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Numeracy literacy ability in three-dimensional topic learning design using *Augmented Reality*

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Abstract

This research aims to produce a learning trajectory on the topic of three dimensions of projection material and describe the numeracy literacy ability of students in class X MAN, using the classroom context through augmented reality technology. The research method used is design research (DR) of the validation studies type. This study is divided into three stages, namely preparing for the experiment, design experiment and the retrospective analysis. The data collection techniques used are observation, interviews, tests, and documentation. The data analysis techniques used were reduction, display, and conclusion drawn. The learning design can attract students' interest and provide new experiences in carrying out mathematics learning. After the learning design went through a series of research stages to produce HLT, which was then implemented and analyzed so that it was suitable for LIT and the results of the analysis also obtained students' numeracy literacy skills as seen from 3 indicators, still experiencing difficulties in indicator 1, namely using various kinds of numbers and symbols related to basic mathematics to solve practical problems in various life contexts everyday.

Keywords*: Learning Design, Numeracy, Projection, and Three Dimensions*

Abstrak

Penelitian ini bertujuan untuk menghasilkan lintasan belajar pada topik dimensi tiga materi proyeksi serta medeskripsikan kemampuan literasi numerasi siswa kelas X MAN, menggunakan konteks ruang kelas melalui teknologi *Augmented Reality*. Metode penelitian yang digunakan yaitu *design research* (DR) tipe *validation studies*. Pada penelitian ini terbagi menjadi tiga tahap yaitu *preparing for the experiment, design experiment* dan *retrospective analysis*. Teknik pengumpulan data yang digunakan yaitu observasi, wawancara, tes, dan dokumentasi. Teknik analisis data yang digunakan reduksi, display, penarikan kesimpulan. Desain pembelajaran dibuat dengan tiga aktivitas yang dapat menarik minat siswa dan memberikan pengalaman baru dalam melaksanakan pembelajaran matematika. Setelah desain pembelajaran tersebut melalui serangkaian tahapan penelitian menghasilkan HLT, yang kemudian diimplementasikan dan dilakukan analisis sehingga layak dijadikan LIT serta hasil analisis tersebut juga memperoleh kemampuan literasi numerasi siswa yang dilihat dari 3 indikator, masih mengalami kesulitan pada indikator 1 yaitu menggunakan berbagai macam angka dan simbol yang terkait dengan matematika dasar untuk memecahkan masalah praktis dalam berbagai macam konteks kehidupan sehari-hari.

Keywords: Learning Design, Three Dimensions, Numeracy and Projection Literacy

INTRODUCTION

Mathematics is a universal science that underlies modern scientific and technological disciplines. Where it is explained that mathematics is the mother of science (Tarigan, 2021). So that mathematics is a compulsory subject at every level (Kusumawati & Irwanto, 2016). An educational institution certainly needs a curriculum to achieve educational goals. The educational curriculum is dynamic, curriculum development in Indonesia is compiled and designed based on the Indonesia National Qualifications Framework (KKNI). Currently, Indonesia is developing the curriculum from a revised K-13 to an Independent curriculum. Where the concept of Education in the Independent curriculum is to integrate literacy skills, knowledge capabilities, skills and attitudes as well as mastery of current technology (Manalu et al., 2022). Implementing the K-13 curriculum, thus requiring students to be more active. To become active students, students are required to master three skills including competence, literacy and character quality. There are six basic literacy agreed upon in World Economic Forum In 2015 in (Ate & Lede, 2022) namely numeracy literacy, science literacy, literacy, financial literacy, digital literacy and cultural literacy and national identity.

Numerical literacy is the ability in the form of knowledge and proficiency in using numbers and symbols related to basic mathematics, analyzing information in various forms (graphs, charts, tables and others) which is then analyzed to produce conclusions and decisions (Kemendikbudristek, 2021). Numerical literacy skills are also synonymous with the mathematical process into daily life problems (Rohim, 2021). To find out the numeracy literacy ability of students in this study, it is seen through 3 indicators, namely; 1) Able to use a wide variety of numbers and symbols related to basic mathematics to solve practical problems in a variety of daily life contexts, 2) Able to analyze information displayed in various forms (graphs, tables, charts), and 3) Able to interpret the results of the analysis that has been carried out to predict and draw conclusions. The numeracy literacy ability of Indonesia students in general can be seen from the results *Programme for international student assessment (PISA) and Trends International Mathematics and Science (TIMSS)*.

PISA is held every three years to determine the literacy of 15-year-old students in mathematics, science and reading, while TIMSS is held every four years to determine student achievement in mathematics and science (Johar, 2012). The results of PISA Indonesia from period to period are at a low level, in 2022 the results of PISA Indonesia with a score of mathematics 366, score Reading 359 and the score Science 383 where the score does not meet the PISA international average (OECD, 2023). Meanwhile, the

acquisition of score TIMSS Indonesia from period to period is at a low level. In 2015 Indonesia obtained score TIMSS 397. The materials in PISA and TIMSS are numerology, algebra, geometry, data and probability (Prastyo, 2020).

Informally geometry has been known from an early age through the visual objects around us, but the reality in the field states that most students lack mastery of geometry materials (Nurani et al., 2016). Geometry requires visual and spatial skills, so a context is needed in learning media to facilitate the delivery of the material (Estapa & Nadolny, 2015). Researchers using media augmented reality, Augmented Reality (AR) is an exciting technology that combines 2D and 3D virtual objects into the real world (Rusnandi et al., 2016; Salinas et al., 2013). The researcher uses the context of the classroom, this is because the classroom is a real 3D example and is closest to students, and can be used in explaining three-dimensional geometry materials (Nugroho & Pramono, 2017).

