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# The correlation between english proficiency and reading comprehension with scientific literacy skills of senior high school student

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**Abstract.** This research aims to determine the correlation between English proficiency and reading comprehension ability with scientific literacy skill of senior high school students. This research was conducted in Bekasi Regency involving 69 senior high school students as samples. Samples were chosen by Simple Random Sampling. The method used in this research was descriptive quantitative and research hypothesis tested by Pearson Product Moment in  $\alpha=0.05$ . The result showed that there was positive correlation between: English proficiency and scientific literacy skill ( $r = 0.354$ ); reading comprehension ability and scientific literacy skill ( $r = 0.424$ ); English proficiency, reading comprehension ability, and scientific literacy skill altogether ( $r = 0,441$ ). Determination coefficient obtained in this study was relatively low ( $r^2 = 12.6\%$  for English proficieny and scientific literacy skill;  $r^2 = 18\%$  for reading comprehension ability and scientific literacy skill;  $r^2 = 19.5\%$  for English proficiency, reading comprehension ability and scientific literacy skill altogether). They indicated that there was other factor which contributed more on students' scientific literacy skill. This result research is expected to be a basic reference for further research.

## 1. Introduction

Science education plays a strategic role in the process of creating quality generation as required in national education goals. National education purpose is to develop ability and build the character and civilization of a dignified nation in order to educate life of nation, develop learner potential to become human beings who believe and fear to the Almighty God; have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizen (Permendikbud no. 22 year, 2016).

It is generally recognized that education is the key of good economic growth. Hanushek and Wobmann, [23], analyse deeper role of education in economic growth. Indicator of education that affects economic growth is not the number of residents who take formal education, but the cognitive ability of the residents as the result of education that determines the progress of country's economic growth. In accordance with Moretti dan Frandell, [29], education is a tool for risk prevention as well as tool that can help improve the quality of human life in a suitable manner. Quality of life here primarily means the ability to understand, read, write and count. By understand, it means to be able to understand the language presented in both oral and written. To be able to understand global information which is mainly presented in English as universal language. The ASEAN community has chosen English as the official language or lingua franca, where English becomes the international language that connects the communication of various activities so that understanding becomes the key to success in achieving a future career (Handayani, [22]). In other word, having the ability to speak English is an investment to be able to compete globally in international scope.



Science literacy plays an important role in preparing students to be able to think critically, creatively, logically, and initiatively respond to issues in society (Prayekti *in* Firman, [17]). Literacy of science is important because: (1) understanding of science, offers personal satisfaction and pleasure that comes after understanding and studying nature; (2) in daily life, everyone needs information and scientific thinking for decision making; (3); everyone needs to involve capabilities in public discourse and debate on important issues involving science and technology; (4) and literacy of science is important in the working world, as more and more jobs require high skills, requiring people to learn science, reasons, think creatively, make decisions, and solve problems (National Research Council, 1996). It is important to have science literacy skill since it becomes the indicator of education quality. This was stated by PISA (Programme for International Student Assessment) which consists of the advanced industrial countries of The Organization for Economic Cooperation and Development (OECD).

According to the study by PISA in 2000, [33] Indonesia ranked 38<sup>th</sup> out of 41 participating countries scoring 393 in average; in 2003, Indonesia ranked 38<sup>th</sup> out of 41 participating countries scoring 395 in average; ranked 50<sup>th</sup> out of 56 participating countries with 395 mean test score in 2006 then ranked 57<sup>th</sup> out of 65 participating countries with 395 average test score in 2009; meanwhile, PISA 2012 showed that Indonesia placed in rank 64<sup>th</sup> out of 65 participating countries with 396 score (OECD, 2013). As for, final result of study of PISA, Indonesia ranked 62<sup>nd</sup> out of 70 participating countries scoring 403 in average while the average score of OECD countries were 493 (PISA 2015, OECD 2016, [34]).

Report of the world's largest ranking of English skills EF- EPI (2016), showed that English proficiency of Indonesian students were quite good which ranked 32<sup>nd</sup> out of 72 countries in the world, with 52.94 average score. The development of test results of EF-EPI since 2011 to the end of 2016 showed a significant increasement of English proficiency of students in Indonesia, moving from beginner to intermediate.

