The Use of NHT and TPS Assisted by Zoom Meetings on the Problem Solving Ability of Elementary School Students

Sri Lestari Handayani[1*], Muamar Isyanto[2], Khairil Ibrahim[3], Kusmajid[4] ID

[1,2,3,4] Pendidikan Guru Sekolah Dasar, Universitas Muhammadiyah Prof. DR. HAMKA, Jakarta, Indonesia

A B S T R A K

Pembelajaran IPA di sekolah dasar masih dilakukan secara konvensional yang mengakibatkan kurangnya kemampuan pemecahan masalah pada siswa. NHT dan TPS merupakan variasi metode yang dapat menunjang kemampuan pemecahan masalah siswa. Penelitian ini dilakukan untuk menganalisis perbedaan kemampuan pemecahan masalah IPA siswa antara penerapan pembelajaran NHT dan TPS materi bunyi kelas IV Sekolah Negeri. Penelitian ini dilakukan dalam bentuk penelitian eksperimen dengan menggunakan Quasy Eksperimental Design. Desain yang digunakan yaitu Non Equivalen Control Group Posttest Design. Populasi dalam penelitian ini adalah sebanyak 58 siswa di kelas IV. Pengambilan sampel dilakukan dengan teknik sampel jenuh pada kelas IV A dengan jumlah 28 siswa sebagai kelas eksperimen I (NHT) dan Kelas IV B dengan jumlah siswa 30 yang diberi perlakuan TPS. Pengumpulan data yang digunakan berupa tes dalam bentuk post-test. Hasil tersebut menunjukkan bahwa terdapat ketidaksamaan atau perbedaan antara kemampuan pemecahan masalah siswa kelas IV pada kelas eksperimen I (NHT) dan kelas eksperimen II (TPS) khususnya pada materi bunyi. Model NHT yang diterapkan lebih berpengaruh terhadap kemampuan pemecahan masalah siswa dalam proses belajar mengajar dibandingkan dengan model TPS.

A B S T R A C T

Learning science in elementary schools still carried out conventionally which results in the lack of problem solving abilities in students. NHT and TPS are a kinds of methods that can support students' problem solving abilities. This study was conducted to analysis the differences in students' science problem-solving abilities between the application of NHT and TPS learning materials for class IV public schools. This research was conducted in the form of experimental research using Quasy Experimental Design. The design used is Non Equivalent Control Group Posttest Design. The population in this study were 58 students in class IV. Sampling was carried out using a saturated sample technique in class IV A with a total of 28 students as experimental class I (NHT) and Class IV B with a total of 30 students being treated with TPS. The data collection technique used a test in the form of a posttest. These results indicate that there are dissimilarities or differences between the problem-solving abilities of fourth-grade students in experimental class I (NHT) and practical class II (TPS), especially in sound material. The NHT model that is applied has more influence on students' problem-solving abilities in the teaching and learning process compared to the TPS model.

1. INTRODUCTION

Natural Sciences is taught to student since in elementary schools and is taken and is required at every level of education. Science subjects are one of the subjects in elementary schools that emphasize the curiosity of students scientifically. Natural Science is a systematic way of explore nature, so that it is not only the ability to master various accumulated knowledge which can be in the form of facts, concepts, or principles but a process of discovering (Cavus & Alhih, 2014; Kurniawan et al., 2019; Tanti et al., 2021). Therefore, the Natural Science subjects given are not only about memorizing and understanding theory, but how we act, do, and solve a problem. This definition states that science is a form of effort in various experiences that can develop process skills, understanding concepts, application of concepts, scientific attitudes, and is based on natural science learning activities on issues developed in society (Kibirige & Teffo, 2014; Madu, 2020; Mouromadhoni et al., 2019).

