THE EFFECT OF EXPERIENCE, LANGUAGE, PICTURE, SYMBOL, APPLICATION (ELPSA) LEARNING MODEL WITH PISA TYPE ASSISTANCE ON STUDENTS' MATHEMATICAL LITERACY ABILITY

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ABSTRACT

This research is motivated by the results of the PISA study competition which shows that the mathematical literacy ability of Indonesian students is still low, this is evidenced that Indonesian students in the PISA competition did not reach level 2 as much as 76% and only 0.3% were able to reach level 5. From the study results It is known that the level of mathematical literacy skills of students in Indonesia is at level 1. One solution to overcome the low mathematical literacy skills of students is by applying learning models related to everyday life and questions that can train higher-order thinking skills. The purpose of thisresearch is to find out whether there is an effect of using the ELPSA learning model assisted by PISA type questions as a solution in improving students' mathematical literacy skills. This research is a quantitative quasi-experimental research with a post-test control groupdesign. The population in this study were all class X SMAN 9 Tangerang as many as 405 students. The sampling technique used in this study is a type of cluster random sampling obtained by class X MIPA 4 as the experimental class and X MIPA 5 as the control class. Based on the results of parametric statistical calculations with the t test, it was found thattcount > ttable = 2.0677 > 1.666 which can be concluded that reject H_0 and accept H_1 which means that there is an influence of the ELPSA learning model assisted by PISA typequestions on students' mathematical literacy abilities.

Keywords: ELPSA Learning Model, Mathematical Literacy, PISA

INTRODUCTION

National Council of Teacher of Mathematics (NCTM) defines five competencies in learning mathematics, namely: mathematical problem solving, mathematical communication, mathematical reasoning, mathematical connection, and mathematical representation. Students need to have these five combinations of competencies in order to be able to use mathematics in everyday life. The ability that includes these five competencies is mathematical literacy ability (Pulungan, 2014). Mathematical literacy is defined as an individual's ability to formulate, use and interpret mathematics in various contexts, including the ability to reason mathematically and use concepts, procedures, facts, as tools to describe, explain and predict a phenomenon or event. However, the mathematical literacy ability of Indonesian students is still low. This can be seen based on the results of the PISA (Program for International Student Assessment) survey. In the results of the 2018 PISA study, Indonesia experienced a decline in the three competencies, namely science, mathematics and reading. Table 1 below shows the average math, science, and reading scores of students in Indonesia on PISA.

Table 1. Acquisition of Indonesian Student's Mathematics, Science, and Reading Scores in PISA 2015-2018

Year	Indonesian Average Score		
	Mathematics	**Science**	**Reading**

2015	386	403	397
2018	379	396	371

Table 1 shows that the ability of Indonesian students in all areas that are measured significantly is in the range of 300 to 400, which is still far from the international average score. Indonesian students were only able to answer questions at a low level (75.7% were at level 2). In accordance with the facts on the ground, students have not been able to work on questions that they are not used to getting, even though the questions given contain the same mathematical content. Another thing in the field is also proven from the inability of students to solve problems in the form of formulating, applying, and even interpreting mathematics in various contexts.

The low results of students' mathematical literacy results are caused by teachers who do not have innovation in the process of learning mathematics, teachers only convey explanations taken from books by not involving them in real life and the questions given only measure students' procedural knowledge in using mathematical formulas and have not been able to hone mathematical thinking ability. In connection with the things mentioned above, an alternative solution in increasing students' mathematical literacy requires a constructivism-based learning model approach related to everyday learning such as the ELPSA learning model and by applying PISA model questions can be an alternative as material for improve and optimize students' mathematical literacy skills.

