The Effectiveness of Think Pair Share (TPS) Integrated Problem-Solving Learning of Students’ Mathematic Ability

M Mariamah¹, M Muslim², G Gunawan³, Arif Hidayat⁴, Suratman⁵
¹,²,⁴Mathematics Education, STKIP Taman Siswa Bima, Bima, Indonesia
³Department of Physics Education, Universitas Mataram, Mataram, Indonesia
⁵English Educations, STKIP Taman Siswa Bima, Bima, Indonesia

Abstract. Generally, mathematical communication skills are still facing the problems. This is based on the results of the PISA study and some previous research results. The problem that occurs is that students are still not quite right in using mathematical symbols, the use of graphs and tables as well as the ability to explain arguments mathematically is still low. Mathematical communication skills are needed and can be used in solving problems. Research aims to describe the improvement of students' mathematical communication skills through the application of problem solving integrated Think Pair share (TPS) in mathematics. This research is an experimental research with two design pretest-posttest group. The instrument consisted of test instruments. The data analysis of the results of the study used the t-test. The results of the study obtained a t count of 9.143 when it is compared to the table with a value of 1.708. The significant value is 0.000 <0.05 so that Ho is rejected or the Think Pair Share (TPS) integration problem solving learning model can improve students' mathematical communication skills.

Keywords: Problem Solving, Think Pair Share, Mathematical Communication

1. Introduction

Mathematical communication is an ability that is still facing problems among students. Though this ability is very important that must be possessed by students to solve problems in daily life. Mathematical communication skills are needed to be used in solving mathematical problems. Students can use reasoning well, are able to illustrate ideas and ideas into mathematical models and students are able to connect processes into mathematical concepts and can be used in everyday life. Many previous research results state that students' communication skills are still relatively low. The results of the study stated that the test results of students' mathematical communication skills obtained an average value of 30.58, which means that students' mathematical communication skills in solving problems are still relatively low. Roheti and Purmiati in their article Nuraini & Edy Surya that the average value of students' mathematical communication skills obtained from the test results is still in low category, this is known from the students' responses to the given communication problems. The results of other studies stated that the cause of the lack of students' responses to communication problems as a result of problem solving problems and communication provided is still considered as a new thing so that students have difficulty in solving problems.

In 2015, according to the results of the Program of International Student Assessment (PISA) under the Organization for Economic Cooperation and Development (OECD) that Indonesia ranked 69 out of 72 countries with an average score of 368 with a low category in the mapping of students' mathematical abilities. Other data that shows that the ability of mathematical communication is low namely from the results of research (Ibrahim, 2011 ),Haryadi, R. & Hodiyanto, 2018), (Aguspinal,
and (Hodiyanto, 2017) that Mathematical communication skills of students and students are not in accordance with what is expected. The same thing is experienced in this study that students in schools are still found errors in the use of symbols, graphics, images and lack of detail in describing the answers to questions given. Of the various problems encountered, it is very important to find solutions because mathematical communication skills are important to give to students. The OECD states that more attention is needed in learning relation to the mathematical communication skills of students who are still relatively low [8]. According to (Anwar, Chorudin, Ningsih, Dewi & Maseleno: 2019) states that mathematical communication skills need to be developed so that students can communicate ideas and can formulate problem solutions. Menurt (Fajri, 2015) states that mathematical communication is an important ability because through communication students can clarify connections and can share ideas. As the result of this ability, so that it becomes one of the goals that must be achieved in learning mathematics. According to Minister of Education Regulation number 22 of 2006 regarding this standard, one of the goals of mathematics learning is that students communicate ideas or ideas through tables, symbols, diagrams / graphs, or other media in order to clarify a problem or state. This is also supported by the National Council of Teachers of Mathematics (NCTM) that in general the aim of learning mathematics is that students have mathematical communication skills. Students who have mathematical communication skills if the student is able to express mathematical ideas clearly and coherently [8]. Mathematical communication is a technique of students in expressing or interpreting mathematical ideas / ideas both verbally and in writing can be in the form of tables, pictures, formulas or mathematical symbols [13]. To achieve the above mathematics learning goals, it is necessary to make various efforts by the teacher such as implementing student-centered learning models, non-boring learning and learning that can encourage students to have good mathematical communication skills, think critically, creatively, and able to solve problems. The factors causing the low mathematical communication skills of students according to the results of previous studies is the learning models used are still less varied and not in accordance with the material being taught, students have not mastered the prerequisite material and lack of facilities and infrastructure [14]. By knowing the factors causing the low communication skills This mathematical solution needs to be found to find a problem that is by determining a model or approach that can improve students' mathematical communication skills. According to Ansari, communication skills can be developed through the application of learning models that can encourage students to think, discuss, and be able to describe the answers to problems raised by the teacher. The learning model chosen is problem solving. According to Melianingsih & Sugiman, the model PS learning in mathematics learning can improve students' mathematical communication skills. According to Mwelese and Wanjala if the study program is carried out well, students can improve their experience / knowledge that have been obtained previously, can consider other ways of solving problems, and can write problem solving well including good communication skills [17].

