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THE EFFECT OF *TEACHING AT THE RIGHT LEVEL* (TARL) APPROACH ON STUDENTS' NUMERACY ABILITY

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Abstrak

Kemampuan numerasi peserta didik di Indonesia masih tergolong rendah. Kondisi ini mendorong perlunya penerapan pendekatan pembelajaran yang lebih adaptif, seperti pendekatan *Teaching at the Right Level* (TaRL). Oleh karena itu, penelitian ini bertujuan mengkaji pengaruh penerapan pendekatan *Teaching at The Right Level* (TaRL) terhadap peningkatan kemampuan numerasi peserta didik kelas X di SMAN 65 Jakarta. Metode yang digunakan adalah penelitian kuantitatif dengan desain *true-experimental* desain *pretest-posttest control group*. Data dianalisis dari *pretest-posttest* menggunakan uji statistik dan regresi sederhana. Setelah dianalisis, hasil penelitian menunjukkan bahwa pendekatan TaRL secara signifikan meningkatkan kemampuan numerasi peserta didik, ditunjukkan oleh skor posttest kelompok eksperimen lebih tinggi dari kelompok kontrol.
Kata Kunci: Kemampuan Numerasi, *Teaching at the Right Level* (TaRL), *Pretest-Posttest.*

The numeracy ability of students in Indonesia is still relatively low. This condition encourages the need to apply a more adaptive learning approach, such as the Teaching at the Right Level (TaRL) approach. Therefore, this study aims to examine the effect of the application of the TaRL approach on improving the numeracy ability of class X students at SMAN 65 Jakarta. The method used is a quantitative research with a true-experimental approach to pretest-posttest control group design. Data were analyzed from pre-posttests using simple statistical and regression tests. After analysis, the results showed that the TaRL approach significantly improved the numeracy ability of the students, as shown by the posttest scores of the experimental group being higher than the control group.
Keywords: *Numeracy Ability, Teaching at the Right Level (TaRL), Pretest-Posttest*

INTRODUCTION

Numeracy is one of the important aspects of mathematics learning that must be understood, managed, and utilized by students in their daily lives. According to Setianingsih et al, (2022); Tresnasih et al, (2022); and Winata et al, (2021), numeracy ability emphasize understanding of numbers, mathematical symbols, and the ability to solve data-driven problems and interpret visual information such as graphs and tables. However, PISA research data in 2022 shows that the numeracy ability of students in Indonesia still needs special attention, because many students are unable to optimally apply this basic concept in practical and academic contexts (OECD, 2023). Indicators of numeracy ability from research Setianingsih et al, (2022) and Winata et al, (2021), are also in the book Kemendikbud, (2017) as follows.

Table 1. Numeracy Ability Indicator

No.	Indicator
1.	The ability to utilize different numbers and symbols associated with fundamental mathematics to address issues encountered in everyday situations
2.	The capability to examine data shown in multiple formats (such as graphs, tables, charts, and diagrams).
3.	The proficiency to understand the outcomes of this analysis for making forecasts and informed choices.

Based on numeracy indicators, learners must understand and analyze visual information such as graphs, tables, and diagrams. They are also expected to use this information to make predictions, master the use of symbols and numbers in solving various problems, and interpret the results of the analysis to create information. Unfortunately, the achievement of these numeracy indicators has not been fully realized in practice in the field.

Based on the results of observations made sixteen times in one month in October 2024, for all classes X at SMAN 65 Jakarta, it was found that students' numeracy ability varied so that there were significant obstacle in the learning process In this case, there are still many students who have difficulty understanding visual data such as graphs and tables, and are not able to use symbols and numbers correctly. This is caused by conventional approaches that are not adjusted to the level of ability of students often cause learning to be less effective and make it difficult for students to understand the material, especially in solving problems based on the context of daily life (Sakniyawati et al., 2024). Therefore, an approach is needed that can overcome this problem by adjusting the learning process according to the level of ability of students. For example, the Teaching at The Right Level (TaRL) approach is one of the approaches that adapts learning to students' abilities to ensure they learn effectively, provide flexibility for educators, and improve the quality of learning. According to Baharuddin et al, (2021), an active learner-oriented learning approach, such as TaRL, can help learners to better understand concepts by tailoring the material based on each learner's ability level. To better understand the factors that affect the improvement of students' numeracy ability, it is necessary to look at the internal and external aspects that surround the learning process.