The process of learning science in elementary schools so far is still carried out conventionally which results in the lack of problem solving abilities in students (Kartikasari et al., 2018; Leasa et al., 2021; Rochman et al., 2019). The practic of the learning process is only directed at the ability to memorize and understand theory so that students find it difficult to relate it to situations in everyday life. Science

Corresponding author.
E-mail addresses: srilestarih@uhamka.ac.id (Sri Lestari Handayani)

learning in elementary schools is also still less emphasis on the curiosity attitude of students scientifically, but it is always about memorizing and understanding theory, so that students are lacking in how to act, do, and solve a problem (Etobro & Fabinu, 2017; Giselsson, 2020; Rostika & Junita, 2017). Natural Science is a theoretical knowledge that is obtained or compiled by finding out and doing, it will assist students to achieve a rooted understanding which is a process (human effort to understand the universe), procedure (appropriate observations and correct procedures) and produce a product or conclusion (Nugraha, 2018; Utaminingsih et al., 2018; Widowati et al., 2017). The implementation of the science learning process is directed at the ability to develop scientific skills and attitudes in students so that they are able to relate them to situations in everyday life. The science learning process in elementary schools does not only memorize concepts for students, but they must to comprehend, observe, analyze and solve problems which will be useful for everyday life through science subjects (Asmahasanah et al., 2018; Wahyuni et al., 2020; Yamin & Karmila, 2020).

Problem solving ability is the activity of higher order thinking skills to solve a problem in accepting new problems. Problem solving ability is power of a person to use the inspiration of his deep thinking so as to encourage scientific thinking which is expected in the learning process (Chasanah, 2019; Muzaki & Masjudin, 2019; Rostika & Junita, 2017). Problem solving leads to the efforts needed by students for the problems experienced and how students act to determine a way out in solving a problem. Some methods that support problem solving skill are NHT and TPS methods. NHT is a cooperative learning model by discussing in groups where each student is given a number and has the same opportunity to answer questions by calling the number randomly proposed by the teacher (Anggraini et al., 2021; Tusyana & Luciana, 2019; Wati & Suarni, 2020). In the NHT model, students are directed to be able to participate actively by using numbered heads in their groups. In process learning by applying the NHT model, students study in groups where each member is liable for the group's work (Astuti, 2019; Kurnia & Damayani, 2019; Yenni, 2016). The NHT model is expected to activate students, motivate students, and invite students to think creatively in solving problems (Maman & Rajab, 2016; Simanungkalit, 2021; Sudewiputri & Dharma, 2021). According to Previous study the NHT model is one of cooperative learning type that design to affect the interaction patterns of student and it can be as an alternative to traditional classroom structures (Pramestika et al., 2019).

While the TPS model requires students to think and find the answers in pairs. The TPS emphasizes that every student are first given the opportunity to think individually, then students make a discussion with their partners and then present the results of their thoughts (Anggreni et al., 2017; Meilana et al., 2020; Mufarizuddin., 2018). According to previous study TPS model is thinking in pairs in interacting with other students to appreciate any differences that exist and be responsible for learning activities (Utami et al., 2020). TPS is applied to students to let them to think, to give respond and to assist one and other in group learning. It presents inspiration such as thinking time as a solid aspect in improving students' skills in responding toward problems. Learning techniques and learning steps in the TPS model consist of Session one, think (thinking), Session two, pair (pairs), and the third session, share (sharing) (Kadek Yogi Parta, 2016; Ulya et al., 2013).

The learning process of NHT and TPS during pandemic has made the implementation of learning activities by online. In order to reduce and suppress the spread of the virus, the learning that was originally carried out in schools was diverted by changing all educational activities into learning at home via online or online. Teachers are required to understand information and communication technology in order to make it easier for teachers to provide direction to students in learning (Fitriansyah et al., 2020; Ningsih et al., 2019; Yu et al., 2021). Learning through online or online using digital technology, namely zoom meetings. Zoom meetings are one of the online platforms or applications that are often used to carry out online or remote activities such as meetings, dialogues and virtual or not face-to-face learning and distance education (Assidiqi & Sumarni, 2020; Novayulianti, 2021; Sadikin & Hamidah, 2020). Zoom meeting is an application that basically fits the demands of the industrial revolution 4.0 by emphasizing on system digitization or technology-based (Kelana et al., 2021; Novayulianti, 2021; Susanti & Kristin, 2021). This study observes the problem solving ability of students in learning science content. Therefore, an experiment has been carried out using one of the methods for researching science content learning in elementary schools. This study aims to analysis the differences in students' science problem solving abilities between the application of the NHT and TPS learning models in the fourth grade sound material at SDN Batu Ampar 02 Pagi, East Jakarta.

