UNIVERSITAS MUHAMMADIYAH PROF. DR. HAMKA
FAKULTAS KEGURUAN DAN ILMU PENDIDIKAN
Kampus B : Jl. Tanah Merdeka No.20, RT.11/RW.2, Rambutan, Kecamatan Ciracas, Kota Jakarta Timur, Daerah Khusus Ibukota Jakarta 13830 Telp. (021) 8400341, 8403683, Fax. (021) 8411531
Website : www.fkip.uhamka.ac.id Home page : www.uhamka.ac.id

# SURAT TUGAS

Nomor : 0169/ F.03.08/ 2023

***Bismillahirrahmanirrahim,***

Pimpinan Fakultas Keguruan dan Ilmu Pendidikan Universitas Muhammadiyah Prof. DR. HAMKA, memberi tugas kepada:

| | | |
|---|---|---|
| Nama | : | **Leni Marlena, S.Stat, M.Si.** |
| Tugas | : | Membuat artikel penelitian dengan judul "Completely Randomized Design Of Three Learning Methods In Economic Mathematics" |
| Waktu | : | 18 Januari 2023 |
| Tempat | : | FKIP UHAMKA |
| Lain-lain | : | Setelah melaksanakan tugas agar membuat laporan tertulis kepada Pimpinan FKIP UHAMKA |

Demikian surat tugas ini dibuat, agar dilaksanakan dengan sebaik-baiknya sebagai amanah.

Jakarta, 14 Januari 2023
Dekan,

**Dr. Desvian Bandarsyah, M.Pd.**

**AKSIOMA**: Jurnal Program Studi Pendidikan Matematika
Volume 0, No. 0, 20xx, 00-00

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

# COMPLETELY RANDOMIZED DESIGN OF THREE LEARNING METHODS IN ECONOMIC MATHEMATICS

**Leni Marlena**[1*]

[1*] Universitas Muhammadiyah Prof. Dr. Hamka, Jakarta Timur, Indonesia
**Corresponding author. Jl. Tanah Merdeka No.20, RT.11/RW.2 Kampung Rambutan Kec. Ciracas, 13830, Kota Jakarta Timur, Indonesia.*
*E-mail:* lenimarlena@uhamka.ac.id

*Received dd Month yy; Received in revised form dd Month yy; Accepted dd Month yy (9pt)*

## Abstrak

Penelitian ini adalah penelitian menggunakan rancangan percobaan dengan Rancangan acak lengkap (RAL) satu faktor. Faktor yang dicobakan terdiri dari tiga level, yaitu metode konvensional, *problem-based learning* (PBL), dan tutor sebaya. Kemudian, ketiga level ini disebut sebagai perlakuan. Setiap perlakuan dilakukan pengulangan tiga kali, sehingga dibutuhkan 9-unit percobaan. Metodologi percobaan ini digunakan dalam pembelajaran Matematika ekonomi. Berdasarkan hasil Analisis ragam (Anova) dengan taraf nyata 5%, ketiga metode ini berpengaruh terhadap nilai Matematika ekonomi. Selanjutnya berdasarkan hasil uji Tukey-HSD pada taraf nyata 5% ditunjukkan bahwa tidak ada pengaruh yang berbeda antara metode konvensional dan PBL, sedangkan antara metode tutor sebaya dengan PBL memberikan pengaruh yang signifikan terhadap skor Matematika ekonomi. Kelas yang menggunakan metode tutor sebaya memiliki nilai rata-rata yang paling rendah, sedangkan kelas yang menggunakan metode PBL memiliki nilai rata-rata yang paling tinggi.

**Kata kunci**: Anova, metode ceramah, PBL, RAL, tutor sebaya.

## *Abstract*

*This study is an experimental design study with a one-factor completely randomized design (CRD). In this study, three levels of learning methods are tested. There are Problem based-learning (PBL), peer tutoring, and lecture method. Furthermore, these three levels can be referred to as treatment. Nine experimental courses were required because each treatment was repeated three times. Applying this experimental methodology to the Economics mathematics course. Based on the findings of the analysis of variance at $\alpha = 5\%$, the three learning approaches have significantly effect on the Economic Mathematics score. The findings of the Tukey-HSD test at $\alpha = 5\%$ reveal that while the lecture and PBL method do not have a difference impact, peer tutoring and the PBL method have a significant impact on the Economic mathematics score. In the class that used the peer tutoring approach, the mean score was the lowest, whereas the class that used the PBL approach had the highest mean score.*
***Keywords**: Anova, lecture method, CRD, PBL, peer tutoring.*