The improvement of students' numeracy ability is influenced by various factors, both from within the students and from the learning environment. Internal factors include initial ability, learning motivation, and individual learning strategies, while domain factors include the learning approach applied, the role of the teacher, the availability of teaching materials, and the conditions of the learning environment. In this context, the TaRL approach has a positive influence on improving numeracy ability because it can accommodate both factors simultaneously. By adjusting the learning process based on the ability level of students, this approach becomes a relevant strategy to overcome the numeracy gap and encourage the achievement of competencies evenly.

The success of the TaRL approach is also supported by a number of studies that show a significant improvement in numeracy ability through the application of the TaRL approach. The TaRL approach emerged as one of the approaches that focuses on grouping learners based on their ability level and providing material that is appropriate to their level of understanding. This approach has been proven to be influential in improving mathematical numeracy ability, as reported by Sakniyawati et al, (2024), which shows a significant increase in the posttest scores of students using the TaRL method. The theoretical framework of this approach is based on the principle that learning success will be greater if the material and activities are adapted to the cognitive development of the learner.

To apply this approach systematically, TaRL has learning stages that have been arranged in the form of a structured learning syntax. The syntax of the TaRL approach according to Ahyar et al, (2022) It includes the following steps:

1) Initial Assessment to identify the level of ability of the learner.
2) Grouping based on ability according to the results of the assessment.
3) Learning is different from a method that is tailored to the needs of the group.
4) Additional interventions for learners in the low group to catch up.
5) Regular monitoring and evaluation of student progress.
6) Enrichment for highly capable learners to further develop their potential.

By understanding the operational steps in implementing the TaRL approach, it is important to examine the extent to which this

approach has a real influence on students' numeracy ability. Given this context, the purpose of this study is to examine the effect of the application of the TaRL approach on improving the numeracy ability of class X students at SMAN 65 Jakarta. Through this study, it is hoped that an empirical picture can be obtained to the extent to which the learning material adjustment strategy based on the level of students' ability affects the achievement of numeracy competencies. With this approach, the learning process is expected to be more in line with the needs of students, thereby encouraging a significant and equitable increase in numeracy. Thus, this research contributes to enriching the study of adaptive and inclusive learning innovations according to the needs of students.

METHOD

This study uses a quantitative methodology with a true experimental design that aims to evaluate the impact of the TaRL method on the numeracy ability of students X at SMAN Jakarta. The design used is a pretest posttest control group that is included in the true experiment category because the researcher has the ability to control external variables that have the potential to affect the research findings, in order to identify cause-and-effect relationships that can be identified more accurately and reliably (Wada et al., 2024).

Using a pretest-posttest control group design, study participants were randomly assigned to two groups: the experimental group that received instruction using the TaRL approach and the control group that engaged in traditional learning. The purpose of this design was to assess the improvement in numeracy ability between the two groups after they had undergone the prescribed treatment (Abdullah et al., 2022).

The research population was 212 students in class X of SMAN 65 Jakarta who met certain criteria and were selected by random sampling, taking sample elements from the population at random without considering the strata or distribution of certain characteristics contained in the population. Thus, each member of the population has an equal chance of being selected as a research sample (Wada et al., 2024).

Table 2. Research Population

No.	Class	Number of Students
1.	X-1	36
2.	X-2	36
3.	X-3	35
4.	X-4	35
5.	X-5	36
6.	X-6	34
Number of all students in class X		212

The selection of subjects was carried out randomly to obtain two classes, namely classes X-4 and X-5 amounting to 31 students each, which were then used as a control group and an experimental group, so that the total research subjects were 62 students. The selection of subjects used random sampling between classes, with limitations based on the completeness of the data seen from the presence of students, to be the consistency of the research results. The instruments used consisted of pretest and posttest questions made based on numeracy indicators, with the Rubik's Cubes scoring mathematical numeracy ability as follows.