2. METHOD

The population in this study were fourth grade students at Sekolah Dasar Negeri Batu Ampar 02 Pagi, East Jakarta. There are 58 students, divided into 32 student as member of first experiment class and

26 student as member of second experiment class students. The sample of this study using the Quasy Experimental Design method was carried out with the saturated sample technique in class IV A by being treated with Numbered Heads Together (NHT) and Class IV B by being treated with Think Pair Share (TPS). The data collection technique used a subjective test in the form of a posttest. In the experimental class I was given Numbered Heads Together (NHT) treatment, while the experimental class II was given Think Pair Share (TPS) treatment. After the two classes were given different treatments, they were then given a final test to determine students' understanding after being given treatment. The results of the final test of both class was analyzed and then compared to test the differences using statistical tests on students' problem solving abilities.

3. RESULT AND DISCUSSION

Result

The results of data analysis (Post-Test) conducted on fourth grade students at Sekolah Dasar Negeri Batu Ampar 02 Pagi East Jakarta, involving class IV A as the experimental class I which was treated with the NHT model and class IV B as the experimental class II given the TPS model treatment can be observed in Figure 1.
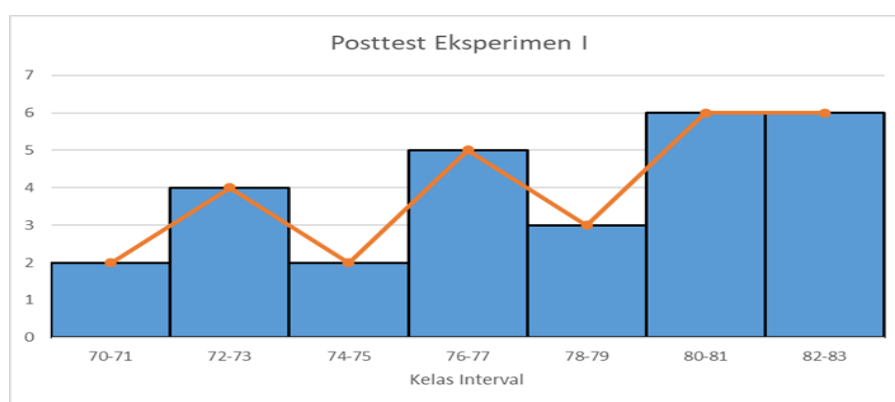

Figure 1. Frequency Distribution of Students' Science Problem Solving Ability Scores in Experiment I Class

Based on Figure 1 show the results of the Experiment I class research as many as 28 students using the NHT model, the results data (Post-Test) obtained the lowest dan highest score in ar row are 70 and 82. Frequency distribution of the results of students' science problem solving ability scores for the post-test in the Experiment I class using the NHT model on the sound properties material, the score ranges from 70 to 82 with a total of 28 students as respondents. Frequency distribution of students' science problem solving ability scores in Experiment II class is show in Figure 2.

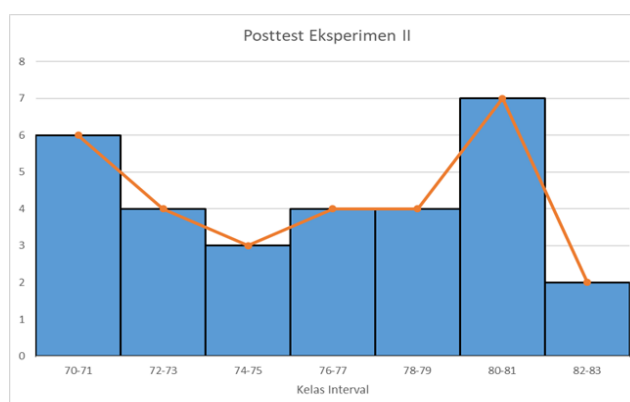**Figure 2.** Frequency Distribution of Students' Science Problem Solving Ability Scores in Experiment II Class