Geometry is a branch of mathematics that studies three dimensions including points, lines, planes, and spaces, as well as their properties, sizes, and relationships with each other (Nur'aini et al., 2017). According to Iswadji in (Nurani et al., 2016), Build a space or third dimension discussing abstract objects. In line with (Hidayatullah et al., 2022) where the discipline that focuses on presenting abstractions from visual and spatial experiences is called geometry. In the material of grade XII of high school, there is a sub-subject of projection. Projection be One of the geometric materials related to points, lines and planes which, if connected, will produce perpendicularity (Friday, 2017). In this study, point projections (point to line, and point to plane), line projection (line to line, and line to plane) and field projection (plane to plane) will be studied. It can be seen in the following **Figure 1**.

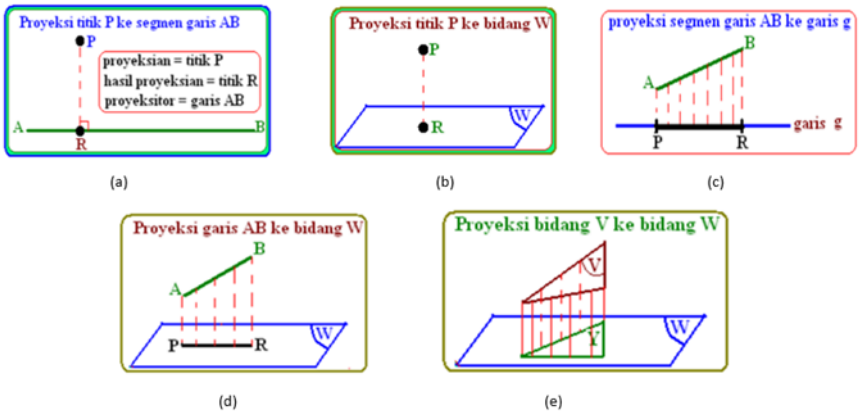

Figure 1. Projection in three dimensions

Based on **Figure 1** of the projection in three dimensions, it can be concluded that the projection is a reflection of all elements in object 1 to object 2 on the condition of forming a right angle, and is the shortest distance. In the projection material, not only do you know the meaning, but also calculate the distance of the projection results. To determine the distance of the projected result, the Pythagorean theorem (), the cosine rule $\left(c=\sqrt{a^2+b^2a^2}=b^2+c^2-2bc\cdot\cos A,b^2=a^2+c^2-2ac\cdot\cos B,c^2=a^2+b^2-2ab\cdot\cos C\right)$ or the triangular area comparison as shown in the following **Figure 2** can be used.

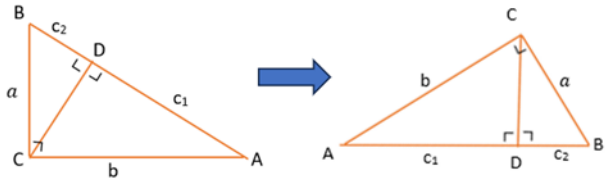

Figure 2. Comparison of the area of a triangle

Finding the projection distance of point C to line AB with the ratio of the area of the triangle in **Figure 2**:

$$Triangle\,L1 = Triangle\,L2$$
$$\frac{base1\times height1}{2}=\frac{base2\times height2}{2}$$
$$\frac{b\times a}{2}=\frac{BA\times CD}{2}$$
$$\frac{b\times a}{2}=\frac{(c1+c2)\times CD}{2}$$
$$\frac{2(b\times a)}{2(c1+c2)}=CD$$

However, before studying the projection material, students must master the prerequisite material. If students have not mastered the prerequisite material, then the three-dimensional geometry material will be difficult to master. In line with (Fitriani et al., 2020), the results of his research stated that there was a leap in student learning in geometry material, this gave rise to the assumption that geometry material was difficult to master. To minimize the occurrence of student learning leaps, it is necessary to design or design learning.

Learning design is a process to create a learning system in order to develop students' intellect and competence (Setyosari, 2020). Line with (Gafur, 2019;

Putrawangsa, 2018) design learning it is the practice of preparing content or material using learning theory and learning theory so that the learning process takes place selectively. So that learning design is the preparation of materials and the development of learning activities in order to improve the quality of learning. The learning design made is in the form of HLT, which is then implemented to produce ALT, and produce a LIT.

Hypothetical learning trajectory (HLT) is a hypothesis or prediction related to students' understanding and thinking in learning activities (Prahmana, 2018, Gravameijer in Prahmana, (2018) stated that there are three main components in making HLT, namely learning objectives, learning activities, and conjecture of the learning process in the classroom. Actual learning trajectory (ALT) is an activity student learning that occurs in the field and takes place in accordance with the HLT that has been designed (Widyawati et al., 2016 (Zabeta et al., 2015). Local instructional theory (LIT) is the final product of HLT that has been designed, tested in the classroom and analyzed for learning results (Prahmana, 2018; Fauzan et al., 2020). In this study, HLT is supported by numeracy literacy-based lesson plans and LKPD with the Indonesia realistic mathematics (PMRI) approach. According to Streefland and Gravemeijer in (Hadi, 2017) The Indonesia Realistic Mathematics Approach (PMRI) is a promising approach in mathematics learning, so that it can be applied in projection materials.

Based on the previous presentation, the researcher used a classroom context visualized through augmented reality technology and activities in HLT that used numeracy literacy questions, this is the latest in this study. So the researcher is interested in describing "Numeracy literacy ability in the learning design of three-dimensional topic of projection materials using augmented reality", through the context of the classroom.

RESEARCH METHODS

This study uses a qualitative approach with the Design Research (DR). Design Research considered as a research paradigm that aims to design activities, develop and evaluate educational interventions as solutions to complex problems in educational practice (Yusri & Arifin, 2018). Deep (Prahmana, 2018) Gravemeijer & Van Eerde explain that Design Research is one of the research methods that aims to develop Local Instruction Theory (LIT) with cooperation between teachers and researchers as an effort to improve the quality of learning. So in this study, a learning design with numeracy literacy was made, which made the researcher describe the students' numeracy literacy ability after the implementation of the design.