Table 3. Rubik's Cube: Mathematical Numeracy Ability Scoring

Sub-Item	Max Score	Numeracy Indicator	Level 3 (High Proficiency)	Level 2 (Moderate Proficiency)	Level 1 (Low Proficiency)
X1_1 (Question No.1 part 1)	15	1. The ability to utilize different numbers and symbols associated with fundamental mathematics to address issues encountered in everyday situations. 2. The capability to examine data shown in multiple formats (such as graphs, tables, charts, and diagrams). 3. The proficiency to understand the outcomes of this analysis for making forecasts and informed choices.	Demonstrates complete and accurate use of formulas, symbols, and procedures	Some correct steps, but with minor computational errors	Incorrect or incomplete formulas and steps
X1_2 (Question No. 1 part 2)	15		Uses correct and systematic procedures with accurate results	Uses formulas appropriately, but makes calculation errors	Fails to apply correct formulas or steps
X2_1 (Question No. 1 part 2)	15		Logical, correct, and consistent procedures and outcomes	Partially correct procedures, but inaccurate final result	Incoherent or incorrect procedures
X2_2 (Question No. 2 part 2)	20		Uses tables and data accurately, interprets correctly	Partial understanding; small errors in data use or calculation	Misunderstands or misuses data
X3_1 (Question No. 3 part 1)	20		Processes data systematically and accurately	Logical steps but minor calculation issues	Unable to process data meaningfully
X3_2 (Question No. 3 part 2)	15		Draws accurate, complete, and contextually relevant conclusions	Partially correct conclusions; lacks clarity or depth	No or irrelevant conclusions

This combined numeracy assessment rubric evaluates each question item (X1_1 to X3_2) based on three integrated ability indicators, namely: (1) the ability to apply mathematical symbols and concepts, (2) the ability to interpret data from visual representations, and (3) the ability to draw conclusions from the analysis results. All items are designed to reflect all three aspects simultaneously, and students' answers are graded using a three-level scale: Level 3 (high ability), Level 2 (medium ability), and Level 1 (low ability). This rubric allows for a comprehensive numeracy assessment, covering the student's thinking process and final outcomes.

The research location is SMAN 65 Jakarta, which was chosen based on considerations of strategic location and the readiness of the school in supporting the research process and the relationship that is relevant to the teaching and learning process in the region. This research lasted for seven months, starting from October 2024 to May 2025, with stages including initial observation, data collection, data analysis, and reporting of research results. The research procedure consists of several main stages.

Table 4. Research Procedure

	Class	Pretest	Treatment	Postetst
Subject	Experiment	Initial math ability test	Mathematics learning using the TaRL approach	Mathematical ability calculation test results
	Control	Initial math ability test	Mathematics learning using a conventional approach	Mathematical ability calculation test results

According to Table 4, it is evident that this study was conducted in an experimental group. The process includes the pretest, treatment, and postest stages.

The initial stage of this research begins with the preparation stage, which includes the preparation of research instruments in the form of pretest and posttest questions, which are used as an initial assessment tool to assess students' numeracy ability. In addition, observation sheets are also prepared to monitor the activeness and involvement of students throughout their educational journey. Before use, all instruments are first tested for the validity and reliability of the content to produce accurate data. The research population is all students of class X in the school where the research is located, with samples taken using random sampling techniques between classes, with limitations based on the completeness of the data seen from the presence of students, to be consistent with the results of the research. The learning tools are arranged according to the approach used, where the experimental class applies the TaRL approach, namely by grouping students based on the results of the pretest and using LKPD that is adjusted to the level of each ability. Meanwhile, the control class was taught with a classic conventional learning approach without distinguishing skill levels.

The final stage included giving a posttest to both groups to measure the improvement in numeracy ability after treatment was administered.

The results of the pretest and posttest were then assessed through analysis using the help of SPSS software. The data stages are carried out as follows:

1) Normality test by using the Shapiro-Wilk test to find out the normally distributed data. With the criteria of Sig.>0.05.
2) Homogeneity Test by using the Levene's Test to test the variance of the two homogeneous groups. With the criteria of Sig.>0.05.
3) The Independentst t-test to find out if there is a difference in the dignified posttest score between the two groups. With the criteria of Sig.<0.05.
4) Simple Linear Regression Test to examine the influence of learning activity and differentiation models on improving numeracy ability.

All of these stages are systematically arranged according to the syntax of the TaRL approach to ensure that the learning process is truly responsive to different skill levels of learners.

Conclusions and reports draw conclusions from the analysis and prepare research reports to illustrate the influence of the TaRL approach on the numeracy ability of class X students.

This design was designed to examine the influence of the TaRL approach on students' numeracy ability by considering internal factors (FI) and domain factors (FD). Therefore, the purpose of this study is to examine the variation in the results of improving students' numeracy ability based on Field Independence (FI) and Field Dependence (FD) following the application of the TaRL approach in mathematics education.