Based on Figure 1 and Figure 2 for the frequency distribution of the results of students' science problem solving ability scores for the post-test in the Experiment II class using the TPS model on the

material properties of sound, the score ranges from 70 to 82 with a total of 30 students as respondents. The data on the value of the results of problem solving abilities in the Experiment II class by applying the TPS model obtained the result data (Post-Test) which obtained the lowest and highest score in a row were 70 and 82. Based on data analysis shows that the experimental class I with 28 students (N) has an average of 78.7. Meanwhile, in the experimental class II with 30 students (N) the average score was 76.16. From Table 1, it can be seen that there is a difference in the Posttest average, which is 2.54. Before analyzing the data, the researcher first conducted a normality and homogenity test on the data of post test. The normality test calculation for the Experiment I class (Post-Test) with the NHT model, it was obtained that 0.119 < 0.167 at the real level = 0.05 with n = 28. It shows that the data of Post-Test Experiment I is normal. While the calculation of the normality test for the Experiment II class (Post-Test) with the TPS model, it was obtained that 0.146 < 0.161 at the real level = 0.05 with n = 30. It shows that the data of Post-Test Experiment II is normal. The homogeneity test of two population variances from two groups was carried out using Fisher's exact test. From the test results obtained F_{count} = 1.06621 and F_{table} = 1.87513 at a significant level of 0.05. Because it does not exceed the variance of the two groups is homogeneous. Next, the data was analyzed using t-test. The results is showned in Table 1.

Tabel 1. T-test Result

Group	α	t_{count}	t_{table}	Decision	Conclusion
Experiment	0.05	4.21	2.00	H_a accepted	There are differences in students' science problem solving abilities

From Table 1, show the results of the calculation of the price t_{count} = 4.21 and t_{table} = 2.00 at the significant level = 0.05. This shows that H_0 is rejected. It means that students' science problem solving abilities between two class is a significant different. The difference the problem solving abilities of fourth grade students between students who follow the NHT and the others who follow the TPS model is because there are differences in the stages of learning activities and delivery of material.

Discussion

Based on result, it has been explained that in research on students' science problem solving abilities there are differences between the application of the NHT and TPS learning models. The hypothesis test shows that t_{count} = 4.21 and t_{table}= 2.00 at the significant level = 0.05. This shows that it is greater than (4.21 > 2.00) then H_0 is rejected. That is to say that the students' science problem solving abilities of both class (NHT and TPS) is not same. One of research states that learning outcomes using the NHT model is better than the TPS model (Juliartini & Arini, 2017). Through the NHT model in learning will encourage students to be more active because NHT has a characteristic that is numbering where the teacher appoints one student according to the numbering to represent the group (Pramestika et al., 2019; Simanungkalit, 2021).

This method aims to involve all students through out the learning activities. The group must ensure that each member of the group is able to master the material given by the teacher, this can make students exchange ideas or opinions to find the most appropriate answer collaboratively and train students' responsibility to try to master the material from the teacher. The learning model in the experimental class I using NHT is superior to the use of TPS in the experimental class (Kadek Yogi Parta, 2016; Meilana et al., 2020). In the use of the NHT model students are better and effective compared to the TPS model. In the NHT model, students tend to be more explore and more focused, which makes students' insights more open to lessons. The NHT model also provides students with active learning so that they are encouraged to think, work together and prepare themselves in mastering the material (Tusyana & Luciana, 2019; Wati & Suarni, 2020). The NHT model creates joint activities that stimulate the curiosity of students with other group members, namely by providing problems or problems related to everyday life, and students finding out how problems could be solved (Kurnia & Damayani, 2019; Sudewiputri & Dharma, 2021). While the TPS model in its implementation in groups of students is carried out in pairs, students together help each other in group study. This model presents inspiration such as thinking time as a solid aspect in improving students' skills in responding to problems (Juliartini & Arini, 2017; Simanungkalit, 2021). By providing problems or problems related to everyday life, opportunities for students to carry out learning activities are to work alone and collaborate with their group mates in finding out how these problems can be solved (Colliver, 2018; Imam et al., 2018). So that in this process, students need more time to think, respond and together help each other in their groups. According to previous study it was revealed from the results of the study that the class that was treated with the implementation of NHT model proved that there was a better effect on students' problem-solving abilities (Yenni, 2016).