Reading is an absolute requirement in enhancing literacy appreciation level and sharpening critical power of society (Tarigan, [45]). Reading comprehension is defined as one kind of reading that aims to understand the content of the reading comprehension consists of four levels namely: literal understanding, interpretive understanding, critical understanding, and creative understanding (Ridwan *in* Putra [36]). The third level in reading comprehension is critical understanding that is understanding the reading content with thinking critically. Critical thinking encompasses problem-solving, creativity, communication, and collaboration skills coupled with the character qualities of each learner such as curiosity, initiative, persistence, adaptation, leadership, and socio-cultural awareness. Critical thinking is a process that leads to the conclusion of what to believe and action to take (Widodo, *in* Rahayu 2014).

C.E.de Boer *in* Adisendjaya, [1], suggests that the first person that use "Scientific Literacy" term was Paul de Hart Hurt from Stamford University who stated that Scientific Literacy means understanding science and its application towards need of society. Literacy of science according to National Science Education Standards is "scientific literacy is knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity". Literacy of science is a science and understanding of the concepts and processes of science that will enable a person to make a decision with the knowledge it has, and also be involved in statehood, culture and economic growth. Literacy of science can be interpreted as an understanding of science and its application towards needs of society (Widyaningtyas, 2005 *in* Adisenjaya, [1]).

Literacy of science according to PISA is defined as the capacity to use scientific knowledge, to identify questions and to picture the decisions about the natural world and the changes made toward it through human activity. Science literacy is defined as the ability to use science knowledge, identify questions, and picture conclusions based on evidence, in order to understand and make decisions regarding nature and changes made toward nature through human activities. This definition of science

literacy views the science literacy as multidimensional, not just an understanding of science knowledge, but more than that.

PISA also assesses students' understanding of the characteristics of science as a scientific inquiry, awareness of how science and technology shape the material. Intellectual and cultural environment, and the desire to engage in science-related issues, as reflective human beings. Literacy of science is considered as a key learning outcome in education at the age of 15 for all demands of citizens, not just scientists. The inclusiveness of scientific literacy as a general competence for life reflects a growing trend in scientific and technological questions.

Language comprehension is an application that describes the storage and retrieval of information in LTM (Long Term Memory) (Carpenter 1995; Clark, 1994; Corballis, 2006; Matlin, 2009). Each child has a Language Acquisition Device (LAD), the child's natural ability to speak (Madyawati, [26] ). According to Clark, [11] early childhood is an important stage for learning the language (critical period). The development of language skills according to Piaget and Vygotsky 1978, (*in* Tarigan [47]) consists of three stages: pralinguistic stage (0-0.5 years), grinding stage (0.5-1 years), and linguistic stage (1-18 years). If language recognition does not occur before adolescence, then the inability to use good grammar will be natural for life. Slightly different from the development of language skills in adolescent age, because in this phase is a sensitive period, where adolescents use a style that is typical in the language, as part of the identity formation. This can cause in the adult age to occur very large differences between individuals with each other in terms of language development. The development of language skills depends on the level of education, role in society, and type of job (Gielson, [20] ).

Language skills are intelligence that related with ability to perform as well as understand information and communication to/from other parties, either orally or in writing, Widura, [49] . Indicators of language skills are listening ability, ability to read effectively, ability to speak and writing ability. Language skill or verbal-linguistic intelligence according to Cambell, [10] is a person's ability to think in words and use language to express and appreciate complex meanings.

Dalman, [13] states that reading the beginning is the beginning level so that people can read. While reading comprehension is a reading skill that is on a higher order. Reading comprehension is cognitive reading (reading to understand). According to Suluh (2014) reading comprehension is a process to recognize or identify text, then recall the contents of the text. Reading comprehension can also mean as an activity of making a sequence about the description / organizing the text content, can evaluate at once can respond to what is written or implied in the text. Understanding correlates the barrel with speed. Understanding or comprehension, is the ability to read to understand: basic ideas, important details, and all understanding. Reading for understanding here is a kind of reading that aims to understand: to understand literary standards, to understand critical reviews, to understand drama, to understand patterns fiction (patterns of fiction). Reading skills are always present in every learning theme. It proves the importance of mastering reading skills. Reading, especially reading comprehension is not a passive activity. Actually at a higher rank, reading it, not just understanding written symbols, but also understanding, accepting, rejecting, comparing and believing in the opinions that are in the reading. Reading this understanding is fostered and developed gradually in school (Tompobolon, [44] ). As multidimensional beings, humans have many names. Some of them are as beings who use symbols, as beings of thought, as political beings, and as social beings. With the advancement of civilization, people feel the limitations in communicating verbally. The information stored in the spoken language will disappear once the oral communication is finished. Oral communication can't break through time constraints. Hence, then man creates written symbols to describe his spoken language. In written communication, there are two abilities involved, namely writing and reading, which is the ability of written language.