This research was carried out at SMA in Palembang (pilot experiment stage) and MAN in Palembang (teaching experiment stage), in July-December 2023. The research procedure is divided into 3 stages, namely: 1) preparing for the experiment, 2) design experiment (pilot experiment and teaching experiment), and 3) restropektive analysis. Where this research procedure forms a cyclic process, as shown in **Figure 3**.

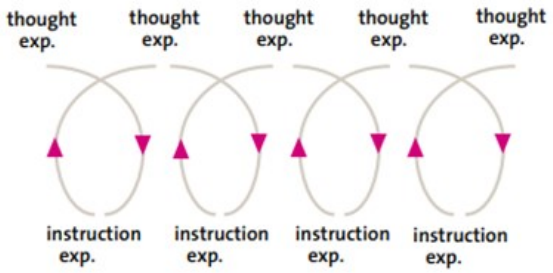

Figure 3. The cyclic process of design research

At the preparing for the experiment stage, the researcher reviewed the high school curriculum of projection material, made numeracy literacy questions then made HLT and presented the HLT in the form of LKPD, then conducted an expert review with material experts whose discussion results in the form of suggestions were used as HLT revision material before proceeding to the design experiment stage. At the design experiment stage, HLT trials were carried out through LKPD. In the design stage of the experiment-pilot experiment was tested on 5 grade XII students, the results were used as material for HLT improvement before the teaching experiment stage. In the teaching experiment stage, it was tested on 30 students in class X, the results of which were restorative analysis was carried out by comparing learning in the classroom with the design of the activities that had been designed. The data collection techniques used are observation, interviews, tests and documentation. The data analysis technique used is the Miles and Huberman model consists of data reduction, Data Display , drawing conclusions (Sugiyono, 2016.)

RESULTS AND DISCUSSION

Preparing for the experiment

At this stage, the researcher conducted literature study and expert review with material experts. So that HLT is obtained projection material with a classroom context through numeracy literacy-based questions. The conjectures of students' thinking that

have been made by the researcher such as and the implementation of numeracy literacy in **Table 1**.

Table 1. Student thinking conjecture & implementation of numeracy literacy

It	Numeracy Literacy Indicators	Question	Students' Thinking Conjectures
		Activity 1	
7	Indicator 3 à Students are able to predict and draw relevant conclusions after going through several completion steps	Students observe classroom augmented reality objects, Students observe activities 2 – 6, then students conclude the concept of projection in three dimensions.	Wrong: A mirror projection that divides exactly into two equal parts (is the centerline) True: The projection is a reflection so that an angle of 900 is formed. Projection is the length of a line segment that is perpendicular between two objects (points and points, lines and planes).
1.2	Indicator 2 à Students are able to analyze and translate the information displayed in the question/displayed in *augmented reality* to solve problems	Students observe augmented reality objects in the classroom, After that students associate 2 objects in the classroom to form a projection and describe it in the construction of a block space, the object in AR is described as a titk in three beam dimensions. Then students deduce the types of projections in the third dimension.	Wrong: It is not complete in providing examples and types of projections. True: Complete in providing examples and types of projections, namely point to line, point to plane, line to line, line to plane and plane to plane.
		Activity 2	
1	Indicator 1(b) à Students are able to relate various ways/steps in solving classroom context problems on the topic of geometry.	Students pay attention to classroom augmented reality in activity 1 (students stand in one corner and walk towards the diagonal line of the floor), after which students describe in the form of a flat figure. Then students describe and calculate the distance of the point-to-line projection (point-to-line distance) in the form of the length of the lines of the points formed, using the Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts.	Wrong: The projected distance formed from point to line is 1/2 diagonal. True: It can solve by utilizing the Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts. $AB^2 = 9^2 + 9^2$ $AB = \sqrt{81 + 81}$ $AB = 9\sqrt{2}$
2	Indicator 1(a) à Students are able to use basic mathematical skills in the form of numbers and symbols in solving problems, as well as using other definitions and rules related to geometry in mathematics in a formal manner.	Students pay attention to the classroom augmented reality in activity 1 (students stand next to their desks and walk towards the front plane/blackboard), after which students describe in the form of flat figures. Then students describe and calculate the distance of the point-to-plane projection (point-to-plane distance) in the form of the length of the lines of the points formed, using the Pythagorean theorem, the Triangle Area Comparison, and the concept of trigonometry.	Wrong: Wrong in determining the angle of the right angle. Can't translate into D2. True: It can be solved by making use of the Pythagorean theorem, the ratio of the area of triangles and the concept of triogonometry. Side x (2/3) $9\,x\,\frac{2}{3} = 6m$

It	Numeracy Literacy Indicators	Question	Students' Thinking Conjectures
3	Indicator 3 à Students are able to predict and draw relevant conclusions after going through several steps of completion.	Students pay attention to classroom augmented reality in activity 1 (students stand right above the diagonal line of the floor plane and face one of the lines/sides, then walk towards that line), after which students describe it in the form of a flat figure. Then students describe and calculate the length of the line as a result of the line-to-line projection in the form of the length of the new line formed, using the Pythagorean theorem, the Triangle Area Comparison, and the concept of trigonometry.	Wrong: Can't translate into D2 Calculating the distance of one of the students True: It can be solved by utilizing classroom size information, Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts. The projection of the side diagonal to the line in front of it is Side length=9m
4	Indicator 3 à Students are able to predict and draw relevant conclusions after going through several steps of completion.	Students pay attention to classroom augmented reality in activity 1 (students stand right above the diagonal line of the floor plane and face one of the walls, then walk towards the wall), after which students describe it in the form of a flat building. Then students describe and calculate the length of the line projected into the plane in the form of a new line length formed, using the Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts.	Wrong: Can't translate into D2 Calculating the distance of one of the students True: It can be solved by utilizing classroom size information, Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts. The projection of the side diagonal to the plane in front of it is Side length = 9m
5.	Indicator 1(a) à Students are able to use basic mathematical skills in the form of numbers and symbols in solving problems, as well as using other definitions and rules related to geometry in mathematics in a formal manner.	Students pay attention to classroom augmented reality in activity 1 (students pay attention to triangular objects located on the floor and the wall to the right of the direction of the door) Then students describe and calculate the length of the line resulting from the projection of the plane to the plane in the form of a new plane that is formed, using the Pythagorean theorem, the Comparison of Triangle Areas, and the concept of trigonometry.	Wrong: Can't translate into D2 Wrong in defining the same field Calculating the distance of one of the students True: It can be solved by utilizing classroom size information, Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts. Triangle side x Classroom side $\frac{1}{3} x\, 9 = 3m$
		Activity 3	
1	Indicator 3 à Students are able to predict and draw relevant conclusions after going through several steps of completion.	The classroom is one of the infrastructure in the school, in the classroom there are various facilities such as spikers, fans and flowers. The classroom has a square base size with a side of 9m, and a height (1/3) from the side of the base. If the end of the wall is drawn a line, then the objects are located right on the diagonal of the wall.	Wrong: Students are wrong in analyzing and translating the information contained in the questions. True: Able to analyze the information on the problem and solve it by utilizing the Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts.