The paradigm that occurs in various mathematics problems causes policy makers to renew mathematics education in achieving the goals of mathematics education. Several studies have been conducted to find out how effective the use of the ELPSA learning model and the use of PISA type questions is on students' mathematical literacy abilities. Seta, et al. (2021) who examined the effect of the ELPSA learning model on students' mathematical literacy abilities and student learning anxiety and concluded that the ELPSA learning model was able to improve students' mathematical literacy skills seen from students' abilities in formulating, applying and interpreting the problems given. Meanwhile, Masfufah & Afriansyah (2021) examined how effective the use of the RME learning model with the help of the PISA performance assessment was on students' mathematical literacy abilities, the results revealed that in the learning process applying a performance assessment similar to PISA was effective in achieving students' mathematical literacy abilities.

The learning theory that supports the ELPSA learning model is constructivism learning theory. This learning theory was put forward by J. Piaget who believes that everyone has the ability to construct their own understanding through constant interaction with their environment. Constructivism learning theory is a learning theory that provides flexibility to those who want to learn and seek needs, by using their ability to meet their needs with the help of other people's facilities, so that this theory provides learning for humans to learn to find their own competencies and knowledge in order to develop themselves.

The syntax of the ELPSA learning model assisted by PISA type questions is (1) the teacher identifies or brings up previous experiences that students have and relates them to new knowledge and experiences that they will gain (study). Experience includes how students use mathematics so far, what concepts they know, how they can obtain information, and how mathematics has been experienced by students both inside and outside the classroom. (2) The teacher gives examples of PISA type questions on the sine and cosine rules as materials and practice questions, in the learning process this model problem does contain a high level of understanding, here the teacher asks students to express their thoughts in their own language regarding the questions given, by writing what is known from the questions, and changing the contextual questions into mathematical models, (3) The teacher transforms language into pictures to bridge students to better understand the material provided. In material the rules of

sine and cosine are closely related to triangles, as much as possible the teacher should visualize the shape of the triangle that is formed from the questions given. Stages such as visualizing help students to be able to state questions about the sine and cosine rules that are contextually shaped symbolically, (4) The teacher explains a representation from image to symbol, with the help of a triangle visualization that is depicted in accordance with what is known in the problem, then from From the results of this visualization, it can be concluded whether the problem is solved using the sine or cosine rule formula.

The advantages of the ELPSA learning model are (1) being able to activate students, helping students understand concepts with their own efforts through experience gained through the stages, (2) Symbols in ELPSA can help students be able to write mathematical sentences from the language process (language) with symbols mathematics, (3) students often see pictures or manipulative objects, and also write in symbols, will make it easier for students to apply them, (4) This model considers learning as an active process in which students understand something through their thought process and social interaction with other students.

LITERATURE REVIEW

Mathematical Literacy

In general, literacy is a person's ability in processing and understanding information when doing reading and writing process. Literacy is the absorption of words in English "literacy" which is etymologically the term Literacy comes from the Latin "Literatus" which means the meaning is people who learn (Magdalena, et al., 2019). Literacy is also interpreted as a process that involves reading, writing and talk to take the core, build, integrate and criticizing a meaning through its actions involve multimodal texts (Frankel, et al., 2016).

Traditionally literacy is defined as ability write as well as read. Along with the passage of time The concept of literacy has also developed and shifted from specific meaning to a more general meaning that includes various aspects. Changes in the concept of literacy due to various factors, including the expansion of meaning due to usage more broadly, advances in information technology, and change analogy (Kusmiarti & Hamzah, 2019).

Along with the development of information technology and communication, the definition of literacy has also developed The next step is literacy in the fifth generation. The term deep literacy The fifth generation is called multiliteracy. Multiliteracy concept arises because humans do not only read or write, but they read and write accordingly specific genres that involve social, cultural and political goals which is a demand in the current era of globalization. The new literacy theory or so-called Multiliteracy arises because there is development significant technology. The difference between old literacy and literacy new is in the aspect of ability, old literacy is loaded calistung competence, while new literacy includes literacy data, technology literacy and human literacy (Alfin, 2018).

Based on the explanation above it can be concluded that literacy in today's era is not just one's ability to read and write the definition has become broad to a person's ability literacy and information technology. Literacy ability in the present era it is necessary for someone to be able develop and adapt to a global society as well capable of facing the challenges of the 21st century.