RESULTS AND DISCUSSION

According to the results of the pretest and posttest of class X students of SMAN 65 Jakarta, there was a significant impact on students' numeracy ability after the application of the TaRL method.

In this section, the author presents the results of the research in complete and detail, starting from the results of the validity,

reliability, normality, to testing the influence of variables on numeracy ability. The following is a full explanation.

Pretest and Postest Score Recapitulation

The Experimental group experienced a higher improvement than the control group. The difference in gain score is +12.73 points which shows a positive influence of the TaRL approach.

Table 5. Pretest and Posttest Score Recapitulation

Group	Number of Students	Average Pretest	Average Posttest	Gain Score
Eksperimen	31	9,32	76,29	66,97
Control	31	8,86	63,10	54,24

Validity Test

Table 6 shows that all instrument items have a pearson correlation value > table r (0.334) and a significance value of < 0.05 (Widodo et al., 2023). This indicates that all items in the test instrument have a significant relationship with the total score and are suitable for use in evaluation. The validity of the instrument can be trusted that the instrument accurately measures what must be measured, namely the ability of students in presenting group data.

Table 6. Results of Validity Test Analysis

Question Number		Y (total)
X1_1 (Question No.1 part 1)	Pearson Correlation	.589
	Sig. (2-tailed)	.000
X1_2 (Question No. 1 part 2)	Pearson Correlation	.481
	Sig. (2-tailed)	.012
X1_2 (Question No. 1 part 2)	Pearson Correlation	.777
	Sig. (2-tailed)	.000
X2_2 (Question No.2 part 2)	Pearson Correlation	.775
	Sig. (2-tailed)	.000
X3_1 (Question No. 3 part 1)	Pearson Correlation	.685
	Sig. (2-tailed)	.000
X3_2 (Question No. 3 part 2)	Pearson Correlation	.759
	Sig. (2-tailed)	.000

Reliability Test

Based on the results of the reliability analysis in the image above, Cronbach's Alpha value of 0.742 was obtained for 6 questions. This value is above the threshold of 0.70, which indicates that the instrument has a good and reliable level of internal consistency.

The results from table 7 state that all instrument items have Cronbach alpha values > table r (0.334) (Widodo et al., 2023). This indicates that all items in the test instrument have a significant relationship with the total score and are suitable for use in evaluation. The validity of the instrument can be trusted that the instrument accurately measures what must be measured, namely the ability of students in presenting group data.

Table 7. Statistik Total Item

Question Number	Cronbach's Alpha if Item Deleted
X1_1 (Question No.1 part 1)	.719
X1_2 (Question No.1 part 2)	.748
X2_1 (Question No.2 part 1)	.663
X2_2 (Question No.2 part 2)	.687
X3_1 (Question No.3 part 1)	.734

X3_2 (Question No.3 part 2)	.667

Normality Test

According to table 8 obtained from the normality test using the Shapiro-Wilk method, all variables showed a significance value (Sig.) > greater than 0.05 (Malay, 2022). Because all Sig. values for all tests are greater than 0.05, the data from the four variables follow a normal distribution. It meets the assumption of normality in parametric statistical testing such as the t-test. With data distributed normally, further analysis can be carried out more validly and accurately.

Table 8. Normality Test

Pretest-Posttest	**Shapiro-Wilk Statistic**
	Sig.
PreTestExperiment	.113
PostTestExperiment	.270
PreTestControl	.167
PostTestControl	.546

Homogeneity Test

According to table 9 of the homogeneity test using Levene's Test, results in an overall Sig. value of all tests greater than 0.05, then it can be concluded that the variance of the data in both groups (experiment and control) is homogeneous or equal (Malay, 2022). In other words, the variability of the data from the two groups did not differ significantly.

Table 9. Variance Homogeneity Test

		Sig.
Results	**Based on Mean**	.524
	Based on Median	.515
	Based on Median and With adjusted df	.515
	Based on trimmed mean	.528

T-test

The results of the independent t-test showed a value of t = 3.851, with a degree of freedom (df) of 60 and a significance value of Sig. (2-tailed) = 0.000. Because the significance value was less than 0.05, there was a significant difference between the mean pretest and posttest values in the treatment and control groups. Thus, an alternative hypothesis (H_1) is accepted, which means that the TaRL approach has been proven to have a positive influence on improving students' numeracy ability. This is in line with the explanation Syafriani et al, (2023), that an independent t-test is used to test the difference in the mean of two groups that are independent of each other, assuming the data are normally distributed and have homogeneous variance.