## INTRODUCTION

One of scientific approach to collecting data and measurement is experimental design. To establish a link between the independent and dependent variables, an intervention in a controlled environment is created. Factors, levels, and treatments are terminology used in experimental designs. The treatment's independent variables, or factors, can have qualitative or quantitative values. The value of a component in the experiment is then represented by the level. Treatment, meantime, refers to a procedure or method applied in experimental settings. This study's

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

experimental setup is a one-factor, completely randomized design (CRD). Three levels of learning approaches are utilized: the lecture method, the peer-teaching method, and the problem-based learning method (PBL). These three approaches were chosen for their ease of use in the classroom.

In the lecture approach, lecturers explain from the beginning of the lecture until its conclusion, while students merely participate as listeners. The speaker will also assign tasks and provide questions and answers. The lecture approach is referred to as a lecture learning approach in some studies. In previous research, Ardeleanu (2019) and Lessani et al., (2017) compare the usage of lecture methods and new (modern) approaches for teaching mathematics. Their findings demonstrated a beneficial effect of novel strategies on learning outcomes.

Furthermore, in the PBL method, learning is based on the teacher's problems, and students solve these problems using all of their knowledge and abilities gained from various sources. Several studies show that PBL methods can improve student learning outcomes (Mardini et al., 2020; Marlena & Nugrheni, 2019; Nafiah & Suyanto, 2014; Perdana & Slameto, 2016; Zulfa, A., Warniasih, K., & Wardono, 2019). As a result of constructivist learning theory, PBL requires students to actively participate in acquiring knowledge and improving their reasoning abilities (Kurniawan et al., 2012). PBL requires students to take an active role in problem solving and think critically.

Teachers choose students with strong academic credentials to tutor and teach their peers using the peer-teaching method. Teachers gave material to students who became tutors, who then discussed it during teaching and learning activities. He then returns the material to his classmates' friends. In other words, learning is provided between students (Safrudin et al., 2014). Peer tutoring methods can improve student learning outcomes, according to several (Anggorowati, 2013; Indriani & Mutmainnah, 2016; Rosanti, 2018; Sidiq et al., 2018)

Furthermore, these three learning methods will be applied to economic mathematics courses. Economic mathematics is a course that applies mathematics to a more specific field, namely economics. This course is a compulsory subject in the Mathematics Education Program (FKIP) as well as in the Management, Accounting, and D3 of Taxation (FEB) Uhamka. Mathematics student achievement is affected by teaching methods (Hassidov, 2017). Thus, the student would achieve good results in this case if the lecturers used relevant and supportive teaching activities in the classroom. Educators, learners, and world reality must all be present in teaching and learning activities (Suyatno, 2009).

The purpose of this study is to determine whether a specific learning approach affects economic Mathematics learning outcomes and which method produces the best results.

## METHOD

This study's population consisted of FKIP and FEB UHAMKA students who took economic mathematics courses. This study required a nine-unit experiment because three treatments were tried, and each treatment was repeated three times. As a result, 9 classes were used as the experimental unit in this study: 5B, 1A, 1B, 1R, 1D, 1Aj, 1E, 1F, and 1J. As the study used a fixed model-completely randomized

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

design, the researcher assigned these classes directly (rather than randomly selecting from the population).

Table 1. Classes Profile

| Classes | Specialization during high school | | | Score*) |
|---|---|---|---|---|
| | IPA | IPS | Others | |
| 5A | 55% | 30% | 15% | 85 |
| 1A | 40% | 43% | 17% | 85 |
| 1B | 44% | 30% | 26% | 80 |
| 1R | 48% | 25% | 27% | 83 |
| 1D | 45% | 39% | 16% | 82 |
| 1Aj | 45% | 40% | 15% | 80 |
| 1E | 46% | 30% | 24% | 81 |
| 1F | 40% | 42% | 18% | 84 |
| 1J | 44% | 40% | 16% | 83 |

*): mean of mathematics final school exam

Table 1 shows the profile of each trial unit (class). According to the table, almost every class is dominated by students who majored in science in high school. Furthermore, the math scores of each class's school exam results are no less than 80. This score indicates that the initial mathematical ability of the average student is quite good and homogeneous

The treatment was placed at random in all experimental units in the CRD experimental design. Table 2 shows the outcomes of the randomization treatment of nine classes that became the experimental unit.