Based on the description, this study aims to find out how much English ability, and the ability to reading comprehension has a relationship with the ability of science literacy toward students of SMA Presiden.

Results of relevant research, among others are: research result of Zega [49], entitled “Development of Biotechnology Module Based on Science Literacy”, showed that four kinds of modules used in this study improve the ability of students’ science literacy. In line with Zega’s research, Adisendjaja (2011), analysed textbooks of Biology High School Class X in Bandung based on science literacy. That research result showed that Biology textbooks which analysed with more emphasis on science knowledge, that presents facts, concepts, principles, laws, hypotheses, theories, models and questions that require students to remember knowledge or information, have not much to provoke students’ literacy skills.

## 2. Methods

The research was conducted in SMA Presiden for the duration of February to March 2018. Using descriptive quantitative method, the hypothesis were tested with multiple correlation. There were two independent variables, namely English capacity and reading comprehension capacity, and one dependent variable, namely scientific literacy capacity. The following instruments were used to measure each variable: scientific literacy exercise of Biology from PISA (2006) translated by H. Adinugraha (2012) to measure scientific literacy capacity, student’s TOEFL score from annual TOEFL test conducted by President University or school’s native speaker to measure English capacity. TOEFL test is a standardized assessment of one’s English capacity. There are four aspect of assessment in TOEFL test including listening comprehension, structure and writing expression, reading comprehension and vocabulary, and test of writing English. Reading comprehension capacity is the result of English capacity assessment toward student’s ability in understanding an essay. The data were obtained directly from SMA Presiden in Bekasi. The correlation among variables were calculated using Pearson Product Moment formula.

Subject of the research was students of SMA Presiden Bekasi. Target population including all students in SMA Presiden while the accessible population was grade XI students of SMA Presiden. Three classes were selected as samples using purposive sampling. From each class, students were selected as sample using random sampling with the total of 69 samples of students. The number of sample was determined by using Slovin formula.

## 3. Result and Discussion

### 3.1 Result

Based on the data of 69 respondent, the highest score on scientific literacy was 83 and the lowest score was 69. The average score on scientific literacy capacity was 76.623. The highest frequency on scientific literacy score was in the range of 74.5 – 76.5 comprising 15 students (21.74%) and the lowest frequency was in the range of 68.5 – 70.5 comprising 5 students (7.25%). Scientific literacy score of students of SMA Presiden is presented in Figure 1.

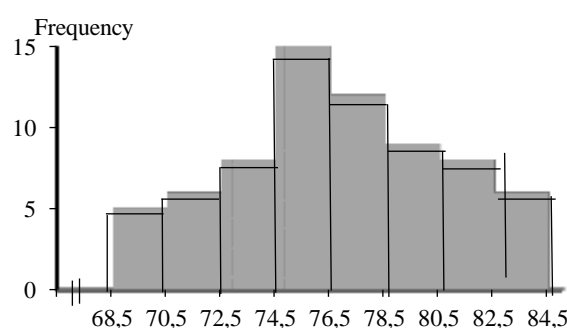
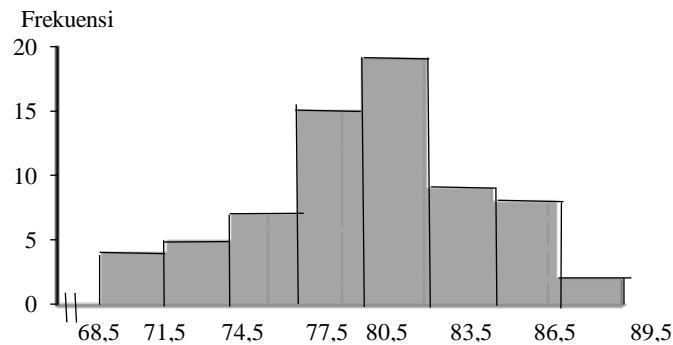