It	Numeracy Literacy Indicators	Question	Students' Thinking Conjectures
1	Indicator 3 à Students are able to predict and draw relevant conclusions after going through several steps of completion. Indicator 1(b) à Students are able to relate various ways/steps in solving classroom context problems on the topic of geometry.	1). Which is the projection of one of the angles against the diagonal of the plane? Give your reason! 2). Calculate the distance of the projection result (distance from point to line)!	1). Which is one of the projections, namely the angle is projected to the diagonal of the plane, where the fan is the result of the projection. Because it forms a right angle. 2). Looking for bevel sides: $CB = 9^2 + 3^2$ $= \sqrt{81+9}$ $= \sqrt{90}$ $= 3\sqrt{10}$ Finding the projected distance using a triangle area comparison: L1 = L2 $\frac{1}{2} x\ a\ x\ t = \frac{1}{2} x\ a\ x\ t$ $\frac{1}{2} x9x3 = \frac{1}{2} x3\sqrt{10} x\ t$ $13{,}5 = \frac{1}{2} x3\sqrt{10}\ x\ t$ $13{,}5x2 = 3\sqrt{10}\ x\ t$ $27 = 3\sqrt{10} x\ t$ $\frac{27}{3\sqrt{10}} = t$ $\frac{9\sqrt{10}}{10} = t$ $13{,}5 = 1{,}5\sqrt{10}\ x\ t$ $\frac{13{,}5}{1{,}5\sqrt{10}} = t$ $\frac{13{,}5\sqrt{10}}{15} = t$ $\frac{27\sqrt{10}}{30} = t$ $\frac{9\sqrt{10}}{10} = t$ $13{,}5 = \frac{\sqrt{9x10}}{2}\ x\ t$ $13{,}5x2 = \sqrt{90}\ x\ t$ $\frac{27}{\sqrt{90}} = t$ $\frac{27}{3\sqrt{10}} = t$ $\frac{27\sqrt{10}}{3x10} = t$ $\frac{9\sqrt{10}}{10} = t$

It	Numeracy Literacy Indicators	Question	Students' Thinking Conjectures
2	Indicator 2 à Students are able to analyze and translate the information displayed in the question/displayed in *augmented reality* to solve problems	Take a look at the following classroom size chart! **Ukuran kelas** p: 20 m, 9 m, 8 cm, 9 m, 25 cm l: 15 m, 9 m, 8 cm, 9 m, 15 cm t: 15 m, 3 m, 4 cm, 9 m, 15 cm In the classroom there are various facilities, one of which is lighting/ lighting. To maximize the spread of light, a lamp is installed at the diagonal intersection of the plane (roof) which is square in shape, and its height (1/3) from the roof side. Based on the table above, find a logical classroom size. Then if the lamp is projected onto the floor, then calculate the distance formed?	Wrong: Students are wrong in analyzing and translating the information contained in the questions. True: Able to analyze the information on the questions and solve them by utilizing the projection concept that has been obtained in activity one. The distance of the lamp projection to the floor is the height of the classroom. $\frac{1}{3}x9 = 3m$
3	Indicator 1 à Students are able to use basic mathematical skills in the form of numbers and symbols in solving problems, as well as using other definitions and rules related to geometry in mathematics in a formal manner.	The classroom is in the shape of a block with p=l (square base). The Q point is located on the extension of one side of the base, so that it becomes 2x the initial length, the initial side=9m. If the point Q is projected relative to the diagonal plane, then draw and determine the distance of the projection (point-to-plane distance)!	Wrong: Students are wrong in analyzing and translating the information contained in the questions. True: Able to analyze the information on the problem and solve it by utilizing the Pythagorean theorem, Triangle Area Comparison, and trigonometric concepts. The projected distance of the Q point to the diagonal plane is the diagonal of the plane, because the Q point is perpendicular to the diagonal plane. $QD = 9^2 + 9^2$ $QD = \sqrt{81 + 81}$ $QD = 9\sqrt{2}m$
4	Indicator 3 à Students are able to predict and draw relevant conclusions after going through several steps of completion.	The classroom is in the shape of a block with p=l (square base). There is a closet located in the middle of the side. Where the cabinet has sizes P, L, T consecutively, namely 1m, 4.5cm, 1.7m. Draw the result of the projection of the cabinet against the wall in front of it and write down the size!	Wrong: Students are wrong in analyzing and translating the information contained in the questions. True: Able to analyze the information on the questions and solve them by utilizing the projection concept that has been obtained in activity one. The projection of the cabinet to the wall in front of it forms a rectangular building with a size of 1m x 1.7m.