De Lange in Sari (2015: 715) explains that mathematical literacy consists of spatial literacy, numeracy, and quantitative. These three things are interrelated, namely: 1) Spatial Literacy is an ability that supports understanding of the 3D world or with In other words, spatial literacy discusses discussion regarding form and space. 2) Numeracy is the ability to manage numbers and data as well as to evaluate statements about real problems and contexts. this ability includes the ability to identify, understand, use numerical expressions in various ways everyday context. 3) Quantitative Literacy is a literacy ability mathematics that refers to ability identify and understand quantitative statements in everyday life.

Based on the above understanding, conclusions can be drawn that mathematical literacy is not only about ability someone on spatial, numeracy or ability on only qualitatively, but the ability of mathematical literacy emphasizes one's competence in reading and understand the conditions of the problem using later mathematical thinking skills connected in the real world, literacy skills Mathematics can also be defined as ability someone in reading, formulating, and interpreting mathematics in various contexts in everyday life as well as being able to communicate and explain phenomena it faces by using the concept mathematics. Very mathematical literacy ability help someone to make a decision good in social life.

PISA (Programme for International Student Assessment)

PISA 2012 provides an understanding that mathematical literacy as the skill of an individual to compile, use and explain mathematics in various ways context. Including the process of reasoning mathematically as well be able to use mathematical concepts, procedures, facts and tools to define, explain and predict phenomena. All of those individual skills can help individuals to make a decision as a form of active community participation in development (OECD, 2019). The most important part of mathematical literacy is use, do, and recognize deep mathematics various contexts in life. Mathematical literacy ability related to how a student is able to apply something knowledge in the real world or everyday life, so that knowledge can be felt more its benefits directly by students (Khotimah, 2018). Literacy is not only limited to ability on arithmetic aspects in mathematics only, but also involve a wider range of skills.

PISA (Program for International Student Assessment) is a survey conducted by the OECCD (Organization for Economic Cooperation and Development), is a student assessment program that makes literacy a assessment to describe the quality of education in a countries (OECD, 2019). PISA has been held since 2000 and is carried out every 3 years which aims to evaluate educational attainment intended for 15 year old students in mastering knowledge and their mathematical literacy skills well at the time faced with the situations and problems presented in the real life context. PISA also explains the things that are the cause how the skills and character of students grow at home and schools and evaluate how things are can be integrated so as to influence development policies of a country (OECD, 2019).

More specifically, PISA monitors the system's results from perspective of student learning outcomes in each participating country which includes three literacy competencies, namely mathematical literacy, science, and read in detail as follows (OECD, 2019):

1) Mathematical literacy, includes the ability to recognize and understand, use the basics of deep mathematics life that a person needs to face everyday life.
2) Scientific literacy, including the ability to apply knowledge, identify problems in life to understand the facts and make decisions about changes in nature and life.
3) Reading literacy, including the ability to understand, use, and reflect in writing.

Assessment of mathematical literacy skills assessed in PISA has certain assessment standards, in the 2018 PISA framework states that there are 3 interrelated assessment components, namely process, content, and context. The components of the PISA assessment process are defined as the procedure one uses in completing problems by applying mathematical concepts as aids in a particular situation or context resulting in a problem it is solved. Assessment in this process is related to solving three mathematical matters namely (1) Formulate available situations mathematically, (2) using mathematical concepts, facts, procedures and reasoning, and (3) interpreting, applying and evaluating math results (OECD, 2019).

ELPSA Learning Model (Experience, Language, Picture, Symbol, Application)

ELPSA is a development of the model ELPS learning developed in 1984 by Liebeck. The ELPS learning model includes E(experience), L (language describes experience), P (picture conveys experience in the form of pictures), and S (symbol describes experience). However, ELPS is not explicitly describes the use of that knowledge has been obtained.