Learning from the NHT model makes all students more active in learning. The use of the NHT model can encourage student activities. Seen in group discussions through the activity of exchanging opinions and giving suggestions in solving problems, where each student will help each other so that all group members are ready to be more enthusiastic in learning. This is also reinforced by previous study that state the NHT model will encourage students to be more active in developing ideas when conducting group discussions, namely by helping one another with students who do not master the subject matter (Juliartini & Arini, 2017; Pramestika et al., 2019). By helping each other and sharing knowledge, students can have open insights when exchanging their respective opinions. Student learning activities through the NHT model improve learning outcomes of students. Through the NHT model, the improvement in learning outcomes takes place because students work together with groups so that they can share data and the teacher also emphasizes students to be more careful in working on the questions that have been given (Kurnia & Damayani, 2019; Tusyana & Luciana, 2019). Information on student learning outcomes is obtained from assessment tests that are tried at the end of each meeting with the aim of sharing an overview of students' skills in understanding learning. The implication of this study results is that the NHT model has a better effect, superior to the use of TPS on students' problem-solving abilities which can affect the learning, and can make students improve their interactions with fellow friends in exchanging opinions and provide input or criticism. The limitation of this research lies in the limited research scope. This research only involved one school as a research subject. It is hoped that future research will be able to broaden and deepen the scope of research and consider other factors related to the use of tps on the problem solving ability.

4. CONCLUSION

Research that has been conducted at Sekolah Dasar Negeri Batu Ampar 02 Pagi East Jakarta, it can be concluded that students' science problem solving abilities between the application of the NHT and TPS learning models assisted by Zoom Meeting on sound material are not same or different. More effective learning with the NHT model that is applied has more effect on students' problem solving abilities in the teaching and learning process compared to TPS model. Other research can focus on more in-depth research related to the application of the two learning models. It can also be done other studies that focus on other materials.

5. REFERENCES

Anggraini, L. A., Arif, S., Muna, I. A., & Aristiawan, A. (2021). Pengaruh Model Pembelajaran Numbered Head Together (NHT) Berbasis STEM dalam Meningkatkan Kemampuan Metakognisi. *Jurnal Tadris IPA Indonesia*, *1*(2), 219–227. https://doi.org/10.21154/jtii.v1i2.199.

Anggreni, P. F., Asri, I. A. S., & Ganing, N. N. (2017). Pengaruh Model Pembelajaran Kooperatif Tipe Think-Pair-Share (Tps) Berbantuan Media Kartu Bergambar Terhadap Penguasaan Kompetensi Pengetahuan Ips Siswa Kelas V Gugus Letkol Wisnu. *Mimbar PGSD*, *5*(2), 1–10. https://doi.org/10.23887/jjpgsd.v5i2.10645.

Asmahasanah, S., Ibdalsyah, I., & Sa'diyah, M. (2018). Social Studies Education in Elementary Schools Through Contextual REACT-Based on Environment and Sociopreneur. *International Journal of Multicultural and Multireligious Understanding*, *5*(6), 52. https://doi.org/10.18415/ijmmu.v5i6.487.

Assidiqi, M. H., & Sumarni, W. (2020). Pemanfaatan Platform Digital di Masa Pandemi Covid-19. *Prosiding Seminar Nasional Pascasarjana*, 298–303. https://proceeding.unnes.ac.id/index.php/snpasca/article/download/601/519.

Astuti, W. (2019). Pengaruh Model Numbered Heads Together (NHT) Terhadap Motivasi Belajar dan Hasil Belajar IPS Siswa Kelas III Sekolah Dasar. *Jurnal Basicedu*, *3*(2), 605–610. https://doi.org/10.31004/basicedu.v3i2.45.

Cavus, N., & Alhih, M. S. (2014). Learning Management Systems Use in Science Education. *Procedia - Social and Behavioral Sciences*, *143*. https://doi.org/10.1016/j.sbspro.2014.07.429.

Chasanah, A. N. (2019). Cognitive Growth Learning Model to Improve the Students' Critical Thinking Skills. *JRAMathEdu (Journal of Research and Advances in Mathematics Education)*, *4*(2), 112–123. https://doi.org/10.23917/jramathedu.v4i2.8127.

Colliver, Y. (2018). Fostering young children's interest in numeracy through demonstration of its value: the Footsteps Study. *Mathematics Education Research Journal*, *30*(4), 407–428. https://doi.org/10.1007/s13394-017-0216-4.