The application of PS in this research is integrated with the cooperative type of think pair share. Think-pair-share (TPS) is a cooperative learning model that is designed so that students are trained to get used to communicating, expressing various ideas and ideas in their minds during the learning process, both to teacher or friend. The stages of TPS learning are think (pair), pair (pair), and (share) sharing. Students are paired with a team partner, at the pair and share stages communication skills are needed to be able to convey ideas and ideas to other couples in the class so that they can be understood, so that the TPS learning model can develop students' mathematical communication skills. The syntax of the application of the integrated TPS problem solving model is starting with the stages: 1) determining pairs, 2) the stage of giving problems, 3) the Think stage (at this stage all students are given time to think for themselves by applying the problem solving problem solving steps ie starting from understanding the problem, collecting data, completing, re-evaluating), 4) pair stage (students discuss with their respective partners to decide the answer to the problem given), 5) share stage (at this stage all pairs convey to other pairs about the answer to the problem given). By combining the application of PS with TPS this can improve students' mathematical communication abilities.
2. Method

The type of research is a quasi-experimental study, using the design of 2 classes by providing initial tests and final tests. The design is as follows:

| Class  | Pret-test | Treatment | Post-test |
|--------|-----------|-----------|-----------|
| Experiment | $A_e$ | $X_e$ | $B_e$ |
| Control | $A_k$ | $X_k$ | $B_k$ |

Explanation:
Ae: Provision of experimental class tests
Ak: Giving post-test to the control class
Be: Provision of experimental class tests
Bk: Post-test for the control class
Xe: Learning with the integration problem solving model Think Pair Share (TPS)
Xk: Regular learning

The sample of this study took all population classes consisting of only two classes, one class would be a control class with 24 students and one class would be used as an experimental class with 26 students. The instrument used was a test instrument to measure students' mathematical communication abilities. The instrument was first tested to find out which questions were valid and reliable. The indicators of mathematical communication ability used in this study are:

| No soal | 1 | 2 | 3 | 4 |
|---------|---|---|---|---|
| the ability of illustrating the ideas of mathematics, symbol, and graphic and pictures | Able to write down the known and asked elements of the question accurately | 5 | 5 | 5 | 5 |
| | Able to write unsure-known and asked elements of the question but still confused | 4 | 4 | 4 | 4 |
| | Able to write down the known and asked elements of the question | 0 | 0 | 0 | 0 |
| | Able to sound answers systematically and use symbols correctly | 20 | 20 | 20 | 20 |
| | Able to sound answers systematically and use symbols but there are still errors | 15 | 15 | 15 | 15 |
| | Not able to sound answers systematically and use symbols in writing | 0 | 0 | 0 | 0 |
| Sum of Score | 25 | 25 | 25 | 25 |
| Total Score | 100 |

The Analysis of research data using t-test at a significant level of 5%. Before conducting the t test, first test the normality and homogeneity. The data normality test is used by the Shapiro-Wilk formula because the number of samples is less than 100. The decision of the test results uses a significance level of 5% with the criteria: if the significance value is greater than 0.05 then the data is said to be normally distributed. To test homogeneity, Box-M is used at a significance level of 5% and a homogeneous sample condition if the significance value or probability value is more than 0.05. To test the research hypothesis using the two independent sample t test. The t test is as follows:
\[ t = \frac{x_1 - x_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \]  

The test results will be interpreted based on the t value. Ha is accepted if the t-value is greater than t-table at a significant level of 5%.

