interval of Mastery Level Percentage (%)	Criteria	Frequency	Percentage (%)	Average
85 – 100	Excellent	12	13	
75 – 84	Good	16	17	65
55 – 74	Fair	40	42	(Fair)
10 – 54	Poor	27	28	

Data in the above table indicate that the overall reading comprehension skill of the 8th grade SMP students in Magelang City was within the fair criteria with an average of 65. The category was based on the percentage results of the students with fair, sound, and excellent category of 72% and students with poor reading comprehension skills of 28%.

The generation of the reading comprehension skill data with a score of 65 was distributed from three reading skill aspects: literal, inferential, and critical. The highest score (77%) was found in the literal level comprehension, with a correct answer of 590. The second-highest score (65%) was in the inferential level comprehension, with a correct answer in 491. Critical level comprehension was followed with a correct answer in 442 (58%). The calculation of data analysis of each reading-comprehension skill level is described in detail in Table 7.

Table 7. Score Percentage of Each Reading-Comprehension Skill Level

No.	Comprehension Level	Number of Question	Correct Answer	Score (%)	Criteria
1.	Literal Level	8	590	71	Fair
2.	Inferential Level	8	491	65	Fair
3.	Critical Level	8	442	58	Fair
	Average Score			65	Fair

The literal level of comprehension refers to the comprehension of information and facts directly stated in the texts. The calculation results suggested that 24 students were in

the excellent category. Overall, the literal level comprehension was in the fair category, with an average score of 71. The research data results of the reading comprehension skill at the literal level are presented in Table 8.

Table 8. Distribution of Scores of the Literal Level Reading Comprehension Skill of SMP Students in Magelang City

The interval of Mastery Level Percentage `(%)	Criteria	Frequency	Percentage (%)	Average
85 – 100	Excellent	24	25	
75 – 84	Good	31	33	71
55 – 74	Fair	22	23	(Fair)
10 – 54	Poor	18	19	

Table 8 indicates that the literal level reading comprehension skills of the research subjects were within the fair criteria, with an average score of 71. The result suggests that the students, on average, had mastered 55%-74% of the reading comprehension skills at the literal level, which consists of student skills in connecting information in the discourse, summarizing the discourse content, identifying reasons stated explicitly, and identifying the written main ideas.

Critical level comprehension is related to the student's ability to criticize text information. The calculation results on assessing reading comprehension skills at the critical level showed that most students (40) received a score with poor criteria. The results of the reading comprehension skills at the critical level are indicated in Table 9.

Table 9. Distribution of Scores of Critical Level Reading Comprehension Skills of SMP Students in Magelang City

Interval of Mastery Level Percentage (%)	Criteria	Frequency	Percentage (%)	Average
85 – 100	Excellent	14	15	
75 – 84	Good	16	17	57
55 – 74	Fair	25	26	(Fair)
10 – 54	Poor	40	42	

Referring to Table 9, the average score gained by the students was 57, which was in the fair criteria. The average score can be interpreted that the students mastered 55%-74% of the reading comprehension skills at the critical level consisting of students are capable of describing the supporting evidence from the discourse, expressing opinions related to the emotional impacts of the discourse, describing whether the information is valid or not, and assessing the discourse according to student knowledge.

Reading comprehension at the inferential level is related to student skills in translating information in implicitly presented texts. The calculation results suggested that most students (29 students) were in the fair criteria with a percentage of 31%. The data results of the reading comprehension skills at the inferential level are presented in Table 10.

Table 10. Distribution of Scores of Inferential Level Reading Comprehension Skills of SMP Students in Magelang City

Interval of Mastery Level Percentage (%)	Criteria	Frequency	Percentage (%)	Average
85 – 100	Excellent	18	19	
75 – 84	Good	23	24	64
55 – 74	Fair	29	31	(Fair)
10 – 54	Poor	25	26	

Based on Table 9, the average score was 64; therefore, the students had reading comprehension skills in the fair criteria. The students, on average, had mastered 55%-74% of the reading comprehension skills at the inferential level, which consists of students who are capable of creating a hypothesis on possibility, connecting additional facts, compiling information that is not stated in the discourse, and estimating conclusion in the discourse.