Etobro, A. B., & Fabinu, O. E. (2017). Students' Perceptions of Difficult Concepts in Biology in Senior

Secondary Schools in Lagos State. *Global Journal of Educational Research*, *16*(2), 139. https://doi.org/10.4314/gjedr.v16i2.8.

Fitriansyah, R., Fatinah, L., & Syahril, M. (2020). Critical Review: Professional Development Programs to Face Open Educational Resources in Indonesia. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, *2*(2), 109–119. https://doi.org/10.23917/ijolae.v2i2.9662.

Giselsson, K. (2020). Critical Thinking and Critical Literacy: Mutually Exclusive? *International Journal for the Scholarship of Teaching and Learning*, *14*(1), 1–9. https://doi.org/10.20429/ijsotl.2020.140105.

Imam, I., Ayubi, A., & Bernard, M. (2018). Pengaruh Pembelajaran Berbasis Masalah Terhadap Kemampuan Pemecahan Masalah Matematis Siswa SMA. *JPMI:Jurnal Pembelajaran Matematika Inovatif*, *1*(3), 355–360. https://doi.org/10.22460/jpmi.v1i3.355-360.

Juliartini, N. M., & Arini, N. W. (2017). Penerapan Model Pembelajaran Nht Untuk Meningkatkan Hasil Belajar Ipa Siswa Kelas III. *Journal of Education Action Research*, *1*(3), 240. https://doi.org/10.23887/jear.v1i3.12688.

Kadek Yogi Parta, L. P. S. W. (2016). Pengaruh Model Dan Media Pembelajaran Terhadap Hasil Belajar Kemampuan Dasar Senam Lantai Pada Mahasiswa Jurusan Penjaskesrek Undiksha. *JPI (Jurnal Pendidikan Indonesia)*, *5*(1), 97. https://doi.org/10.23887/jpi-undiksha.v5i1.8932.

Kartikasari, A., Roemintoyo, R., & Yamtinah, S. (2018). The Effectiveness of Science Textbook Based on Science Technology Society for Elementary School Level. *International Journal of Evaluation and Research in Education (IJERE)*, *7*(2), 127–131. https://doi.org/10.11591/ijere.v7i2.13022.

Kelana, J. B., Wulandari, M. A., & Wardani, D. S. (2021). Penggunaan Aplikasi Zoom Meeting di Masa Pandemi Covid-19 Pada Pembelajaran Sains. *Jurnal Elementary: Kajian Teori Dan Hasil Penelitian Pendidikan Sekolah Dasar*, *4*(1), 18–22. https://doi.org/10.31764/elementary.v4i1.3520.

Kibirige, I., & Teffo, W. L. (2014). Actual and Ideal Assessment Practices in South African Natural Sciences Classrooms. *International Journal of Educational Sciences*, *6*(3), 509–519. https://doi.org/10.31901/24566322.2014/06.03.1.

Kurnia, V. T., & Damayani, A. T. (2019). Keefektifan Model Pembelajaran Number Head Together (NHT) Berbantu Media Puzzle Terhadap Hasil Belajar Matematika. *Jurnal Ilmiah Sekolah Dasar*, *3*(2), 192–201. https://doi.org/10.23887/jisd.v3i2.17772.

Kurniawan, D. A., Astalini, A., Darmaji, D., & Melsayanti, R. (2019). Students' Attitude towards Natural Sciences. ,. *International Journal of Evaluation and Research in Education*, *8*(3), 455–460. https://eric.ed.gov/?id=EJ1232323.

Leasa, M., Fenanlampir, A., Batlolona, J. R., & Saimima, A. S. (2021). Problem-solving and creative thinking skills with the PBL model: The concept of the human circulatory system. *Biosfer*, *14*(2), 154–166. https://doi.org/10.21009/biosferjpb.20825.

Madu, B. C. (2020). Scientific Explanation of Phenomenon, Imagination and Concept Formation as Correlates of Students' Understanding of Physics Concepts. *Journal of Natural Sciences Research*, *11*(16), 17–28. https://doi.org/10.7176/jnsr/11-16-03.

Maman, M., & Rajab, A. A. (2016). The Implementation of Cooperative Learning Model 'Number Heads Together (NHT)' in Improving the Students' Ability in Reading Comprehension. *International Journal of Evaluation and Research in Education (IJERE)*, *5*(2), 174–180. https://doi.org/10.11591/ijere.v5i2.4536.

