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IMPROVING STUDENT LEARNING OUTCOMES ON TEMPERATURE AND HEAT MATERIALS WITH GUIDED INQUIRY ASSISTED BY SIMULATION MEDIA

MENINGKATKAN HASIL BELAJAR SISWA PADA MATERI SUHU KALOR DENGAN GUIDED INQUIRY BERBANTUAN MEDIA SIMULASI

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Abstract

This study was conducted to describe the improvement of student learning outcomes in learning that applied guided inquiry assisted by simulation media on temperature and heat materials. This research was carried out on students in grade VII-G at UPT SMPN 18 Gresik by conducting pre-test activities, three learning treatments, and post-tests. The type of research used is pre-experimental research with a one group pretest posttest research design. The learning outcomes of students were measured by pretest and posttest questions with a sample of 31 students in this study which was measured by N-Gain analysis and to test the significance, the Wilcoxon test was used. The learning outcomes obtained by students have increased with an increase in N-Gain of 0.40 with a "Medium" interpretation. In addition, the results of the significance of the pretest and posttest scores showed a value of 0.000 (<0.05) which means that there was a significant increase in the pretest and posttest results.

Keywords: guided inquiry, simulation media, learning outcomes, temperature, heat.

Abstrak

Penelitian ini dilakukan untuk mendeskripsikan peningkatan hasil belajar peserta didik pada pembelajaran yang menerapkan guided inquiry berbantuan media simulasi pada materi suhu dan kalor. Penelitian ini dilakukan pada peserta didik kelas VII-G di UPT SMPN 18 Gresik. Jenis penelitian yang digunakan adalah penelitian pre-eksperimen dengan desain penelitian one group pretest posttest. Hasil belajar peserta didik diukur dengan soal pretest dan posttest dengan sampel pada penelitian ini adalah 31 peserta didik yang diukur dengan analisis N-Gain dan untuk menguji signifikansi data digunakan uji Wilcoxon. Hasil belajar yang diperoleh siswa mengalami peningkatan dengan kenaikan N-Gain sebesar 0,40 dengan interpretasi

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"Sedang". Selain itu, hasil signifikansi skor pretest dan posttest menunjukkan nilai sebesar 0,000 (<0,05) yang berarti terjadi peningkatan yang signifikan pada hasil pretest dan posttest.

Kata Kunci: guided inquiry, media simulasi, hasil belajar, suhu, kalor.

1. INTRODUCTION

Science learning in junior high school aims to make students understand and master the concept of nature well, where this also aims to enable students to use scientific methods to solve natural problems related to daily life (Hasibuan & Sapri, 2023). This goal can be achieved if science learning emphasizes processes such as direct experience from interacting with the environment, so that students will be more motivated to participate in science learning which has an impact on improving student learning outcomes (Khalida & Astawan, 2021).

Student learning outcomes in science subjects are unfortunately still low based on the results of observations that have been carried out at one of the Junior High Schools (SMP) in Gresik. According to the teacher at the school, the learning outcomes are considered less due to teaching activities which generally tend to be centered on the teacher and are still conventional (speech) so that the learning process in the classroom makes students tend to be passive during the learning process. Teaching activities through lectures that are often used by teachers are considered insufficient to improve student learning outcomes, where learning activities should be made more interesting so that it is easier for students to learn science subjects (Riyadi et al., 2021).

One of the teachers at the school where the observation was carried out also said that the student learning results in science subjects, one of which was in temperature and heat materials, were still lacking. The average score obtained by students in the material was 56.2 out of a minimum completeness score of 70. From the results of observations made by the researcher, it shows that the science laboratory equipment owned by the school is still inadequate to be used during joint practicum activities, so teachers can only demonstrate it in class. Temperature and heat materials also have quite complex characteristics because some materials are not studied by students through laboratory experiment activities due to limited time and infrastructure so that they affect the learning outcomes of the material (Sakti et al., 2022).