3. Research Result

The following will describe the results of research data ranging from the average value, minimum and maximum values, standard deviations and variances.

| Table 3. Descriptive Data of Pretest and Post-test of Mathematical Communication Ability |
|-----------------------------------------------|---------------|----------------|----------------|
| Descriptive                                  | Control class | Experiment Class |                |
|                                              | Pret-test     | Post-test       | Pret-test      | Post-test     |
| Average                                      | 18.67         | 73.50           | 18.85          | 84.73         |
| Maximal score                                | 30            | 95              | 28             | 96            |
| Minimal Score                                | 10            | 50              | 10             | 64            |
| Simpangan baku                               | 5,768         | 10,843          | 4,567          | 8,215         |
| Variance                                     | 33,275        | 117,565         | 20,855         | 67,485        |

The data description in table 3 above shows that the average value of the initial test in the experimental class was 18.85 and the control class was 18.67. The average value of these two classes is almost the same as the difference of 0.18. The final test score of the experimental class was 84.73 and the control class was 73.50. The average value of the two classes on the final test has a difference with a difference of 11.23. For the maximum and minimum values of the initial test experimental classes 28 and 10, respectively for the final test successively 96 and 64. While in the control class for the test initially 30 and 10, respectively, the final test 95 and 50, respectively.

Before conducting the t test, first conduct a prerequisite test that is the normality test. The normality test is done with the help of SPSS 16 software for windows. The normality test results can be seen in the following table:

| Table 4. Result of Normality Test          |
|--------------------------------------------|
| Class           | Significant result Test | Sig (α) | Explanation |
| Control (n = 24) | 0.434                 | 0.300   | Normal      |
| Experiment (n = 26) | 0.601           | 0.152   | Normal      |

Based on the results of the analysis above, it shows that the data normality test for both classes in both the pret-test and post-test data shows that the data are normally distributed. Homogeneity test is done to test the similarity of variance in the sample used. Homogeneity test was carried out with the help of SPSS 16 of windows software and Microsoft officel excel. Homogeneity test results obtained homogeneous results with a significant value at the pretest of 0.284, the significance value is greater than 0.05

To test the research hypothesis using a t-test with a significant level = 0.05 with degrees of freedom (dk = n-1) respectively 26 - 1 = 25 and 24 - 1 = 23. The results of the effectiveness test can be seen in the following table:
Table 5. The result of the learning effectivity result

| Class         | Variabel          | $t_{Table}$ | $t_{hitung}$ | Value | Df | Sig (2-tailed) | Explanation   |
|---------------|-------------------|-------------|--------------|-------|----|----------------|---------------|
| Experiment    | Mathematic        | 1,708       | 9,143        | 70    | 25 | 0,000          | Efektive      |
|               | Communication     | 1,714       | 1,581        | 70    | 23 | 0,127          | Not Efektive  |
| Control       |                   |             |              |       |    |                |               |

Based on the table above, it can be seen that in the experimental class using the problem solving learning model with a test-value of 70 obtained $t$ count is 9,143 when compared with $t$ table of 1.708 with a significant value of 0,000 <0.05, then H0 is rejected. It can be concluded that the learning model Problem Solving integration of Think Pair Share (TPS) is effective in terms of students' mathematical communication skills. In the learning control class with the lecture method with a test-value of 70 obtained a $t$ count of 1.581 compared to the $t$-table value of 1.714 while a significant value of 0.127> 0.05, then H0 is accepted. It can be concluded that the lecture method is not effective in terms of students' mathematical communication skills.