The student's thinking conjecture is visualized using *augmented reality,* which begins by creating a 3D model using *Software* Blender (Irfansyah & Anifah, 2022). Then use *Software* unity to produce an Apk. *augmented reality.* Student thinking conjectures are made as a guideline for teachers to anticipate the flow of student thought that arises during the learning process. The student's conjecture of thinking can be concisely illustrated into HLT as shown in **Figure 4**.

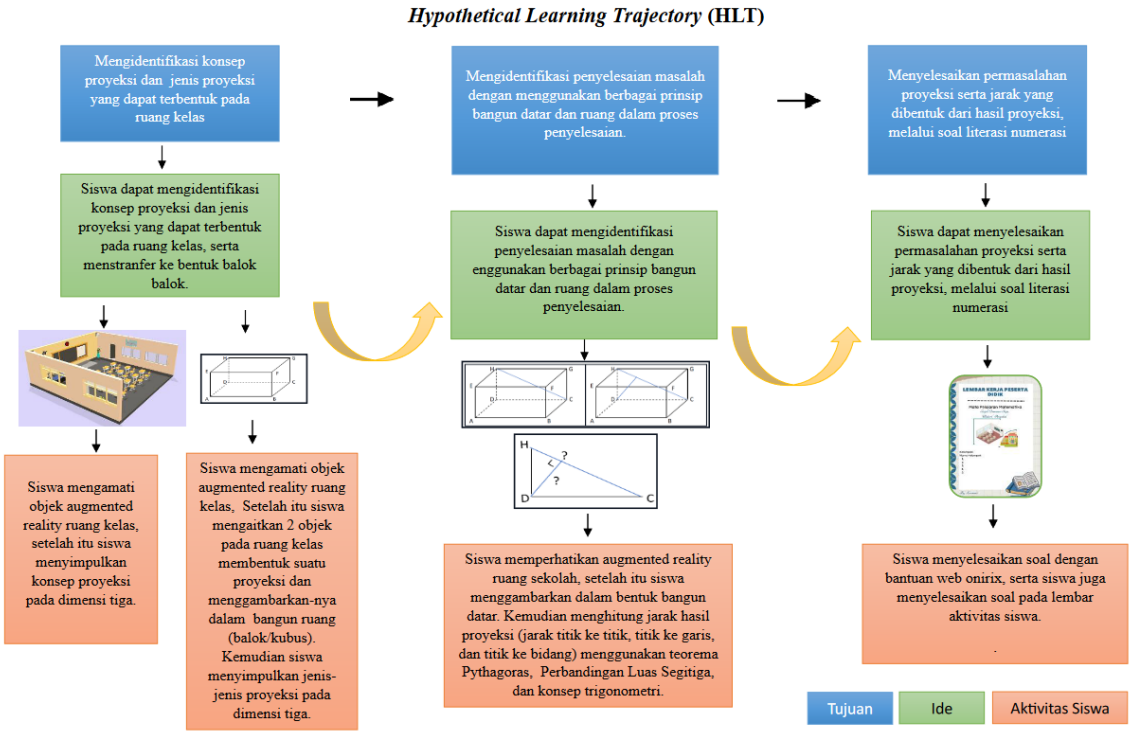

Figure 4. HLT after *expert review*

Design experiment – pilot experiment

At this stage, 5 students were given a preliminary ability test containing prerequisite material (pythagoras and triangular area comparison) and projection material. The results showed that they had just understood the pythagorean material, so before carrying out *the pilot experiment test*, the researcher explained the prerequisite material that the students did not understand. The results of the implementation of HLT at the *pilot stage* are shown in **Figure 5**.

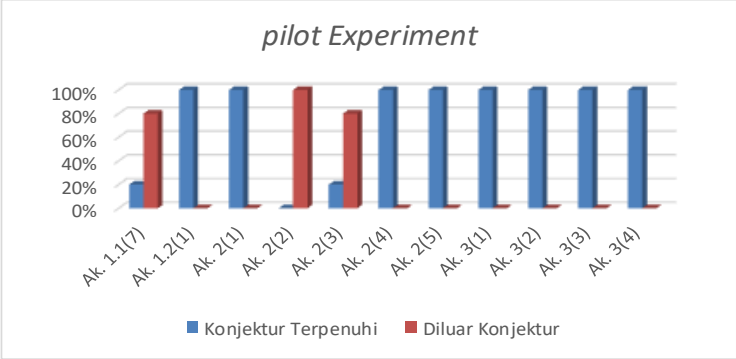

Figure 5. Results of *the pilot experiment*

The researcher conducted interviews and asked for the opinions of several students regarding LKPD and augmented reality media. Here are the results of the interview

Transcript 1 Interviews for the opinions of several students

Teacher	:	*How about you, dizziness?*
Student	:	*(smile) Yes, it's dizzy, ma'am.*
Teacher	:	*What makes you dizzy?*
Student 1	:	*Question, maybe because we are not used to questions like this. We usually ask you directly, because it's short.*
Student 2	:	*Then this is you, in activity 2 you, we are dizzy because there is no size*
Teacher	:	*Okay, what about the media? Does it help?*
Student		*Help, we have just learned to use media that can be as if there is (real) on paper.*
Teacher		*Interesting?*
Student		*Interesting*

Restropektive Analysis pilot

Based on the activities carried out in the pilot experiment. The researcher evaluated the LKPD that had been made and tested. The results of the pilot phase test showed that some students made mistakes related to the projection concept, the researcher revised the redaction of the words in the questions in the LKPD.

Design experiment – teaching experiment

At this stage, just like the pilot stage, an initial ability test was carried out on 30 students. Where the TKA results, students only understand the Pythagorean theorem. So that before carrying out the pilot experiment test, the researcher explained the prerequisite material that students did not understand. The results of the pilot stage numeracy literacy in **Figure 6**.