On the other hand, the Program for International Students Assessment (PISA) in Thomson and Buckley stated that the achievement of a process of learning mathematics It doesn't just stop at the ability of students understand the material being studied. However, it should be noted that they are also capable of applying knowledge their mathematics in other contexts. Based on discussion above, the RIPPLE team (Research Institute for Professional Practice, Learning & Education) chaired by Prof. Tom Lowrie from Charles Sturt University Australia added one element to the ELPS development is Application. Then the learning model developed is known as the learning model ELPSA (Wulandari, 2017).

Based on research, ELPSA is a specially designed learning design framework for the Indonesian context as a result of video data analysis TIMSS (Thrends International Mathematical Science Study) (Lowrie & Patahudin, 2015). ELPSA learning model developed based on learning theory social constructivism. Learning model ELPSA was developed on the basis of learning theory social constructivism. This learning model view learning as an active process in which students will trying to find his own way of understanding things through personal thought processes and social interactions with other students (Mustakim, 2016).

The ELPSA learning model is cyclical in nature, not as a linear process. Learning is complex that cannot be predicted and does not occur with linear sequence, so that at the time of implementation of the model This learning is not as a linear process but every elements are interrelated with one another as well complete each other. The following will be described in more detail regarding the elements contained in the learning process ELPSA according to (Mustakim, 2016):

1) Experience (E): Experience, learning bring out the experiences that students have. Experience considering how para students use mathematics so far, what concepts do they know, how they can get information.
2) Language (L): The language of learning to be develop a specific mathematical language in order interpreted by students.
3) Picture (P): This component is related to the use of visual representations in presenting ideas.
4) Symbol (S): Symbol (symbol representation) is learning activities that can make the transition from image representation to symbol representation.
5) Application (A): Application related to how the knowledge that has been obtained can be applied in various situations.

Based on the explanation and some definitions described above it can be concluded that the model ELPSA learning (Experience, Language, Picture, Symbol, Application) is a learning model that have elements in them that are mutually exclusive relate to one another and to each other complement, here students learn by associating experience, language, symbols, and their applications, which ones students can be more active because they will try on their own in finding a way.

METODOLOGY

This research method is Quasi Experimental. Quasi Experimental is used when the research implementation cannot control variables outside the research that can affect the implementation of the experiment (Sugiyono, 2019). The design of this study is a posttest-only control design. According to Sugiyono (2013) the posttest-only control research design has two classes selected randomly.

Table 2. Research Design

R	**X**	O_1
R		O_2

Information:
R = Random

X = The Sample is Treated
O_1 = The experimental group that was given the treatment
O_2 = Control group that was not given treatment

In this study, the population was all students of class X SMAN 9 Tangerang. While the research samples were class X MIPA 4 with 37 students as the experimental class and X MIPA 5 with 36 students as the control class who were selected using the cluster random sampling technique. This study examines the relationship between one dependent variable and one independent variable. The dependent variable in this study was the students' mathematical literacy ability, while the independent variable in this study was the PISA Type Question Assisted ELPSA Learning Model. The research instrument used to collect research data is a description and documentation test instrument. The description test instrument will be tested on the upper class to test its validity and reliability. Validity test using Product Moment and reliability test using Alpha Cronbach.

Before testing the hypothesis, a prerequisite test is carried out to find out whether the results of the data are tested hypotheses using parametric or non-parametric statistics. The prerequisite test is the normality test and homogeneity test. The normality test is carried out to find out whether the data that has been collected comes from normally distributed data. The normality test is carried out using the Chi-Square test. while the homogeneity test is a test that to find out whether the two groups of data that have been collected come from homogeneous data groups, the homogeneity test is carried out using Fisher's test. The hypothesis test was carried out using the influence test, namely the T test. The statistical hypothesis was $H0$: The average mathematical literacy ability of the experimental class students was smaller than the average mathematical literacy ability of the control class, the average mathematical literacy ability of the experimental class students was higher from the average mathematical literacy ability of the control class. If $t_{hitung} > t_{tabel}$ then $H0$ is rejected $H1$ is accepted, meaning that there is an influence of the ELPSA learning model assisted by PISA type questions on students' mathematical literacy abilities.