Table 2. Randomization of treatment results into experimental units

| Lecture | PBL | Peer Tutoring |
|---|---|---|
| 5B, 1A, 1B | 1R, 1D, 1Aj | 1E, 1F, 1J |

Linear Model in a completely random design is:

$Y_{ij} = \mu + \tau_i + \mathcal{E}_{ij}$ **(1)**

*i = 1, 2, and 3; j= 1, 2, 3*

with:

$Y_{ij}$: the value of economic mathematics due to the treatment of learning methods to-*i* reply to-*j*

$\mu$: general average

$\tau_i$: Influence of learning methods to-*i*

$\mathcal{E}_{ij}$: Random effects on the treatment of-*i* reply to-*j*.

Hypothesis:

$H_0$: $\tau_1 = \tau_2 = \tau_3 = 0$ (The three learning methods had no effect on Economic mathematics score).

$H_1$: there is at least one *i*, so $\tau_i \neq 0$ (At least one learning method influences on Economic mathematics score).

Hypothesis testing is done using analyses of variance (Anova). However, before using Anova, the following assumptions must be tested:

1. Additive Effect

Because the treatment and the surrounding environment have an additive effect, adding treatments can change the level of experimental results. The treatment ($\tau_i$) and eror ($\varepsilon_{ij}$) are additive in the CRD linear model (Eq. 1), which means that the effect of the treatment addition is constant for each repeat and the repeat effect is constant for each treatment. Response Value ($Y_{ij}$) is the sum of the treatments and errors plus the overall average value. Tukey test was used to test the effect of additives with the following hypotheses and formulas:

$H_0$: additive model vs $H_1$: the model is not additive

$$SS_{non-additive} = \frac{Q^2}{r\sum(\bar{Y}_{i.}-\bar{Y}_{..})^2\sum(\bar{Y}_{.j}-\bar{Y}_{..})^2} \quad (2)$$

with

$r$ = number of repetitions

$Q = \sum(\bar{Y}_{i.} - \bar{Y}_{..})(\bar{Y}_{.j} - \bar{Y}_{..})Y_{ij}$

**AKSIOMA**: Jurnal Program Studi Pendidikan Matematika
Volume 0, No. 0, 20xx, 00-00

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

$F_{count} = \frac{SS_{not\ additive}}{SSE/dfE}$

If $F_{count\ a} > F_{\alpha\ (1,\ dbg)}$, then the additivity of the model is satisfied.

2. Normal distribution of error

The Shapiro-Wilk test is used to test normally distributed error assumptions. If the significance value is greater than 0,05, then the error for CRD in the economics mathematics score is normally distributed at the 5% level of significance.

3. Homogeneity of Error Variance

The Levene test was used to determine the homogeneity of error variance. If the significance value is greater than 0.05, the error of model CRD in the experiment is homogeneous.

4. Independent Error

A plot between the error value and the estimated value of $y_{ij}$ can be used to determine whether the experimental error is independent of each other. If the scatter plots between the estimated value $y_{ij}$ - and the value of the error are not patterned (random), the assumption of independent error is met.

The analysis of variance (Anova) is then calculated using a table, as shown in Table 3.

Table 3. Analysis of Variance Table

| Source | df | SS | MS | F |
|---|---|---|---|---|
| Between treatments | *t-1* | SSB | MSB | MSB/ MSE |
| Error | $t\,(r-1)$ | SSE | MSE | |
| Total | $tr-1$ | SST | | |

Description:

df = degree of freedom
SS = sum of squares
MS = Mean of square
t = number of treatments, in this case, *t* = 3
r = number of repetitions, in this case, *r* = 3

$$FK = \frac{Y_{..}}{tr}$$

$$SSB = \sum_{i=1}^{t} \frac{Y_{i.}^2}{r} - FK$$

$$SST = \sum_{i=1}^{t}\sum_{j=1}^{r} Y_{ij}^2 - FK$$

$$SSE = SST - SSB$$

$$MSB = \frac{SSB}{t-1}$$

$$MSE = \frac{SSE}{r-1}$$

$H_0$ rejected if: $F > F_{0,05\ (t-1,\ t(r-1))}$

Furthermore, if the obtained result is less than $H_0$, it will be followed by additional Tukey tests. Tukey's post-hoc tests were used to determine which methods were statistically significant and which had the greatest impact. The Tukey's HSD test is as follows:

$$\mathbf{HSD} = q\sqrt{\frac{KTG}{r}} \qquad (3)$$

with $r$ = number of repetitions and $q$ = value the Tukey's – HSD Table (Table $q$) with $\alpha = 0{,}05$ when df error and the number of treatments $k$ certain.