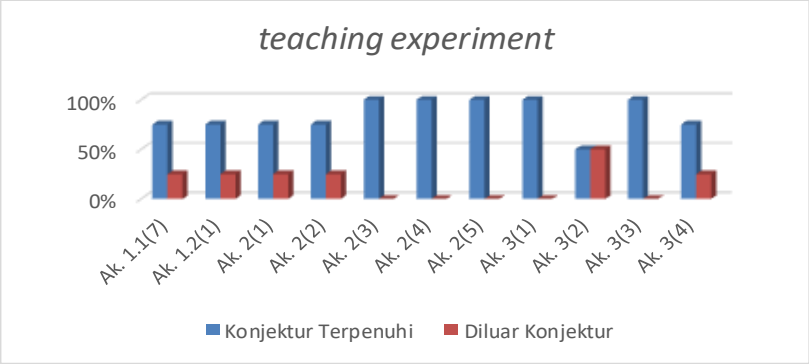

Figure 6. Teaching experiment results

Restropektive analysis teaching

Based on the restropektive analysis of the pilot and teaching stages, it is known that there is progress in the teaching stage of students who are able to understand and carry out activities well. So this indicates that the HLT that has been designed has succeeded in running well even though there are conjectures that are not in accordance with the researcher/student answers outside the conjecture.

Based on the results of the implementation of HLT which has been designed and carried out research procedures starting from preparing for the experiment, design experiment and restrospektive analysis, it can be concluded that HLT has run well so that it is worthy of being made as a Local Intraction Theory (LIT) as follows.

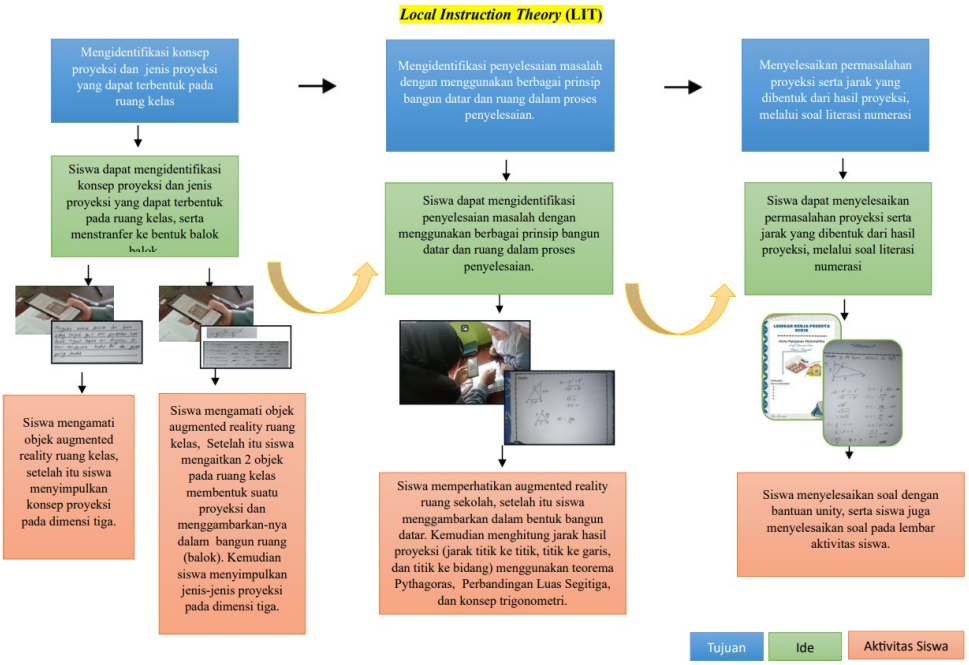

Figure 7. LIT after *expert review*

Numeracy literacy ability

Students' numeracy literacy ability can be seen from the way students answer correctly or inappropriately. If the student answers correctly, it means that the numeracy literacy indicators in the question are met, and vice versa. In this study, students' numeracy literacy ability will be seen through activity 3. After the analysis, the following results were obtained.

Table 2. Analysis of numeracy literacy results

Name	3 *pilot activities*				
	1		2	3	4
	1(1)	1(2)			
	K3	K1(b)	K2	K1(a)	K3
NRS	0	1	1	1	1
PAH	0	0	1	1	1
MMA	0	0	1	1	1
AP	0	0	1	1	1
DPA	0	0	1	1	1
Fulfilled	**0**	**1**	5	5	5

Name	Activity 3 *teaching*				
	1		2	3	4
	1(1)	1(2)			
	K3	K1(b)	K2	K1(a)	K3
BA	1	1	1	1	1
AH	1	0	1	1	0
SH	0	0	1	1	1
TA	1	0	0	0	0
Fulfilled	3	**1**	5	3	2

From **Table 2**, it is found that at the pilot stage students have difficulties in indicators 3 and 1. However, at the teaching stage, students experience difficulties in indicator 1. So that the researcher will explain the answers of students to activity 3 no 1 (2) at the pilot and teaching stages.

