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# Meta Analysis Of The PMRI (Indonesian Realistic Mathematics Education) Approach To Improving Primary Students' Mathematics Learning Outcomes

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**Abstract :** Research objectives This is For analyze PMRI approach (Mathematics Education Realistic Indonesia) towards results Study students at school base. PMRI's approach is a mathematization - oriented approach experience everyday and also apply mathematics in life daily . Study This use method meta- analysis research. Data analysis was carried out with SPSS 22.00 for windows help . Result of data analysis that has been done done done show that PMRI approach ( Mathematics Education Realistic Indonesia) is influential big to results Study students , the results of the independent samples test show that mark significance (2-tailed) 0.000 <0.05, the result of the effect size calculation is -2.65773, so it can be concluded that the influence of the PMRI (Indonesian Realistic Mathematics Education) approach is significantly more effective compared to conventional learning in terms of elementary school student learning outcomes. The results of data analysis show a significant difference between learning outcomes in the experimental class and the control class with a Sig (2-tailed) result of 0.000 and a small effect size. The results of data analysis can then be said that there is a significant difference between the learning outcomes of the experimental and control groups, however the treatment in this study showed a small effect on learning.

## INTRODUCTION

Education has very important role especially in the 21st century , where expected education can give Lots skills Good That Skills in Study nor innovate , skills in technological nor Skills in media information . Education provided at school expected can form proficiency life (life skills) that you have student For can operate life daily . Education at school need equip ability

in develop method think more critical and also more solution .

Rahayu, S., Ladamay , I., Susanti, RH, Wiyono , BB, & Vindya, M. (2022) also added that think critical , for accept various type information , for think in a way creative , for solve problem with existing knowledge and for make complex decision

The learning strategies applied wherever possible encourage innovation and creative thinking skills. Meanwhile, according to Muliastrini (2000), high level cognitive abilities are also needed for creativity. Because high creativity can create more creative students. Elementary school is a level of education that also develops creative thinking abilities and is the foundation stone for three main intelligences including: intellectual, spiritual and emotional intelligence which have a very important role in responding to challenges. (Muliastrini, 2020). This is also supported by Law Number 20 of 2003 concerning the National Education System which also emphasizes that National Education functions to develop abilities and also shape the character and civilization of a dignified nation in order to make the nation's life more intelligent. Apart from that, it also aims to develop the potential of students so that they can become human beings who believe and are devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens. Tawa (2019) also added that national policies and implementation in elementary schools are currently not optimal. So it is necessary to provide a strong foundation in children's development. This is an important element because elementary school is the foundation of education and is the initial education that determines the direction of achieving the nation's ideals.

Eye lesson mathematics become one eye lesson Which follow develop ability think And creativity . Mathematics is eye Lesson Which can increase ability think And Also ability argue . Matter This Can become one of the experiences Which interesting And experience Which interesting according to Sugiharto , FB, Rozhana , KM, & Iten , F. (2022). capable open And give outlook student in follow activity Study teach in class together

with the teacher. Math says comes from words Latin mathematics Which at first taken from words Greece mathematice Which means study . There are words origin he said mathema Which means knowledge or science (Helmi, 2019) . Mathematic says also related to other words Which almost the same, ie mathein or mathenein Which It means learning ( thinking ). So , based on origin he said , then words mathematics means knowledge knowledge Which obtained with thinking ( reasoning ). Mathematicsmore emphasize activity in world ratio ( reasoning ), no emphasize on results experiment or results observation mathematics Which formed Because thoughts human , that is relate with ideas, processes , and reasoning ( Russeffendi in Siagian , 2016; Adri, 2023; Gultom, 2021). In addition, Kline (1973) that mathematics is not knowledge alone Which can perfect Because himself myself , however exists especially mathematics For help man in understand And control problem social , economic, and nature ( in Suwardi , et al ., 2016; Adri, 2020). Whereas learning mathematics Which is at school role For develop ability count , measure , derive And use formula mathematics Which needed in life everyday including through various material that is measurement And geometry , algebra And trigonometry . No that 's all , learning at school Also own role For develop ability in communication of ideas with language through model mathematics Which can form sentence And equality math , diagrams , graphs , or table ( Rahmah in Fitriani & Pujiastuti , 2021).