Meilana, S. F., Aulia, N., Zulherman, Z., & Aji, G. B. (2020). Pengaruh Model Pembelajaran Think Pair Share (TPS) terhadap Kemampuan Berpikir Kritis di Sekolah Dasar. *Jurnal Basicedu*, *5*(1), 218–226. https://doi.org/10.31004/basicedu.v5i1.644.

Mouromadhoni, K. R., Prasetyo, Z. K., & Atun, S. (2019). Development Student Activity Sheet of Natural Sciences with Authentic Inquiry Learning Approach to Improve Problemsolving Skills of Junior High School Students. *Journal of Physics: Conference Series*, *1233*(1). https://doi.org/10.1088/1742-6596/1233/1/012092.

Mufarizuddin. (2018). Improving learning outcomes by using Think Pair Share (TPS) cooperative learning model at primary school students. *Jurnal Pendidikan Indonesia*, *7*(2), 77–85. https://doi.org/10.23887/jpi-undiksha.v7i2.10469.

Muzaki, A., & Masjudin, M. (2019). Analisis Kemampuan Literasi Matematis Siswa. *Mosharafa: Jurnal Pendidikan Matematika*, *8*(3), 493–502. https://doi.org/10.31980/mosharafa.v8i3.557.

Ningsih, I., Winarni, R., & Roemintoyo, R. (2019). *Implementation of Digital Literacy to Achieve 21st Century Skills in The 2013's Curriculum*. https://doi.org/10.4108/eai.27-4-2019.2286855.

Novayulianti, R. S. H. (2021). Analisis Aktivitas Belajar Siswa Pada Mata Pelajaran IPA Kelas V di SDN Duri Kepa 05 Dalam Masa Pandemi Covid-19. *Jurnal Inovasi Pendidikan*, *2*(3), 987–996. https://doi.org/https://doi.org/10.47492/jip.v2i3.793.

Nugraha, W. S. (2018). Peningkatan Kemampuan Berpikir Kritis Dan Penguasaan Konsep Ipa Siswa Sd Dengan Menggunakan Model Problem Based Learning. *EduHumaniora | Jurnal Pendidikan Dasar Kampus Cibiru*, *10*(2), 115. https://doi.org/10.17509/eh.v10i2.11907.

Pramestika, M. C., Muslim, A., & Eka, K. I. (2019). Meningkatkan Sikap Tanggung Jawab dan Prestasi Belajar Melalui Model Pembelajaran Tipe Number Head Together (NHT) Berbantu Video Stop Motion. *Ar-Riiayah, Jurnal Pendidikan Dasar*, *7*(2), 98–108. https://doi.org/10.46368/jpd.v7i2.165.

Rochman, C., Nasudin, D., & Rokayah, R. (2019). Science literacy on science technology engineering and math (STEM) learning in elementary schools. *Journal of Physics: Conference Series*, *1318*(1). https://doi.org/10.1088/1742-6596/1318/1/012050.

Rostika, D., & Junita, H. (2017). Peningkatan Kemampuan Pemecahan Masalah Siswa SD dalam Pembelajaran Matematika dengan Model Diskursus Multy Representation (DMR). *EduHumaniora : Jurnal Pendidikan Dasar*, *9*(1), 35–46. https://doi.org/10.17509/eh.v9i1.6176.

Sadikin, A., & Hamidah, A. (2020). Pembelajaran Daring di Tengah Wabah Covid-19. *Biodik*, *6*(2), 109–119. https://doi.org/10.22437/bio.v6i2.9759.

Simanungkalit, M. (2021). Penerapan Pembelajaran Aktif Kooperatif Melalui Metode Numbered Head Together (NHT) Sebagai Upaya Meningkatkan Aktivitas Dan Hasil Belajar Ipa - Biologi. *Jurnal Teknologi Informasi & Komunikasi Dalam Pendidikan*, *7*(1), 89. https://doi.org/10.24114/jtikp.v7i1.22635.

Sudewiputri, M. P., & Dharma, I. M. A. (2021). Model Pembelajaran Numbered Heads Together (NHT) Terhadap Motivasi dan Hasil Belajar IPA. *Jurnal Pedagogi Dan Pembelajaran*, *4*(2). https://doi.org/10.23887/jp2.v4i2.36193.