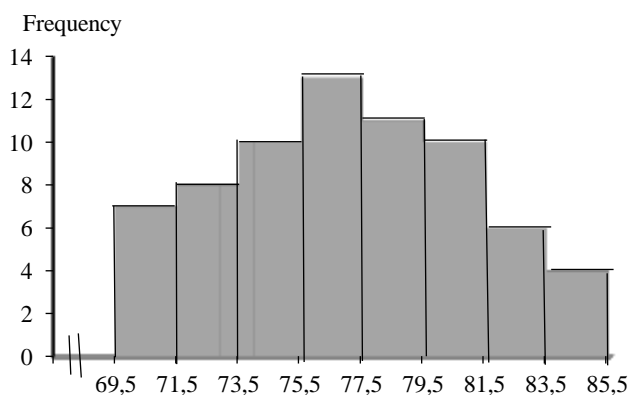
Figure 1. Histogram of SMA Presiden students’ score on scientific literacy capacity (Y)

The highest and the lowest score on English capacity was 90 and 69, respectively. The average score on English capacity was 80.420. The highest frequency on English capacity score was in the range of 80.5 – 83.5 comprising 19 students (27.54%) and the lowest frequency was in the range of 89.5 – 92.5 comprising 2 students (2.90%). English capacity score of students of SMA Presiden is presented in Figure 2.



**Figure 2.** Histogram of SMA Presiden students' score on English proficiency (X1)

The highest and the lowest score on reading comprehension capacity was 84 and 70, respectively. The average score on reading comprehension capacity was 76.986. The highest frequency on reading comprehension capacity score was in the range of 75.5 – 77.5 comprising 13 students (17.39%) and the lowest frequency was in the range of 83.5 – 85.5 comprising 4 students (4.35%). Reading comprehension capacity score of students of SMA Presiden is presented in Figure 3



**Figure 3.** Histogram of SMA Presiden students' score on reading comprehension capacity (X2)

Initially, the data were preconditioned with two other test: normality test and linearity test. Normality test was performed on the data of scientific literacy capacity, English capacity, and reading comprehension capacity with Liliefors test at  $\alpha = 0.05$  using SPSS 22. The result showed that L value was statistically significant (L<sub>calculation</sub> 0.106 and 0.093 was smaller than L<sub>table</sub> 0.107). It proved that all three group of data were normally distributed. Linearity test of English capacity and scientific literacy capacity was performed using F test at  $\alpha = 0.05$ . The result showed that F<sub>calculation</sub> 1.021 was smaller than F<sub>table</sub> 1.863 thus proved that the data model was linear. Regression test on the data of English capacity and scientific literacy capacity was performed with F test. The result showed a statistically significant value with F<sub>calculation</sub> 9.630 is higher than F<sub>table</sub> 7.029 at  $\alpha = 0.01$ . Linearity test on reading comprehension capacity and scientific literacy capacity was performed with F test at  $\alpha = 0.05$ . The result showed that both data were linear since F<sub>calculation</sub> 1.777 was smaller than F<sub>table</sub> 1.933. Regression test on reading comprehension capacity and scientific literacy capacity was

performed with F test. The result showed a statistically significant value since  $F_{\text{calculation}}$  14.687 was higher than  $F_{\text{table}}$  7.029 at  $\alpha = 0.01$ .

After passing the precondition test, the data were tested for their correlation using multiple correlation of Pearson's correlation (Pearson Product Moment) in SPSS 22.0. The result is presented on Table 1.

**Table 1. Calculation result of Coefficient Correlation Test**

Correlation	<i>Pearson Product Moment</i>		
	<i>r<sub>calculation</sub></i>	R square	Sig.
$X_1 \rightarrow Y$ ( $r_{x_1y}$ )	0,354*	0,126	0,003
$X_2 \rightarrow Y$ ( $r_{x_2y}$ )	0,424*	0,180	0,000
$X_1$ and $X_2 \rightarrow Y$ ( $r_{x_1x_2y}$ )	0,441*	0,195	0,001

\*) significance at  $\alpha = 0,05$

Based on Table 1 The strength of correlation was obtained by calculating correlation coefficient of variable  $X_1$  (English capacity) and variable  $Y$  (scientific literacy capacity) that resulted in correlation coefficient of  $r_{x_1y}=0.354$  thus the relation was deemed significant. Determination coefficient was 12.6% which meant as much as 12.6% of English capacity contributed to scientific literacy capacity while 87.4% was affected by other factors.