Pilot stage

Activity 3 Question no 1

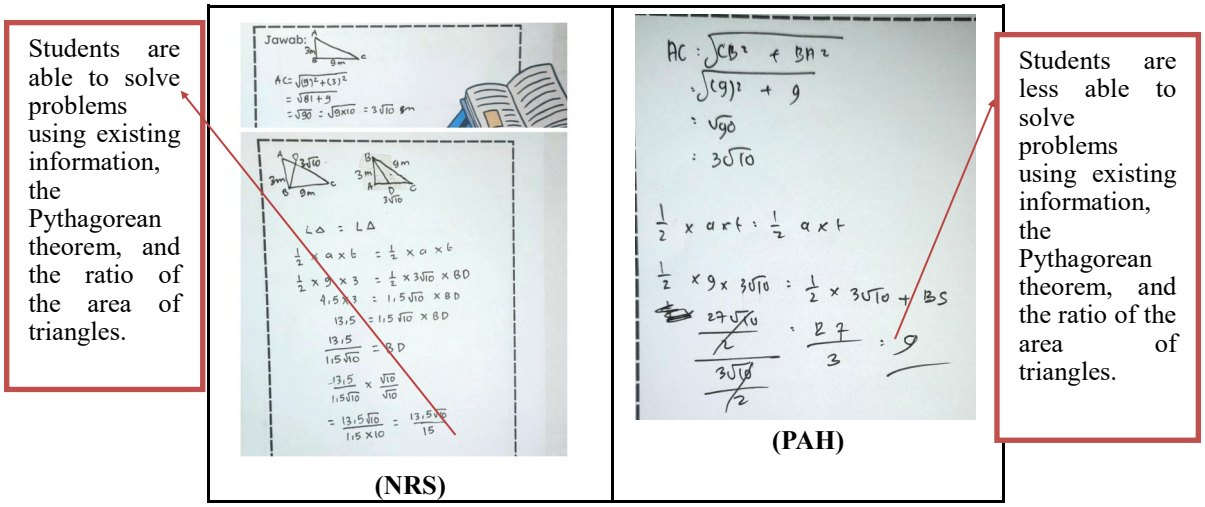

Figure 8a. Student answer activity 3 no 1 *pilot stage*

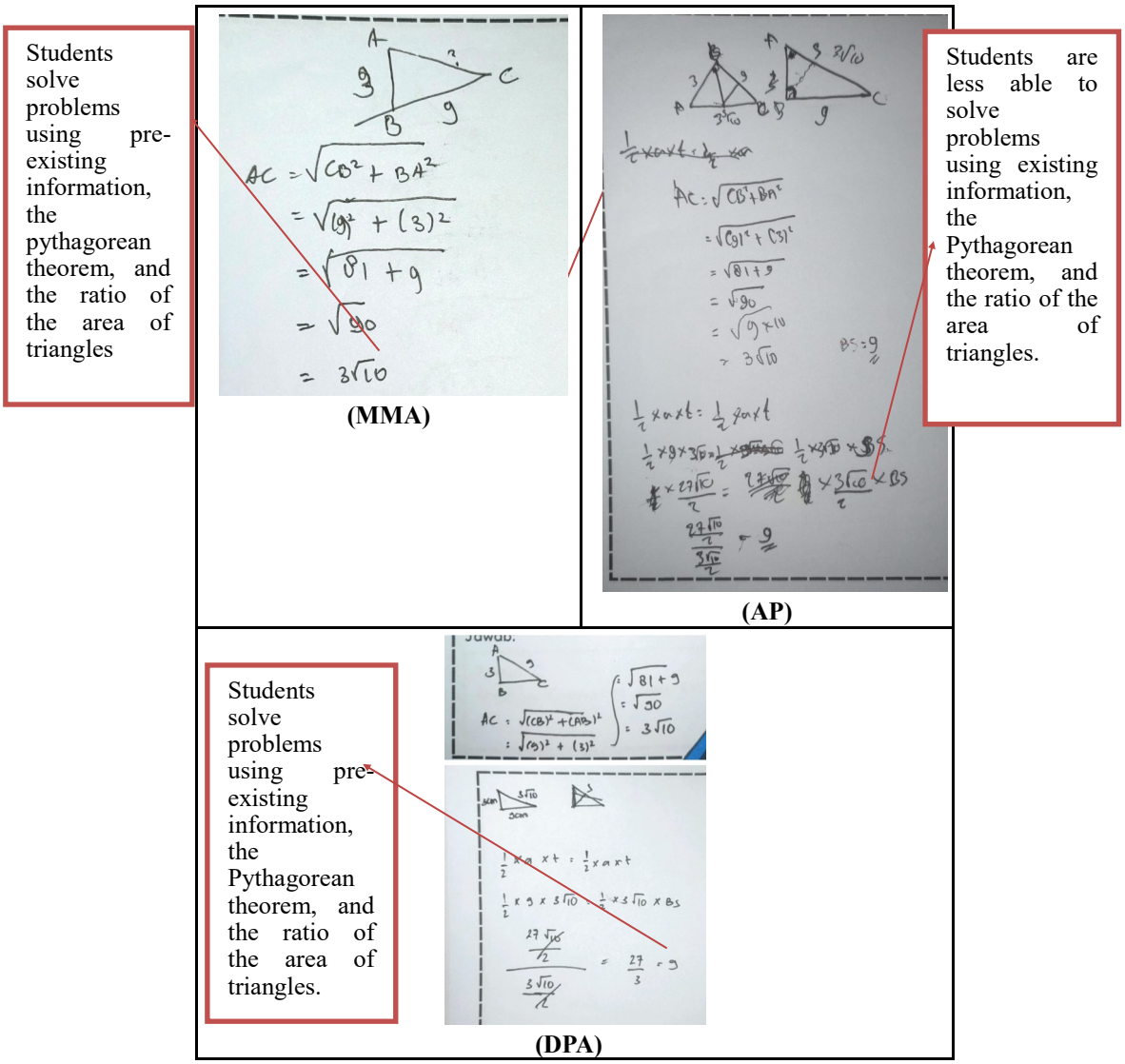

Figure 8b. Student answer activity 3 no 1 *pilot stage*

NRS students' answers met indicator 1. Students answered correctly, but students did not answer question number 1 so they did not meet indicator 3. PAH students' answers did not meet indicators 3 and 1. Students answered question 1(2) incorrectly and students did not answer question number 1(1) so they did not meet indicator 1 or indicator 3. MMA students' answers did not meet indicators 3 and 1. Students answered question 1(2) incorrectly and students did not answer question number 1(1) so they did not meet indicator 1 or indicator 3. AP students' answers do not meet indicators 3 and 1. Students answered question 1(2) incorrectly and students did not answer question number 1(1) so they did not meet indicator 1 or indicator 3. The DPA students' answers did not meet indicators 3 and 1. Students answered question 1(2) incorrectly and students did not answer question number 1(1) so they did not meet indicator 1 or indicator 3.