Susanti, A., & Kristin, F. (2021). Efektivitas Penggunaan Google classroom dan Zoom Cloud Meeting Terhadap Minat Belajar IPS. *MIMBAR PGSD Undiksha*, *9*(3), 367. https://doi.org/10.23887/jjpgsd.v9i3.39658.

Tanti, T., Kurniawan, D. A., Syefrinando, B., Daryanto, M., & Fitriani, R. S. (2021). Identification of students attitudes towards natural sciences at Adhyaksa 1 Junior High School, Jambi City. *Journal of Education and Learning (EduLearn)*, *15*(1), 19–26. https://doi.org/10.11591/edulearn.v15i1.16377.

Tusyana, E., & Luciana, D. (2019). Pengaruh Model Pembelajaran Kooperatif Tipe Numbered Heads Together Terhadap Hasil Belajar Pkn. *TERAMPIL: Jurnal Pendidikan Dan Pembelajaran Dasar*, *6*(2), 173–184. https://doi.org/10.24042/terampil.v6i2.4812.

Ulya, S., Hindarto, N., & Nurbaiti, U. (2013). Keefektifan Model Pembelajaran Guided Inquiry Berbasis Think Pair Share (TPS) dalam Meningkatkan Pemahaman Konsep Fisika Kelas XI SMA. *UPEJ Unnes Physics Education Journal*, *2*(3). https://doi.org/10.15294/upej.v2i3.2926.

Utami, D. A., Irianto, S., & Muryaningsih, S. (2020). Pengembangan Handout Kurikulum 2013 Berbasis Kompetensi Peserta Didik Abad 21 Kelas IV Di Sd Negeri Kembaran. *Al Qalam: Jurnal Ilmiah Keagamaan Dan Kemasyarakatan*, *14*(2), 151. https://doi.org/10.35931/aq.v14i2.386.

Utaminingsih, R., Rahayu, A., & Andini, D. W. (2018). Pengembangan RPP IPA sekolah dasar berbasis problem-based learning untuk siswa learning disabilities Development of primary school natural science lesson plan based on problem-based learning for learning disabilities students. *Jurnal Inovasi Pendidikan IPA*, *4*(2), 191–202. https://doi.org/10.21831/jipi.v4i2.21401.

Wahyuni, L. T. S., Japa, I. G. N., & Rati, N. W. (2020). Correlation of Reading Interests and Learning Motivation Toward Science Learning Outcomes. *Jurnal Ilmiah Sekolah Dasar*, *4*(3), 484. https://doi.org/10.23887/jisd.v4i3.25376.

Wati, N. K. S., & Suarni, N. K. (2020). Social Studies Learning With Numbered Head Together Model Improves Learning Outcomes Viewed From Student Learning Motivation. *International Journal of Elementary Education*, *4*(2), 244. https://doi.org/10.23887/ijee.v4i2.25250.

Widowati, A., Nurohman, S., & Anjarsari, P. (2017). Developing science learning material with authentic inquiry learning approach to improve problem solving and scientific attitude. *Jurnal Pendidikan IPA Indonesia*, *6*(1), 32–40. https://doi.org/10.15294/jpii.v6i1.4851.

Yamin, M. R., & Karmila. (2020). Analisis Kebutuhan Pengembangan Media Pembelajaran Berbasis Cartoon dalam Pembelajaran IPA pada Materi Lingkungan Kelas III SD. *Biology Teaching and Learning*, *2*(2), 159–170. https://doi.org/10.35580/btl.v2i2.12307.

Yenni, R. F. (2016). Penggunaan metode numbered head Together (NHT) dalam pembelajaran matematika. *Jurnal Penelitian Dan Pembelajaran Matematika*, *9*(2), 263–267. https://doi.org/10.30870/jppm.v9i2.1006.

Yu, H., Liu, P., Huang, X., & Cao, Y. (2021). Teacher Online Informal Learning as a Means to Innovative Teaching During Home Quarantine in the COVID-19 Pandemic. *Frontiers in Psychology*, *12*(June),

1–12. https://doi.org/10.3389/fpsyg.2021.596582.