## RESULTS AND DISCUSSION

Figure 1 depicts a summary of descriptive statistics for each class of experiments. The class with the highest mean score, as shown in the figure, was a class using Lecture methods, with a value of 78,667. While classes using the PBL method received a mean of 69,667, classes using the Peer Tutoring method received the lowest mean score of 54,677.

**AKSIOMA**: Jurnal Program Studi Pendidikan Matematika
Volume 0, No. 0, 20xx, 00-00

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

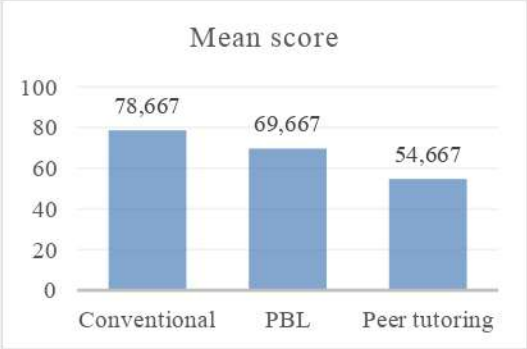


Figure 1. Bar chart of the mean score of Economic mathematics in each treatment

The following are the results of testing assumptions for the CRD liner model:

1. Additive Effect

The results of the statistical tests yielded an additive effect value of F = 0,23 and the value of $F_{0,05(1,6)}$ = 5,987. $H_0$ failed to reject since the value of F > $F_{0,05(1,6)}$. This means that the additive model's assumption is met at a level of significance of 5%.

2. Normal distribution error

The results of the normality test on the error data yielded a Saphiro-Wilks Test value of 0,953, with a significance value of 0,72. This significant value is greater than 0,05, implying that the error for CRD in Economic mathematics score is normally distributed at the 5% level of significance.

3. Homogeneity of Error Variance

The Levene test was used to check the homogeneity of the error data. The Levene test yielded a value of 1,672 with a significance value of 0,265. Because the significance value is greater than 0,05, it can be stated that the error for CRD in Economic mathematics score has a homogeneous variation at the significance level of 5%.

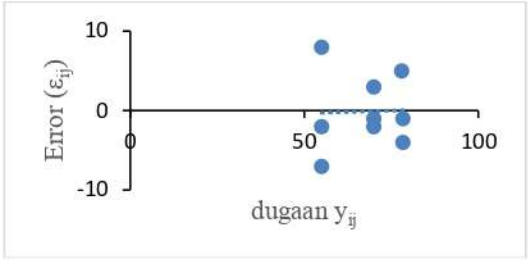


Figure 2. Scatter plot of Error and $\hat{y}_{ij}$

4. Independent error

To find out if the error is mutually independent, a plot is used between the error value and the expected value of $y_{ij}$. Figure 2 shows a plot of the values of $\hat{y}_{ij}$ versus the value of error that is not patterned (random). This implies that the assumption of independent error is met.

Table 4. Anova table comparing three different learning methods

| Source | df | SS | MS | F | p-val |
|---|---|---|---|---|---|
| Between treatments | 2 | 882 | 441 | 15,75 | 0,004 |
| Error | 6 | 168 | 28 | | |
| Total | 8 | 1050 | | | |

Table 4 shows that F= 15,75 > $F_{0,05(2,6)}$ =5,143 with a p-value of 0,004. So, at significance level of 5%, the decision is failed to reject the null hypothesis. As a result, it can be concluded that there are at least two learning methods that have different effects on the Economic mathematics score.

This conclusion leads us to conduct further tests to determine which treatment pairs have different effects and which do not. At a significance level of 5%, k = 3, and df error = 6, the value of q is 4,34. As a result, the Tukey test statistic has the following value:

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

$$HSD = 4{,}34\sqrt{\frac{28}{3}} = 13{,}259.$$

Furthermore, the value of HSD is compared with the average difference between the treatments contained in Table 5. If the mean difference between treatments is greater than the statistical value of the HSD test, it can be concluded that the two treatments have different effects on the value of Economic mathematics. Based on these criteria, it is concluded that the lecture method and peer tutoring, as well as the PBL method and peer tutoring, have different impacts on the score of Economic mathematics.