Results studies Program for International Students Assessment (PISA) 2018 which Already released on Tuesday , December 3 2019. mentioned that results studies the Indonesia's 2018 PISA ranking drops if compared to with PISA results in 2015. Study on this year 2018 assessed 600,000 children 15 year olds from 79 countries every three year very . studies This explain comparison math , reading , and performance science of every children ( Tohir , 2019). For the mathematics category, Indonesia is ranked 7th from the bottom (73) with an average score of 379. Based on the latest report, Indonesia's performance appears to have decreased compared to the 2015 PISA report. This can be seen from the

three aspects assessed. The following is a comparison (Tohir, 2019):

| PISA 2015 | PISA 2018 |
|---|---|
| - kemampuan membaca: 397<br>- kemampuan matematika: 386<br>- kemampuan kinerja sains: 403 | - kemampuan membaca: 371<br>- kemampuan matematika: 379<br>- kemampuan kinerja sains: 396 |
| Untuk diketahui, indikator dan metode yang digunakan untuk survei PISA 2015 dan 2018 sama. Hal yang membedakan, jika tahun 2015 ada 70 negara yang disurvei, maka tahun 2018 bertambah menjadi 79 negara. | |

As education continues to develop according to the demands of the times, it is important to learn mathematics which also invites students to be involved and not just focus on the teacher. The role of the teacher becomes a facilitator and the role of students is the center in learning and constructing their own knowledge. Students are involved and experience their own learning in accordance with the learning objectives to be achieved. One learning approach that actively involves students in learning is the PMRI Approach (Indonesian Realistic Mathematics Education). Indonesian Realistic Mathematics Education (PMRI) can be linked to instilling concepts to solve mathematical problems. Because by presenting realistic problems according to this pattern, characters that were previously unclear can easily be formed. Apart from that, choosing realistic problems can arouse students' enthusiasm for learning so that students can discover new ideas. So that it can motivate students who previously had a vacuum in class to become more enthusiastic and creative in developing learning patterns (Rosalina & Mandasari, 2021). This was also added by Melly Andriani (2013:13) that Indonesian Realistic Mathematics Education is an approach that has been developed since 1971 by a group of mathematicians. It was further explained that mathematics learning is carried out by placing students' reality and experiences as the starting point for learning. Apart from that, the opinion of Desty Septianawati (2014:57) explains that one approach to mathematics learning that is oriented towards mathematizing everyday experiences and applying mathematics in everyday life is PMRI. PMRI or Indonesian realistic mathematics

education reflects that mathematics is subject matter, namely how students process mathematics and how mathematics is actually studied. Therefore, the approach to mathematics learning that relates realistic problems is the Indonesian Realistic Mathematics Education (PMRI) approach which directly emphasizes the experience and reality of mathematics learning in real life (Lestari & Yudhanegara in Rosalina & Mandasari, 2021). The steps in the mathematics learning process with PMRI are as follows: 1) understand contextual problems, 2) explain contextual problems, 3) solve contextual problems, 4) compare and discuss answers, 5) conclude, and 6) evaluate (Rahmawati, 2013).

"The PMRI approach is expected to improve the learning abilities that students already have after the students experience the learning process" (Sudjana, 2005). During the learning process the teacher not only prepares but can also assist in the success of delivering lesson material, namely by evaluating the results of teaching and learning. Evaluation results can be seen from the mathematics learning process which is marked by a scale of values in the form of letters or symbols or numbers, and this is usually used as a benchmark for whether the student is successful or not in learning mathematics (Fimansyah, 2015). The process of learning mathematics can start from real or concrete objects intuitively, then at a higher stage the concept can be taught again in a more abstract form using notation that is more commonly used in mathematics (Ruseffendi in Fimansyah, 2015). Therefore, the benefit of this research is that it can help students improve their learning outcomes and can also be used as material for teachers to consider in determining learning methods in class.

One research that can be done is to conduct a meta-analysis study where this research combines several studies, strengthens the level of validity of research results with similar findings and can explain differences if there are differences in results (Kot et al., 2018; Siegel et al . , 2021; Juandi et al., 2021; Suparman, Juandi, et al., 2021). Meta analysis was carried out to summarize the population and consider the implications (Lee, 2019;Tamur, Jehadus

et al., 2020; Tamur, Kusuham, Juandi et al., 2021). Meta analysis can also be used to calculate effect sizes and combine them in an objective formula, thereby increasing the possibility that different readers will reach the same conclusions (Schmidt & Hunter, 2015).

This is also in line with the contents of Permendiknas No. 22 of 2006 which states that students must have problem-solving abilities in studying mathematics. Sembiring (2019) stated that there was an increase in mathematical problem solving abilities as seen from the increase in student learning outcomes by using meta analysis in problem solving.