The research hypothesis testing was conducted using a one-sample t-test. The test aimed to prove whether the average reading comprehension skills of the SMP students in Magelang City mainly were 60% of the expected criteria. Based on the overall reading comprehension skills result using a significance level of 0.05, the significance data was 0.000 or 0.000 < 0.05. Therefore, the hypothesis was accepted.

Discussion

The reading comprehension skills analysis of the 8th grade SMP students in Magelang City indicated that the literal level comprehension aspect, which refers to understanding information and facts directly stated in the text, received the highest score of 71% or in the fair criteria. The second-highest score of 65% was found in the inferential level comprehension, which is related to the ability to understand reading the information presented implicitly. Next was the critical level comprehension, which refers to the ability of students to criticize information in the texts that received a score of 58% or in the fair criteria.

The three aspects contained in the research were in line with Anderson (in Tarigan, 2015), stating that reading has goals of obtaining factual details, acquiring ideas or main ideas, recognizing information structure coherently, classifying reading results, evaluating and assessing reading results, and comparing based on the reading results acquired.

The fair criteria in the percentage of 65% indicated that the students, on average, had mastered 55%-74% of the reading comprehension skills in the three comprehension levels. This was due to several factors, such as a lack of self-motivation, which led to poor reading comprehension skills. Another factor was encouragement from parents since it is a determinant factor in the success of good reading comprehension skills. The reading interest of the SMP students in Magelang City was low, as indicated by the lack of effort by students to read.

Students with high reading comprehension abilities can learn the material and complete assignments compared to those with low reading comprehension abilities (Julianto, 2016). Thus, reading comprehension ability becomes one-factor influencing student learning outcomes. It is in line with the opinion of Rudyanto (2017), who explains that students' reading comprehension abilities are optimal in influencing learning outcomes. Higher students' reading comprehension ability will result in higher students' learning outcomes.

A study (Saepurokhman, 2002) stated that low interest and habit in reading textbooks had a high correlation to reading comprehension level. Efforts in directing the

reading process to achieve good effectiveness and accuracy can be made through variations in reading and its testing. Several techniques are available to improve reading comprehension, including summarizing reading, finding main ideas, answering a question, completing hiatus paragraphs, and organizing ideas (Agustina, 2008). Enhancing reading comprehension skills will require effort, interest, and mastery of reading techniques.

Another factor affecting reading comprehension skills is the background of social-economic conditions and living environment. Student characteristics related to value attitudes and linguistic skills are formed according to their background. Students' residential background can affect their skills. If books are available at their home and their parents often read, this will influence their interest and skills to perform the same activities. Moreover, students' values, attitudes, and personalities related to the skills are formed according to their socio-economic condition. (Askari & Samadi Rahim, 2017) Elaborate that parents' part in supporting and directing their children in terms of education must be democratic, such as encouraging the children's skills to think and be independent. The research results indicated that the sample school has students with a less supportive environment in reading activities; therefore, students' reading comprehension skills are low.

Natural intelligence, or IQ, affects reading comprehension skills but at a low level. Other factors besides intelligence affect students' reading skills, namely learning methods and teachers' ability in the learning process. Samadi Rahim, 2017 supports this), and elaborates that students' high intelligence does not determine good reading skills.

Students' physical conditions also influence reading comprehension. Such factors as fatigue can affect students' focus and thus impact their reading skills. Students' understanding-related basic skills of differentiating symbols, letters, and numbers can affect their comprehension in understanding reading.

A study by Wulandari (2012) described that the skills of SMP students in Yogyakarta City were low, as proven by their scores not meeting the minimum standards. Additionally, a study on reading skills performed at SMP Negeri in Brebes Regency areas resulted in an average score of 4.35, which was in the low category.

Research by (Manulang and Malan Lubis, 2017) indicated that students' reading comprehension skills received an average score of 74.07, which was in the fair category. Based on the studies, students' reading skills are either poor or poor. The current research provides an illustration related to the need for improving students' reading comprehension skills.

CONCLUSION

The research results indicated that the reading comprehension skills of SMP students in Magelang City were within the fair criteria. This was proven by the average score obtained of 65. The average score of the student's reading comprehension skills in the literal level comprehension was 71, inferential level comprehension was 65, and critical level comprehension was 58. All the comprehension levels were in the fair criteria.

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