4. Discussion

The study begins by providing initial tests to ensure that both study samples have the same variance. Box-M test results at a significance level of 5% obtained a significant value of 0.284, these results indicate that a significant value is greater than 0.05, which means both samples are homogeneous. While the results of normality test data using Shapiro-Wilk obtained significant value of the experimental class for the initial test of 0.601 and the final test of 0.152. Whereas the control class for the initial and final tests had a significance value of 0.434 and 0.300. Significant values for both classes in the initial and final tests showed values greater than 0.05 so that it was concluded that the data were normally distributed. After testing the analysis prerequisites, it is continued by testing the hypothesis to find out the effectiveness of the TPS integrated problem solving model for students' mathematical communication skills. From the data obtained regarding the application of the TPS integrated PS model showed significant results on improving students' mathematical communication skills. The application of this learning encourages students to discuss in solving the problems given. This has a positive impact on group members, students exchange ideas, express ideas and ideas and encourage group members to be creative in solving problems. The final test results show different mean values between the experimental class and the control class. The experimental class got a higher average score of 84.73 compared to the control class which was only an average of 73.50. Hypothesis testing results obtained $t$ value of 9.143 at a significant level of 5% with a $t$ table value of 1.708. This shows that $t$ arithmetic is greater than $t$ table which means that the application of integrated problem solving models with TPS has a positive effect on students' mathematical communication skills. Application of the integrated TPS problem solving model is carried out by giving problems to be solved by each partner, all couples get problems to be solved through discussion. Each pair thinks individually about ways to solve problems starting from identifying, collecting data, solving problems and re-evaluating the results of the settlement. After each thought of ways to resolve, each pair then discusses to unite opinions, so that it can be presented to other pairs. Learning steps are carried out based on the steps of the collaboration between the problem solving model with TPS. Where TPS is carried out with three main stages namely Think, Pair and Share [19]. At the think stage, each student applies the problem solving stage which consists of identifying, collecting data, application and re-evaluating the results of the completion. From the collaboration model problem solving with TPS gives significant results on communication skills. According Suryasubroto that learning with problem solving can improve student understanding [20]. Students with a good understanding of the material, will have implications for good communication skills as well. In line with the results of Jamila's research that students who have high communication ability have high achievement and understanding of concepts [21]. Menurt Cotton that more mathematics learning involves students to be actively involved, students can develop their knowledge verbally when they present the results of their
thoughts, besides verbally, students can also write down their mathematical ideas through problem solving given in writing [22].

From the results of the application of the TPS integrated problem solving model, it provides an opportunity for all students to think, express their ideas, share with each other and encourage students to be able to communicate the results of mathematics completion both verbally and in writing. Mathematical communication skills that look like they are able to use mathematical symbols correctly, describe answers in detail, are able to convey mathematical ideas smoothly and correctly as well as good understanding of material. The opportunities given to students to communicate and convey ideas lead to an integrated problem solving model TPS successfully developing students' mathematical communication skills. According to Azizah (2018) that students who are given the opportunity to share their experiences and ideas in groups will improve students' communication skills, both communicating with fellow students and communicating with teachers. The success of this research is also caused by:

a. students are given space to convey their mathematical ideas both through writing and orally,
b. there is an opportunity for students to change their understanding of oral or written form into drawing form,
c. students are given the opportunity to solve problems both individually and in groups.

Mahmudi (Tamyah, 2015) states that learning that provides a challenge for students to think and communicate their ideas both verbally and in writing, then indirectly students have good communication skills to compile ideas that are more structured. The results of this study are in line with the results of previous studies that PS is effective against improving students' mathematical communication skills. Like the results of Ali Hukandad's research, Akhter & Khan that PS is better than other learning in terms of students' mathematical communication abilities. Likewise the results of research conducted by Perveen in 2010. According to Surya's research results that problem-based cooperative learning can encourage students to solve problems in daily life including in the use of mathematical symbols and formulas. The results of Hartini, Maharani, and Rahman convey the results of their research that the application of TPS in mathematics learning shows significant results in improving students' mathematical communication skills. The average value obtained is higher than the average value of students' mathematical communication skills using conventional learning [28]. Nadila et al. stated that the results of research in the form of scores of mathematical communication ability scores, based on the results of the hypothesis using the t-test obtained significant results that the application of the TPS learning model has an effect on increasing students' mathematical communication skills [29].

5. Discussion and Recommendations

From the results of this study obtained information that the application of integrated problem solving TPS can improve students' mathematical communication skills. From the results of this study it can be recommended for teachers to apply the TPS integrated PS learning model to develop students' mathematical communication skills.
6. Conclusion

Based on the data analysis above, it can be concluded that the problem-based learning method integrated with Think Pair Share can influence the mathematic ability of students’ communication.

References

[1] Tinungki, Maria Georgina. (2015) “The Role Of Cooperative Type Team Assisted Individualization TO Improve the Students’ Mathematics Communication Ability in the Subject of Probability Theory” Journal of Education and Practice 6.No. 32

[2] H. Hodiyanto. 2017. engaruh Model Pembelajaran Problem Solving Terhadap Kemampuan Komunikasi Matematis Ditinjau dari Gender. Jurnal Riset Pendidikan Matematika.4 (2), 2017, 219-228. Available online at http://journal.uny.ac.id/index.php/jrpm

[3] Nuraini, Edy Surya. Perbandingan Kemampuan Komunikasi Matematis Siswa Yang Belajar Dengan Model Pembelajaran Kooperatif Tipe Think Talk Write dan Tipe Think Pair Share di SMP Negeri 3 Percut Sei Tuan. Jurnal Inspiratif, Vol 3, No. 3 Desember 2017.