PMRI or the abbreviation for Realistic Mathematics Education is one solution in increasing students' conceptual understanding of mathematical problems. Understanding , reasoning , and interpretation student on math problems will increase if own ability in understand mathematical problem concept . Andriani (2014) too put forward that learning mathematics realistic started with that problem contextually then converted into mathematical language And resolved with use method mathematics . Inner teacher learning mathematics combine draft material mathematics And experience life students' daily lives so that matter the can applied return while studying draft material mathematics Which new . Matter This can Also repair education mathematics in Indonesia so can increase reasoning And understanding mathematics on students , then develop it Approach Learning mathematics realistic For eye lesson mathematics . Approach learning mathematics realistic demand student in think critical , focused, as well systematic so that make student remember material in period time the old one and make achievement Study become maximum ( Hadi , 2017).

PMRI has four levels in learning namely 1) level situational , level This is levels Which most base Because knowledge And model Still develop on situation problem Which used ; 2) levels referential , deep levels This student make model For describe situation context Which refers on activity learning ); 3) general level , where levels This model Which developed student leads For looking for a mathematical solution or model connect activity mathematics ; 4) levels

formal , on levels This formulation problem And affirmation draft mathematics Which has built by student No depend on model ( Feriana & Putri , 2016).

## METHOD

This research uses a meta-analysis method. Meta analysis is research carried out by researchers by summarizing research data, reviewing and analyzing research data from several previously existing research results (Anugraheni, 2018). The stages carried out in this research are: first, formulating the research problem, namely the PMRI (Indonesian Realistic Mathematics Education) Approach to elementary school mathematics learning outcomes.

Second, summarize the research results in the form of academic journals and theses related to the problem studied. Third, review the research report to ensure the content is related to the problem being studied, and record the information needed for the research. Fourth, calculate the effect size for each study using the data obtained. Fifth, analyze research reports that have been combined based on the data analysis methods used, so that conclusions in this research can be made.

Data collection was carried out by researchers by searching for academic journals and theses related to the topic being researched via internet network sites. The data summarized is data containing information according to the required variables stated on the code sheet. The data is then grouped based on data containing the average value of each experimental class and control class accompanied by the standard deviation. All journals and theses are summarized according to the sample criteria. In this meta-analysis research, 18 articles were used. The data collection technique is carried out by searching for articles from articles taken from various sources, namely those that have been published in online journals via Google Scholar, Repository, Garuda. The article is about the PMRI (Indonesian Realistic Mathematics Education) approach. Furthermore, the articles that have been obtained are then given their respective codes. The data obtained was then analyzed using data analysis techniques.

## RESULT & DISCUSSION

The results of this research have obtained 30 scientific articles about the PMRI (Indonesian Realistic Mathematics Education) approach and 18 articles were selected to improve students' learning outcomes in mathematics learning. The data that has been taken from the articles obtained is then processed by making a summary and essence of the research results using the PMRI (Indonesian Realistic Mathematics Education) approach. Furthermore, the data that has been obtained is re-reported descriptively qualitatively and quantitatively .

*Table 1 Results of Analysis of the PMRI (Indonesian Realistic Mathematics Education) Approach to Learning Outcomes*

| NO | Kode Data | Prngaruh Hasil Belajar | |
|---|---|---|---|
| | | Kelas Eksperimen | Kelas Kontrol |
| 1 | A2 | 80 | 66 |
| 2 | A3 | 83,25 | 88 |
| 3 | A5 | 77,133 | 72,487 |
| 4 | A7 | 77,52 | 60,76 |
| 5 | A8 | 86,7 | 73,2 |
| 6 | A9 | 71,9705 | 63,4117 |
| 7 | A12 | 77 | 60 |
| 8 | A13 | 78,64 | 62,52 |
| 9 | A14 | 78,64 | 70,83 |
| 10 | A16 | 78,75 | 67,85 |
| 11 | A17 | 71,50 | 60,76 |
| 12 | A22 | 77,52 | 74,06 |
| 13 | A24 | 83,71 | 73,17 |
| 14 | A25 | 82,96 | 60,29 |
| 15 | A27 | 83,23 | 72,71 |
| 16 | A28 | 83,42 | 62,50 |
| 17 | A29 | 78,12 | 62,78 |
| 18 | A30 | 77,56 | 65,3 |
| | Rata-rata | 79,37 | 66,47 |

Table 1 shows use PMRI approach ( Mathematics Education Realistic Indonesia) is influential to results Study student Elementary school . Class with use PMRI approach ( Mathematics Realistic Indonesia) obtain the average value is 79.37 more tall from classes that use learning models conventional with average value 66.47. Furthermore Normality test was carried out .