Regression Test Results (Effect of Pretest on Posttest)

Linear regression is a technique used to represent the relationship between a single dependent variable and one or more independent variables. When a model includes only one independent variable, this technique is referred to as simple linear regression (Harian, 2018). The findings of the simple linear regression analysis show a noteworthy positive correlation between pretest scores and posttest scores. The regression model obtained is $\text{posttest} = 53{,}159 + 1.773 \times \text{pretest}$. This means that for every unit of PreTest score increase, PostTest scores are predicted to increase by 1,773. An interception value of 53,159 indicates that if the pretest value is zero, the posttest value is predicted to be 53,159. The regression coefficient for the pretest was also

proven to be statistically significant with a significance value (p) of 0.002, which is less than 0.05. This suggests that pretest scores are a significant predictor of posttest scores. In addition, the standard coefficient (Beta) of 0.380 indicates the strength of the moderate relationship between the two variables.

Tabel 10. Cow Physin Regresi Linier

Model		Coefficients	
		B	**Sig.**
1	**(Constant)**	53.159	.000
	PreTest	1.773	.002

From all these tests, it can be concluded that the instruments used are valid and reliable, the data is distributed normally, the pretest scores have a big impact on students' numeracy ability applying the TaRL approach to students' numeracy ability.

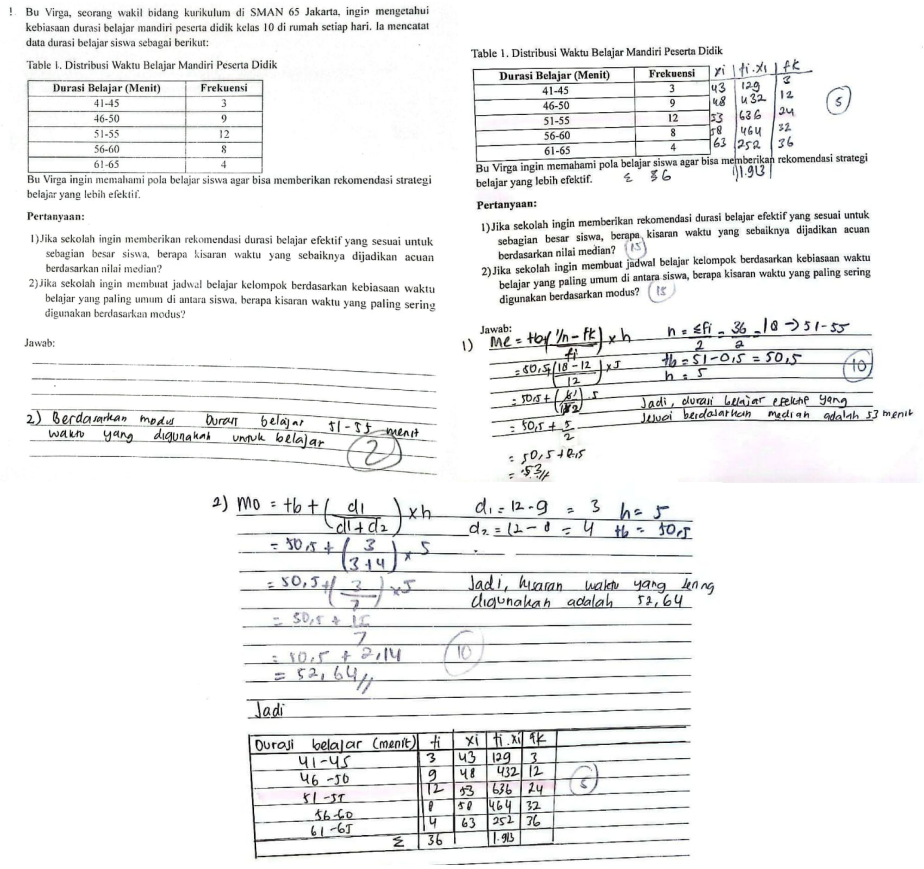

Figure 1. Pretest-Posttest Answer Result No. 1

In the pretest (top left figure), students failed to answer the questions accurately and completely, which shows a lack of understanding of symbols and mathematical concepts. In contrast, posttest results (top right and bottom figure) showed significant improvements, where students were able to interpret tables, understand numerical data, and draw correct conclusions—meeting all three indicators of mathematical numeracy ability.