[4] Fachhrurazi, (2011), PenerapanPembelajaran Berbasis Masalah Untuk Meningkatkan Kemampuan Berpikir Kritis dan Komunikasi Matematis Siswa Sekolah Dasar,Forum Penelitian Edisi Khusus No. 1, hal 76-89.

[5] Ibrahim. (2011). Peningkatan Kemampuan Komunikasi, Penalaran, dan Pemecahan Masalah Matematis Serta Keceerdasan Emosional Melalui Pembelajaran Berbasis-Masalah Pada Siswa Sekolah Menengah. UPI Bandung.

[6] Haryadi, R. & Hodiyanto, H. (2018). Diskripsi Kemampuan Komunikasi Matematis Mahasiswa. In Seminar Nasional Penerapan Ilmu Pengetahuan dan Teknologi (PIPT). Pontianak: UNTAN: Pontianak.

[7] Hodiyanto, H. (2017a). Kemampuan Komunikasi Matematis Dalam Pembelajaran Matematika. Jurnal Ilmiah Pendidikan Matematika, Ilmu Matematika Dan Matematika Terapan, 7(1), 9–18.

[8] OECD. 2016. PISA 2015 Results (Volume I) Excellent and Equity in Education.(Online), (https://www.oecd.org/pisa/pisa-2015-results-in-focus.pdf),diakses 12 September 2019.

[9] Anwar, M. S., Choirudin, Ningsih, E. F., Dewi, T., & Maseleno, A. (2019). Developing an Interactive Mathematics Multimedia Learning Based on Ispring Presenter in Increasing Students’ Interest in Learning Mathematics. Al-Jabar :Jurnal Pendidikan Matematika, 10(1), 135–150.https://doi.org/10.24042/ajpm.v10i1.4445

[10] Fajri, N. (2015). Korclasi Antara Kemampuan Koneksi dan Komunikasi Matematis Siswa Dengan Menggunakan Pendekatan Contextual Teaching And Learning (CTL). Numeracy, 2(1), 149–161.

[11] Permendiknas No. 22 tahun 2006 mengenai standar isi

[12] NCTM. (2000). Principles and standards forschool mathematics. The United State ofAmerica

[13] Lomibao, L. S., Luna, C. A. & Namoco, R. A.(2016). The influence ofmathematicalcommunication on students’ mathematicsperformance and anxiety. AmericanJournal of Educational Research, 4 (5),378-382

[14] Prayitno, S., Suwarsono, & Siswono, T. Y. (2013). Identifikasi indikator kemampuan komunikasi matematis siswa dalam menyelesaikan soal matematis berjenjang pada tiap-tiap jenjangnya.Konverensi nasioanl pendidikan matematikaV, 27-30 Juni 2013. Malang: universitas negeri Malang

[15] Ansari, B. I. (2012). Komunikasi matematik dan politik. Banda Aceh: Yayasan Pena.

[16] Melianingsih, N., & Sugiman, S. (2015). Keefektifan pendekatan open-ended dan problem solving pada pembelajaran bangun ruang sisi datar di SMP.Jurnal Riset Pendidikan Matematika, 2(2), 211 - 223. doi:http://dx.doi.org/10.21831/jrpm.v2i2. 7335

[17] Mwelese, J. K. & Wanjala, M. S. M. (2014). Effect of problem solving strategy school students’ achievement in circle geometry in Emuhaya District of Vihiga County.Journal of Education, Arts and Humanities, 2, 18-26.

[18] Hartini, Maharani, Z. dan Rahman, B. 2016. Penerapan Model Pembelajaran Think Pair Share untuk Meningkatkan Kemampuan Komunikasi Matematis Siswa SMP.Jurnal Pendidikan
Matematika. (Online), Vol. 7, No. 2, (https://journal.unnes.ac.id/nju/index.php/kreano/article/download/5009/6223), diakses 21 Februari 2019.

[19] Huda, Miftahul. (2014). Model-model Pengajaran dan Pembelajaran. Yogyakarta: Pustaka Pelajar.

[20] Suryobroto. (2009). Proses Pembelajaran di Sekolah. Jakarta: PT Asdi Mahasatya.

[21] Jamilah. (2013). Eksperimentasi Pendekatan Pendidikan Matematika Realistik (PMR) dengan Metode Discovery Learning pada Materi Pokok Bentuk Aljabar Ditinjau dari Kemampuan Komunikasi Matematis. Tesis. Tidak Diterbitkan. Surakarta: UNS.