*Table 2 Normality Test PMRI Approach ( Indonesian Mathematics Education )*

Test of Normality

| | | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | Kelas | Statistic | df | Sig. | Statistic | df | Sig. |
| Nilai | 1 | ,166 | 18 | ,200* | ,937 | 18 | ,253 |
| | 2 | ,170 | 18 | ,184 | ,886 | 18 | ,033 |

*. This is a lower bound of the true significance.

a. Lilliefors Sianificance Correction

Table 2 shows normality test results class experiments and classes control to results Study student school base . Normality test using Shapiro-Wilk data with SPSS 26.00 for windows help with base taking decision as following : Based on table 2 is obtained results significant class experiment is 0.345 > 0.05, so is the value significant class control is 0.136 > 0.05, can concluded that the data is normally distributed .

Based on normality test results PMRI approach ( Mathematics Education Realistic Indonesia) towards results Study student with using the pretest and posttest scores in table 4 which were analyzed with use the Shapiro-Wilk technique assisted by SPSS version 22 for windows shows that mark significance 0.200 > 0.05 which means the data has normally distributed

*Table. 3 Homogeneity Test of Pretest and Posttest Scores PMRI (Indonesian Mathematics Education ) Approach to Learning Outcomes Elementary students*

**Test of Homogeneity of Variances**

| Nilai | | | |
|---|---|---|---|
| Levene Statistic | df1 | df2 | Sig. |
| 3,240 | 1 | 34 | 0,81 |

the data can said homogeneous Because significance more from 0.05. Based on acquisition from table on that results from acquisition homogeneity with mark significance namely 0.081 > 0.05, so obtained that with use Based on acquisition from table 3 above that results from acquisition homogeneity with mark significance namely 0.246 > 0.05, so obtained that with use PMRI approach ( Mathematics Education

Realistic Indonesia) has the same variation or homogeneous .

**Uji t test**

Basis for taking decision If the Sig (2-tailed) value is 0.05, then No there is significant difference between results studied in class A and Class B. Conclusion: based on t-test test results using spss , obtained the result of Sig.(2-tailed) is 0.000 then can concluded that Sig value (2-tailed)

*Table 4 t test PMRI (Indonesian Mathematics Education) Approach to Elementary School Student Learning* Outcomes

Independent Samples Test

| | | Levene's test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Nilai | Equal variances assumed | 3.240 | 0,81 | 8,407 | 34 | ,000 | 12,892 | 1,534 | 9,775 | 16,008 |
| | Equal variances not assumed | | | 8,407 | 32,098 | ,000 | 12,892 | 1,534 | 9,769 | 16,015 |

Based on Table 4 above show independent samples test results test results data Study student school base . An independent samples test using SPSS 26.00 for Windows was obtained mark significance 0.000 < 0.05, can concluded that There is significant difference between results Study students who use PMRI approach ( Mathematics Education Realistic Indonesia) and results Study students who use PMRI approach ( Mathematics Education Realistic Indonesia).

**Paired Sample t test**

Paired Samples Test

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference Lower | Upper | | | |
| Pair 1 | Kelas_kontrol - Kelas_eksperimen | -12,89193 | 4,85327 | 1,14393 | -15,30941 | -10,47446 | -11,270 | 17 | ,000 |

| | d=mean/std |
|---|---|
| pembilang | -12,89 |
| penyebut | 4,85 |
| Cohen E.S | -2,65773 |

**Criteria regarding the size of the effect size**

| | |
|---|---|
| <0,05 | Kecil |
| 0,50-0,60 | Cukup |
| 0,70-0,90 | Besar |
| ≥ 1, 00 | Sangat Besar |

(Cohen et al, 2007)

So research treatment show little effect on learning . Effect small can means that difference between group or compared conditions Possible not enough relevant in a way practical or Possible need more samples big or design more research sensitive For can interpreted with appropriate . That matter can become input for study furthermore For look for sample study with big amount .

## CONCLUSION

Based on findings and analysis results research that has been done , then can concluded that results Study mathematics elementary school students use PMRI Approach ( Mathematics Education Realistic Indonesia) experience enhancement which is significant . By more Specific a

number of the resulting findings in study This is as following . By whole PMRI Approach ( Mathematics Education Realistic Indonesia) has influence big to results Study elementary school students with the average value of the included effect sizes in category small .

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