DISCUSSION

Based on the research results obtained, it shows that the application of the ELPSA learning model assisted by PISA type questions has an influence on students' mathematical literacy abilities. Learning in class using the ELPSA learning model assisted by PISA type questions was carried out in 3 meetings. Before the question instrument is used as a test tool to determine students' mathematical literacy skills, the instrument is tested for validity and reliability. The results of the validity test of the six question instruments are explained in the table below.

Table 3. Test Instrument Validity Test Results

Item to	r_{xy}	r_{tabel}	Information
1	0,742896	0,367	Valid
2	0,700192	0,367	Valid
3	0,643741	0,367	Valid
4	0,460003	0,367	Valid
5	0,637572	0,367	Valid

6	0,769243	0,367	Valid

Criteria for the validity of an instrument, declared valid if $r_{xy} > r_{tabel}$ then based on table 3 it can be seen that $r_{xy} > r_{tabel}$ so that in the end the 6 items are declared valid and can be used as instruments for mathematical literacy skills. Then reliability test was carried out. The reliability test was carried out with the number of questions to be tested as many as 6 items and the results are as follows.

Table 4. Reliability Test Results

Item	**Varians(σ_b)^2**	**Varians(σ_t)^2**
1	1,221644	31,275754
2	1,527575	
3	1,221644	
4	1,017689	
5	3,931322	
6	3,644121	
Total Varians ($\sum(\sigma_b)^2$)	12,563996	
r_{11}	0,717939	
Criteria	$0{,}60 < r_{11} \leq 0{,}80$	
Information	Height	

Judging from table 4 the results of the reliability test carried out obtained the result r_{11} which was 0.717939 which was included in the criterion interval $0.60 < r_{11} \leq 0.80$ so that overall the item instrument included a category that had a high level of reliability which could then be used as a tool to measure the level of students' mathematical literacy ability. So, in the end the results of the test instrument can be declared valid and reliable.

Furthermore, after the instrument was declared valid and reliable the researcher continued the research by collecting data on students' mathematical literacy abilities to test the research hypothesis taken from class X MIPA 4 as the experimental group and class X MIPA 5 as the control group. For the average value in the experimental group obtained $\bar{x}$ = 73.7838, while for the control group obtained $\bar{x}$ = 69.1944. Before testing the hypothesis, the data is tested for normality and homogeneity first. The results of the normality test were carried out using the test $Chi - Square$ with normality test results in the experimental class and control class can be seen in the table below.

Table 5. Normality Test Results

Class X MIPA 4 (Experimental Class)			Class X MIPA 5 (Control Class)		
Interval	f	χ^2_{hitung}	Interval	f	χ^2_{hitung}
48-54	1	7,0718	48-54	1	3,6658
55-61	3		55-61	6	
62-68	10		62-68	12	
69-75	4		69-75	7	
76-82	10		76-82	9	
83-89	8		83-89	1	
90-96	1				
χ^2_{table}		9,488	χ^2_{table}		7,815
Conclusion	Normal Distributed Data		Conclusion	Normal Distributed Data	

Meanwhile, the homogeneity test was carried out using Fisher's test with the results shown in table 6 below.

Table 6. Homogeneity Test Results

Group	Varians	Db	F_{hitung}	F_{tabel}	Conclusion
Experiment	107,94444	36	1,5131	1,7478	Homogeneous
Control	71,34045	35			

From the results of these two tests, the research data can be analyzed using parametric statistical hypothesis testing. The parametric test used in this study is the T test. The results of the T test can be seen in table 7 below.