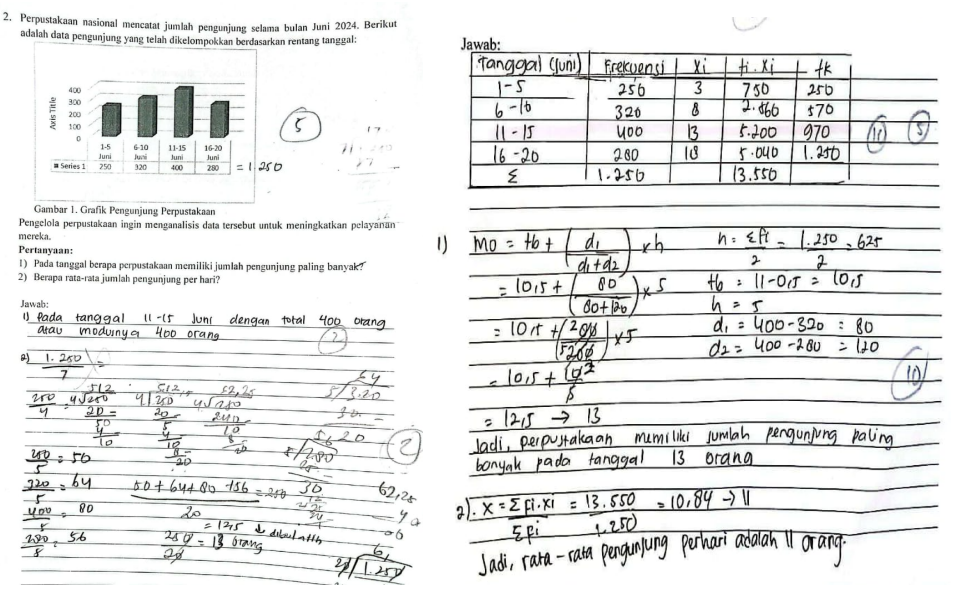

Figure 2. Pretest-Posttest Answer Result No. 2

In the pretest (left figure), students showed confusion and did not follow the correct solution steps. In the posttest (right figure), students successfully translated visual data into a table, interpreted the graph accurately, and applied correct symbols and calculations, indicating improved numeracy ability.

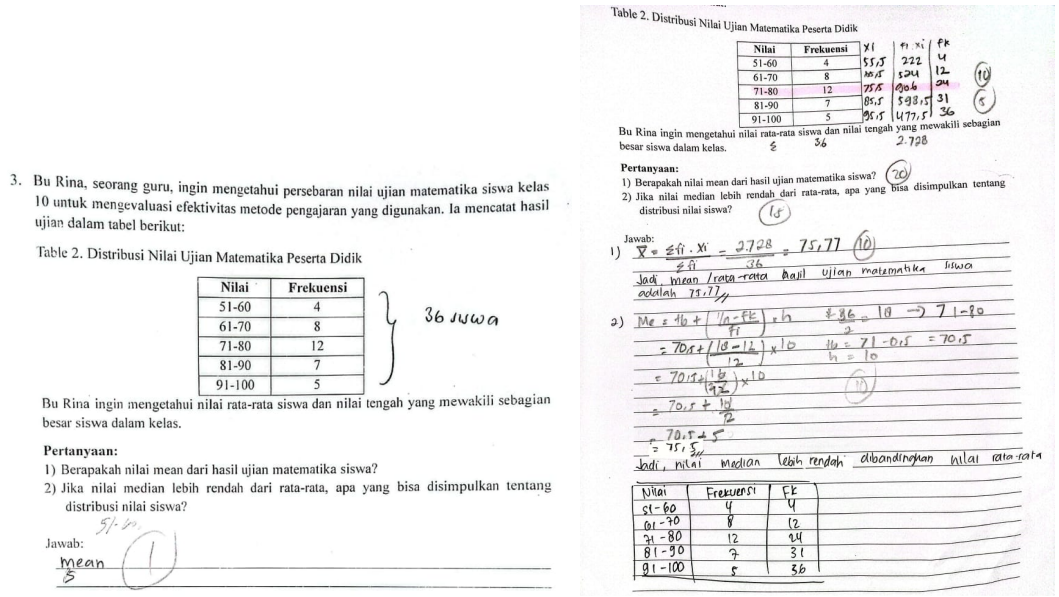

Figure 3. Pretest Answer Result No.3

The answers in the pretest (left figure) are incomplete and do not have a coherent sentence structure or numerical justification. After the TaRL intervention, the results of the posttest (right figure) showed mastery in organizing data, interpreting visual elements, and expressing reasons logically and thoroughly.