Based on Table 1 The strength of correlation between variable  $X_2$  (reading comprehension capacity) and variable  $Y$  (scientific literacy capacity) was  $r_{x_2y}=0.424$  thus the correlation was deemed significant. Determination coefficient was 18% which meant as much as 18% of reading comprehension contributed to scientific literacy capacity while 82% was affected by other factors.

Based on Table 1 The strength of correlation between variable  $X_1$  (English capacity) and  $X_2$  (reading comprehension capacity) simultaneously toward variable  $Y$  (scientific literacy capacity) resulted in correlation coefficient of  $r_{x_1x_2y}=0.441$  thus the correlation was deemed significant. Determination coefficient was 19.5% which meant as much as 19.5% of English capacity and reading comprehension capacity altogether contributed to scientific literacy capacity while 80.5% was affected by other factors.

English capacity and reading comprehension is very essential for student of SMA Presiden to support learning process. Based on the result above, it can be inferred that improvement in English capacity and reading comprehension capacity will lead to the improvement of scientific literacy capacity.

### 3.2 Discussion

Based on the **first** hypothesis test, the result showed that there was positive correlation between English capacity ( $X_1$ ) and scientific literacy capacity ( $Y$ ), has moderate strength with coefficient of 0.354. It showed that English capacity could support scientific literacy capacity.

The result showed that scientific literacy capacity could be obtained by processing any information given in a critical and creative manner through English activity. English capacity refer to four aspect of English that being assessed in TOEFL including listening comprehension, structure and writing expression, reading comprehension and vocabulary, and test of writing English. Those four aspect are standard in assessing one's English capacity. in this research, students' TOEFL score, in form of secondary data, obtained from English teacher of SMA Presiden, Mr. Paul Mc. Adam, who is also a native speaker from Canada.

A student of SMA Presiden who capable of understanding, implementing, and evaluating scientific knowledge using their English capacity to make sound decision and action in order to solve daily problems is said to be scientifically literate. English capacity becomes the foundation to reach scientific literacy. Scientific knowledge can be obtained through English activity. A student of SMA

Presiden must have good English capacity in order to obtain scientific literacy capacity. Good English capacity will help the student in understanding scientific context, scientific competency, scientific content, and having a good scientific manner.

Based on the **second** hypothesis test, reading comprehension capacity of the students of SMA Presiden (X2) has positive correlation with scientific literacy capacity (Y). a moderate strength of correlation with coefficient of 0.424. The relation between reading comprehension and scientific literacy capacity can be proven when a student uses their reading comprehension ability in the form of critical thinking and creative thinking in order to solve various complex challenge, as well as making decision to solve science problem in daily lives. Therefore, it can be infer that one's reading comprehension capacity relates and supports their scientific literacy capacity.

Based on the **third** hypothesis test, there is positive correlation between English capacity (X1) and reading comprehension capacity (X2) altogether towards scientific literacy (Y). It has moderate strength with the coefficient of 0.441. The result showed that English capacity in a "extra-integrated manner" correlates with reading comprehension capacity, and altogether correlates with scientific literacy capacity. Possible explanation for this is because decision making process on scientific problem can be obtained by analyzing, appreciating, selecting, criticizing, and evaluating any given information on scientific matters in an English activity. Reading comprehension capacity helps a student in receiving and processing information for their benefit in dealing with various challenges in daily live. Based on these explanation, showed that the contribution of English capacity and reading comprehension towards scientific literacy capacity is undeniable.

#### 4. Conclusion

Based on the result and discussion of this research, it can be concluded that there is positive correlation between English capacity and scientific literacy of students of SMA Presiden. There is positive correlation between reading comprehension capacity and scientific literacy capacity of students of SMA Presiden. There is positive correlation between English capacity and reading comprehension altogether with scientific literacy of students of SMA Presiden. This research is expected to be reference for another research.

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