[22] Cotton, Kimberly Hirschfeld. (2008). Mathematical Communication, Conceptual Understanding, and Students’ Attitudes Toward Mathematics. Jurnal pada In partial fulfillment of the MAT Degree Department of Mathematics University of Nebraska-Lincoln: tidak diterbitkan.

[23] Azizah, S. N., & Wahyudi, W. (2018). Penerapan Model TTW Berbasis Saintifik Untuk Meningkatkan Hasil Belajar Tema Kebersamaan Siswa Kelas II. JINoP (Jurnal Inovasi Pembelajaran), 4(2), 160-171.

[24] Surya, E. 2009. “Pembelajaran Kooperatif dengan Pendekatan Berbasis Masalah dalam Pemecahan Masalah Matematika”. Jurnal Pendidikan Matematika dan Sains, IV (1), 14-17.

[25] Tamyah, A., Asnawati, R., & Djilil, A. (2015). Efektivitas Model Problem Based Learning Ditinjau dari Kemampuan Komunikasi Matematis Siswa. Jurnal Pendidikan Matematika Unila, 3(2).

[26] Ali, R., Hukamdad., Akhter, A., & Khan, A. (2010). Effect of using solving method in teaching mathematics on the achievement of mathematics students. CCSE Asian Social Science, 6(2), 67-72.

[27] Perveen, K. (2010). Effect of the problem-solving approach on academic achievement of students in mathematics at th secondary level. Contemporary Issue In Education Research, 3(3), 9-14.

[28] Hartini, Zhana Zhefra Maharani, Bobbi Rahman. Penerapan Model Pembelajaran Think Pair-Share untuk Meningkatkan Kemampuan Komunikasi Matematis Siswa SMP. Kreano Jurnal Matematika Kreatif-Inovatif, 7 (2) (2016): 131-135

[29] Nadila Rizkiana, M. Coesamin, Agung Putra Wijaya. Efektivitas Model Pembelajaran Think Pair Share Ditinjau dari Kemampuan Komunikasi Matematis Siswa Jurnal Pendidikan Matematika Unila, Volume 7, Nomor 2, Juni 2019, H.246

[30] Husna, Ikhsan, M., dan Fatimah, Siti. 2013. Peningkatan Kemampuan Pemecahan Masalah dan Komunikasi Matematis Siswa Sekolah Menengah Pertama Melalui Model Pembelajaran Kooperatif Tipe Think Pair Share (TPS).Jurnal Peluang. (Online), Vol. 1, No. 2, (http://www.jurnal.unsyiah.ac.id/peluang/article/download/1061/997), diakses 21 Februari 2019

[31] Munifah., Tsani, I.,Yasin, M., Zuroidah, N., Huda, S., Lestari, F., & Rahmat, A. (2019). Management Development of Student Worksheets to Improve Teacher Communication Skills: A Case Study Self-Efficacy and Student Achievement. Journal for the Education of Gifted Young Scientists, 7(4), 777-798. DOI: http://dx.doi.org/10.17478/jegys.625618

[32] Saregar, A., Latifah, S., & Sari, M. (2016). Efektivitas Model Pembelajaran CUPs: Dampak terhadap Kemampuan Berpikir Tingkat Tinggi Peserta Didik Madrasah Aliyah Mathla’ul Anwar Gisting Lampung. Jurnal Ilmiah Pendidikan Fisika Al-Biruni, 05(2), 233–243.https://doi.org/10.20402/jpifalbiruni.v5i2.123

[33] Saregar, A., Marlina, A., & Kholid, I. (2017). Efektivitas Model Pembelajaran ARIAS ditinjau dari Sikap Ilmiah: Dampak terhadap Pemahaman Konsep Fluida Statis. Jurnal Ilmiah Pendidikan Fisika Al-Biruni, 06(2), 255–263. https://doi.org/10.20402/jpifalbiruni.v6i2.2181

[34] Mariamah. 2014. Penerapan Pembelajaran Kooperatif Number Head Together (NHT) Untuk Meningkatkan Kemampuan Komunikasi Matematika Siswa Kelas VIII SMP IT Suhadah Yogyakarta Mariamah. Jurnal Pengkajian Ilmu dan Pembelajaran Matematika dan IPA “PRISMA SAINS” Vol. 2. No.1