Collectively demonstrate a clear improvement in students' numeracy ability after applying the TaRL approach. Students transitioned from providing incomplete or incorrect responses to showing a more accurate, structured, and conceptually sound understanding.

These results are in line with the findings Binaoui et al, (2023), the TaRL method is very effective in improving students' basic ability, as evidenced by a significant increase in posttest scores during the one-month intervention. Meanwhile, research by Khurniati et al, (2024), it shows that the Tarl-based PBL model can improve students' mathematical literacy in triangle equality materials. This states that the TaRL approach significantly improves the basic competencies of learners through grouping based on their ability level.

This is supported by the latest research conducted Sakniyawati et al, (2024), shows that adaptive approaches and pshows that adaptive approaches and personalization in mathematics learning can significantly improve learning outcomes. Empirical support is also obtained from research Khurniati et al, (2024), examine the influence of the TaRL-PBL model on students' mathematical literacy ability. A significant enhancement was observed in the posttest scores of the treatment group relative to the control group, with a significance level of 0.001. In addition, a simple linear regression test showed that students' learning activity had an influence of 48.2% on mathematical literacy ability. These findings confirm that the TaRL approach, when combined with contextual learning models such as PBL, can have a real positive impact on the achievement of students' mathematical competence.

According to research conducted Masiah, (2020), the application of the constructivism approach can improve students' ability to understand mathematical concepts In addition, Vygotsky's Zone of Proximal Development (ZPD) theory was found in the study Kusmaryono et al, (2021), states that ZPD describes the potential of child development that can be realized through social interaction and appropriate guidance, which is in line with Vygotsky's theory that cognitive development is centered on the process of internalizing knowledge through the help of others and the surrounding environment. In the TaRL approach, ZPD shows that successful learning is not only seen from the final results, but from an interactive process that stimulates the child's potential to the maximum through scaffolding that touches the level of development of the child's potential.

In addition to the theoretical aspect, a study conducted by theeh Binaoui et al, (2023), shows that the use of the TaRL method can greatly improve the numeracy ability of students in Morocco, which confirms that this approach can not only be applied contextually in Indonesia, but also across cultures and education systems. This approach allows the learning process to be more focused, comprehensive and adaptive to the needs of students In accordance with the findings Sukarelawa et al, (2024), regarding the success of personalized learning strategies in improving learning outcomes, this approach can be used to improve learning outcomes.

CONCLUSION

Based on the results of the research that has been conducted, it could be concluded that the application of the TaRL approach has a significant impact on improving the numeracy ability of class X students at SMAN 65 Jakarta. Learning tailored to the student's initial ability level has been proven effective in improve basic numeracy ability, especially in the use of numbers and mathematical symbols to solve everyday problems; develop the ability to interpret visual data, such as graphs, tables, and diagrams, which is an important part of numeracy literacy; encouraging the ability to analyze and make data-based decisions, with posttest results showing that students are able to make accurate and logical predictions based on quantitative information.

The TaRL approach creates a learning process that is more adaptive, inclusive, and responsive to the needs of students so that the gap in students' numeracy ability can be effectively reduced.

The theory of constructivism and Vygotsky's principle of the Proximal Development Zone are aligned with the results, showing that active involvement and adjustment of materials according to individual abilities play a role in improving learners' numeracy ability. Nonetheless, effective TaRL execution requires efficient time management and specialized training for

educators to take full advantage of these strategies. As a result, the TaRL approach clearly demonstrates its effectiveness in narrowing the numeracy gap, boosting students' fundamental competencies, and fostering a more inclusive and adaptable learning environment.

However, this study had a limited intervention time, namely a 2-week gap between treatment and posttest, so students needed to remember previous learning. Therefore, further research needs to pay attention to the academic calendar in schools is highly recommended to reinforce these findings.

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