Teaching stage

Activity 3 Question no 1

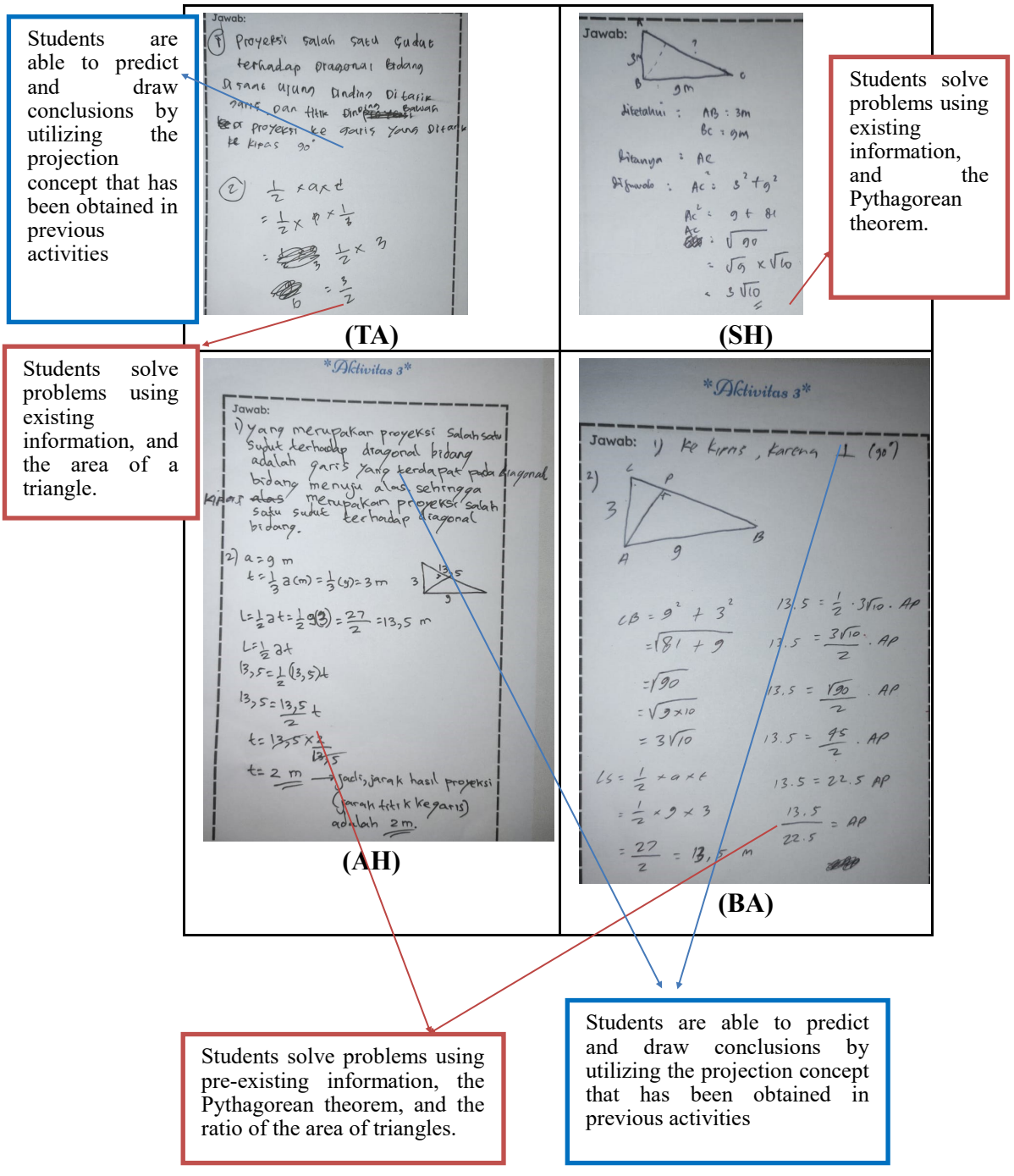

Figure 9. Student answers for activity 3 no 1 teaching stage

The answers of the BA group met indicators 1 and 3, students answered question no 1 (1) correctly, but there was a mistake in question no 1 (2) indicator 1 when changing the

root. The answer of the AH group met indicator 3, answering question no 1 (1) correctly. However, there was an error in the answer to question no. 1 (2) that was not precise/ forgot one step to find a base using the Pythagorean theorem, so that the answer was inaccurate and indicator 1 was not met. The answers of the SH group did not meet indicators 1 and 3. Students do not answer question no. 1(1), but answer question no. 1(2) incompletely because they do not continue to solve the second problem using a triangular area ratio, so they cannot answer the problem in the question. The answers of the TA group met indicator 3, answering question no 1 (1) correctly. However, in question no. 1 (2) indicator 1 is not correct, because the AH group does not continue to solve the problem using a triangular area ratio, so it cannot answer the problem in the question.

By Pilot Experiment and teaching experiment, Based on these 2 stages, they have similarities, namely students are constrained by question number 1 indicator 1. This is the same as the previous study, where indicator 1 is the most students cannot complete (Ate & Lede, 2022.

CONCLUSION

Based on the research process that has been carried out in the implementation of HLT at the pilot experiment and teaching experiment stages, there is progress and interviews with students, it can be concluded that HLT has been running well so that it is worthy of being used as a LIT. In this study, the analysis of Shiva numeracy literacy ability was also carried out at the pilot experiment and teaching experiment stages through activity 3. After the literature study, 3 numeracy literacy indicators were used, namely being able to analyze information, being able to use numbers and symbols to solve problems, and being able to interpret the results of the analysis. After the analysis of activity 3, it was found that of the 4 questions given, students had the most difficulties in answering question no 1 (2). So it can be concluded that students still have difficulties in indicator 1, namely using various kinds of numbers and symbols related to basic mathematics to solve practical problems in various contexts of daily life.

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