Table 7. Hypothesis Test Results

	Class X MIPA 4	Class X MIPA 5
N	37	36
Range	43	37
Mean	73,7838	69,1944
Varians	107,9444	71,3404
t_{hitung}	2,0677	
t_{tabel}	1,6666	
Conclusion	H_0 rejected H_1 accepted	

After performing calculations using the t test, it was found that $t_{hitung} > t_{tabel}$ = 2.0677 > 1.6666, so it can be concluded that H_0 is rejected H_1 is accepted, which means that there is an effect of using the ELPSA learning model assisted with PISA type questions on mathematical literacy ability students do in class experiment or X MIPA 4, with the mathematical literacy abilities of students in the control class or class X MIPA 5 who carry out the learning process with conventional learning models and without using PISA type questions as practice questions. Judging from the results of the post-test of the two classes, it was found that in the control class the ability of mathematical literacy was not fully good according to the established indicators of mathematical literacy ability, of the 36 students who were sampled as many as 30.55% of students could not formulate problems from contextual questions to in mathematical models and do not understand the context in the problem, 41.66% of students are not able to determine the procedure to be used or do not know the formula used to solve the problem based on the information provided in the problem, and 91.66% of students are still wrong with the answer themselves and because the concepts used by students are wrong so that drawing conclusions is wrong, students also cannot evaluate and provide arguments from the results they get. In the control group, only 47.22% of students succeeded in achieving the KKM. So, it can be concluded that the control class has mathematical literacy skills which are still at level 1-2.

Whereas in the experimental class as many as 86.48% of students were able to identify problems in mathematical form, for example students were able to change contextual problems into mathematical forms in the form of triangles, students also understood problems in questions, 62.16% of students were able to reason and procedures according to the information provided in the questions, students are able to use symbols and mathematical formulas to solve the problems presented in the questions such as doing calculations with formal symbols. However, only 16.21% were able to evaluate the answers they obtained. From the post-test results of the experimental class it was concluded that the weakness of some students in the experimental class was that they were not able to provide arguments based on interpretation of the problems posed, and did not evaluate the answers obtained, in the experimental class as

much as 62.16% succeeded in achieving the KKM, so it can be concluded that the average level of students' mathematical literacy skills is already at level 2-3.

The use of the ELPSA learning model applied in the experimental class has proven to have a positive impact on students' mathematical literacy abilities. The ELPSA learning model is oriented towards the five elements namely Experience, Language, Images, Symbols, and Applications. This learning model proves to be able to make students much more active, have a desire to express experiences related to the material being studied, and be able to solve problems in questions and in the context of everyday life. Other the case with the control class which applies conventional learning which makes students seem much more passive and only relies on the teacher's presentation in answering the questions given. This is in line with research conducted by Amalia. et al, (2021) which stated that the ELPSA learning model makes students more active in the learning process, especially in responding to questions posed by the teacher and being able to express opinions. With the ELPSA learning model students are used to conveying their ideas using language so that it makes it easier for them to solve problems that require them to convey their mathematical ideas.

The use of PISA type questions also proves to be able to improve students' mathematical literacy skills, students who are accustomed to being given questions of the same type as the PISA model questions will be trained in their level of understanding, and if given questions like that it is less likely that students will find it difficult to answer the questions. In contrast to students who are only given procedural questions in the book, if they are given questions that require a high level of understanding such as PISA model questions, they will find it difficult to solve them, because they are not accustomed to working on questions that have characteristics such as PISA model questions. This is in line with research conducted by Putra, et al (2016) which states that in training students' mathematical literacy skills, teachers can apply PISA questions that have been developed by other researchers. The questions that have been developed have a potential effect on students' mathematical literacy skills.

CONCLUSION

Based on the results of research conducted at SMAN 9 Tangerang, several conclusions can be drawn as follows:

The application of the ELPSA learning model assisted by PISA type questions has been shown to have a positive influence on students' mathematical literacy skills, as evidenced by the results of the calculation of the hypothesis test where the result is t_{hitung} = 2.0677 and t_{tabel} = 1.6666, so $t_{hi\ tung}$ is bigger than t_{tabel}. The results of these calculations show that reject H_0 and accept H_1, which means that there is an influence of the ELPSA learning model assisted by PISA type questions on students' mathematical literacy abilities.

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