Table 5. Mean Difference Between Treatments

| Mean of treatment | $\bar{Y}_{1.}$ = 78,667 | $\bar{Y}_{2.}$ = 69,667 | $\bar{Y}_{3.}$ = 54,667 |
|---|---|---|---|
| $\bar{Y}_{1.}$ = 78,667 | - | … | … |
| $\bar{Y}_{2.}$ = 69,667 | 9,00 | - | … |
| $\bar{Y}_{3.}$ = 54,667 | 24,00* | 15,00* | - |

Description: *) significant at Level 5%

Based on the results of this test, it was also determined that the learning outcomes of Economic mathematics using the lecture method and PBL did not differ significantly. This is supported by the findings of a research conducted by Kazemi & Ghoraishi, (2012), which found no significant difference between the group that learned mathematics using PBL methods and and those who learned using traditional methods. This is because, in both the traditional and PBL methods, teachers remain the center of information in the learning process.

According to Saputro et al. (2020), PBL benefits students by increasing their interest, motivation, and learning activities, assisting students in transferring student information to understand real-world situations, and providing students with opportunities to apply their knowledge in their daily lives. This method makes it simple for students to grasp this course.

College students' ability to listen and concentrate can improve when they learn with their peers (Putra et al., 2018). A meta-analysis of 50 independent studies of peer tutoring methods in mathematics at various levels of education found that 88% of these methods had a positive effect on academic performance (Alegre-Ansuategui et al., 2017). However, in this study, the peer tutoring method had the lowest mean. Given that all classes have similar abilities, this result could be due to the tutor's lack of understanding of the material provided. As a result, the process of knowledge transfer and group discussion is not ideal for Economic mathematics courses. Further research on this matter is still required.

## CONCLUSIONS AND RECOMMENDATION

Economic mathematics experiments using a completely randomized design (CRD) with the treatments of lecture method, PBL, and peer tutoring produced respective means of 78,667, 69,667, and 54,677. The peer tutoring method has a lower mean than the lecture method, which has the highest mean. According to the analysis of variance, it can be determined that the use of lecture methods, PBL, and peer tutoring has a significance value of 0,004 on the score in Economic mathematics.

Additional Tukey-HSD tests revealed that there was no difference in the utility of Economic mathematics between learning through lecture and PBL approaches. The difference between the two methodologies' means,

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

which is only 9 points, is not statistically significant. This occurred because learning activities in lecture or PBL methods still center on the lecturer as a source of information (lesson materials).

The comparison of the peer tutoring method to the lecture and PBL methods had a different effect on the Economic mathematics score. Based on these findings, the researchers do not recommend using the peer tutoring method during Economic Mathematics. However, further research to analyze these findings is still required to learn more about the factors that cause the peer tutoring method to be ineffective in Economic mathematics courses.

## REFERENCES

Alegre-Ansuategui, F. J., Moliner, L., Lorenzo, G., & Maroto, A. (2017). Peer Tutoring and Academic Achievement in Mathematics: A Meta-Analysis. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(1), 337–354. https://doi.org/10.12973/ejmste/79805

Anggorowati, N. P. (2013). Penerapan Model Pembelajaran Tutor Sebaya Pada Mata Pelajaran Sosiologi. *Komunitas: International Journal of Indonesian Society and Culture*, *3*(1), 103–120. https://doi.org/10.15294/komunitas.v3i1.2303

Ardeleanu, R. (2019). Traditional and Modern Teaching Methods in Mathematics. *Journal of Innovation in Psychology, Education and Didactics*, *23*(2), 133–140.

Hassidov, D. (2017). The Link between Teaching Methods and Achievement in Math in Computer-Assisted Elementary Schools. *Creative Education*, *08*(14), 2293–2311. https://doi.org/10.4236/ce.2017.814157

Indriani, A. M. F., & Mutmainnah, S. (2016). Metode Pembelajaran Tutor Sebaya Sebagai Upaya Meningkatkan Hasil Belajar Siswa. *Journal of Accounting and Business Education*, *2*(2). https://doi.org/10.26675/jabe.v2i2.6057

Kazemi, F., & Ghoraishi, M. (2012). Comparison of Problem-Based Learning Approach and Traditional Teaching on Attitude, Misconceptions and Mathematics Performance of University Students. *Procedia - Social and Behavioral Sciences*, *46*, 3852–3856. https://doi.org/https://doi.org/10.1016/j.sbspro.2012.06.159

Kurniawan, D., Kristen, U., & Wacana, S. (2012). Problem-based Learning. *Satya Widya*, *28*(2), 167–173. https://doi.org/10.24246/j.sw.2012.v28.i2.p167-174

Lessani, A., Suraya Md. Yunus, A., & Bt Abu Bakar, K. (2017). Comparison of New Mathematics Teaching Methods With Traditional Methods. *PEOPLE: International Journal of Social Sciences*, *3*(2), 1285–1297. https://doi.org/10.20319/pijss.2017.32.12851297

Mardini, N. I., Marlena, L., & Azhar, E. (2020). Regresi Logistik Pada

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

Model Problem Based Learning Berbantu Software Cabri 3D. *Jurnal Mercumatika: Jurnal Penelitian Matematika Dan Pendidikan Matematika*, *4*(1), 47–53.

Marlena, L., & Nugrheni, E. A. (2019). Probit Regression Analysis in Estimating the Effect of Learning Assisted by Cabri 3D on Students' Mathematical Understanding Ability. *Al-Jabar : Jurnal Pendidikan Matematika*. https://doi.org/10.24042/ajpm.v10i2.4729

Nafiah, Y. N., & Suyanto, W. (2014). Penerapan model problem-based learning untuk meningkatkan keterampilan berpikir kritis dan hasil belajar siswa. *Jurnal Pendidikan Vokasi*, *4*(1), 125–143. https://doi.org/10.21831/jpv.v4i1.2540

Perdana, S., & Slameto, S. (2016). Penggunaan Metode Problem Based Learning (Pbl) Berbantuan Media Audio Visual Untuk Meningkatkan Hasil Belajar Matematika Siswa Sekolah Dasar. *Jurnal Pendidikan Dasar Universitas Sebelas Maret*, *4*(2), 119026.

Putra, I. I., Idkhan, A. M., & Djuanda. (2018). *Analisis Faktor yang Mempengaruhi Kemampuan Penalaran dan Dampaknya Pada Penguasaan Kompetensi Teknologi Mekanik Siswa SMK Se-Kota Makassar*. Universitas Negeri Makassar.

Rosanti, D. (2018). Penerapan Metode Pembelajaran Tutor Sebaya Untuk Meningkatkan Aktivitas Dan Hasil Belajar Siswa Di Sma Negeri 9 Pontianak. *Jurnal Pendidikan Matematika Dan IPA*, *9*(2), 1. https://doi.org/10.26418/jpmipa.v9i2.26773

Safrudin, S., Kamaluddin, K., & Haeruddin, H. (2014). Penggunaan Tutor Sebaya untuk Meningkatkan Hasil Belajar Fisika Kelas X B di SMA Negeri 1 Gumbasa. *JPFT (Jurnal Pendidikan Fisika Tadulako Online)*. https://doi.org/10.22487/j25805924.2013.v1.i3.2538

Saputro, L., Sunandar, S., & Kusumaningsih, W. (2020). Keefektifan Model Problem Based Learning Berbasis Etnomatematika Terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMP Kelas VII. *Imajiner: Jurnal Matematika Dan Pendidikan Matematika*, *2*, 409–416. https://doi.org/10.26877/imajiner.v2i5.6663

Sidiq, H. A., Suhayat, D., & Permana, T. (2018). Penerapan Metode Tutor Sebaya Terhadap Hasil Belajar Siswa Pada Kompetensi Dasar Memasang Sistem Penerangan Dan Wiring Kelistrikan Di Smk. *Journal of Mechanical Engineering Education*, *5*(1), 42. https://doi.org/10.17509/jmee.v5i1.12618

Suyatno. (2009). *Menjelajah Pembelajaran Inovatif*. Masmedia Buana Pustaka.

Zulfa, A., Warniasih, K., & Wardono, W. (2019). Peningkatan Pemahaman Konsep Matematika melalui Model Problem Based Learning pada Siswa Kelas XI IPS

ISSN 2089-8703 (Print)
ISSN 2442-5419 (Online)

DOI: https://doi.org/10.24127/ajpm

2 SMA Negeri 1 Gamping. *PRISMA; Prosiding Seminar Nasional Matematika*, *2*, 371–375. https://journal.unnes.ac.id/sju/index.php/prisma/article/view/28955