According to Kotimah (2024), one way to improve student learning outcomes is with innovative learning models and the use of interesting and varied learning media to support learning itself. The learning model that is assessed to be used to improve student learning outcomes and get information to solve problems with guidance from teachers is the inquiry learning model (Fahmi et al., 2023). From various inquiry learning models, the guided inquiry learning model can involve students in a systematic investigation process to achieve understanding of the material, where they are expected to draw conclusions from the results of the investigation carried out with the guidance of the teacher (Ndruru & Harefa, 2023; Sudria et al., 2018).

The achievement of a learning model can also be supported by using various learning media that can support the science learning process (Feri & Zulherman, 2021). The use of media can improve student learning outcomes, especially in science subjects because the use

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of media will involve students creatively in the learning process to develop their thinking skills so that there is an increase in learning outcomes for students (Wahyuningtyas & Sulasmono, 2020).

One of the learning media that has developed and plays a role in the learning process is in the form of a virtual laboratory (Yusuf et al., 2024). This virtual laboratory is an interactive multimedia with a series of laboratory equipment in the form of software (virtual), which is operated using computer hardware (real) and can simulate like a real practicum activity (Verdian et al., 2021). In addition, the use of simulation media can also help the student learning process based on guided inquiry, especially in materials that require practicum activities (Subekti et al., 2022). The use of simulation media can also help the learning process that uses the guided inquiry model because students will have the opportunity to find concepts independently through their experiments/simulations (Lestari et al., 2024).

The above statement is also supported by research conducted by Ristina et al (2020) which shows that learning through a virtual laboratory based on guided inquiry can increase learning outcomes and student learning activity by 49% and 45% in two junior high schools in Aceh. Good results are also shown in the implementation of learning media in the form of virtual laboratories that can increase learning motivation and science process skills in science learning from 65% to 80% (Hermana & Subekti, 2022). The combination of inquiry learning models combined with learning media, makes classroom learning more meaningful and makes students active in the classroom (Aisyah & Sucahyo, 2022).

In the midst of the limitations of laboratory equipment in supporting learning and the existence of a learning model that is able to improve student learning outcomes, this opens up opportunities to utilize the guided inquiry learning model assisted by simulation media applications that are interesting as a science learning medium for students to get good learning outcomes. Based on the background described above, the research was conducted with the title "*Improving Student Learning Outcomes on Temperature-Heat Materials Using Guided Inquiry Assisted by Simulation Media*"

2. RESEARCH METHOD

The type of research that will be used in this study is pre-experimental research. The research design used in this study is in the form of One-Group Pretest-Posttest Design. The One-Group Pretest-Posttest Design is used to reveal cause-and-effect relationships by involving only one group of subjects, so that there is no strict control over the variables (Sugiyono, 2019). The subjects of this study were all students in class VII-G UPT SMPN 18 Gresik as many as 31 students. The sample in this study was determined using purposive sampling. The researcher used purposive sampling because sampling from the population was carried out by considering certain things (Sugiyono, 2019). The reason the researcher chose this subject was because the researcher had conducted pre-research on this school.

The data on the results of the pretest and posttest that have been done by students are analyzed using N-Gain to determine the improvement in learning outcomes after learning

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(Wiyono et al., 2022). Meanwhile, to see the significance between the two paired data, a normality test and a statistical test were conducted. The data normality test in this study uses *the Saphiro-Wilk test* because the amount of data is less than 50 (<50) with a significance level (p) of 0.05, if the data has a significance of >0.05, then the data is said to be distributed normally (Hasanah, 2017). The statistical test of this study is based on the normality of the data, if the data is distributed normally, a paired T test will be carried out, the use of this test is because one individual (the object of the study) gets 2 different treatments (Farida et al., 2022). If the data is not distributed normally, then the requirements for the paired T test are not met, so an alternative test can be used for *the Wilcoxon* test (Awwaludin & Novita, 2024). An increase in the significance of learning outcomes will be shown if the value of Sig < 0.05 (Sari et al., 2021).

3. RESULTS AND DISCUSSION

In this section, we will describe the results of research on the application of guided inquiry assisted by simulation media to improve student learning outcomes on temperature and heat materials. This research uses research instruments that have been validated by experts including two science teachers and one science education lecturer. The results are valid and have been revised so that they can be continued for research.

Student learning outcomes were analyzed using N-Gain to see the improvement of student learning outcomes through a pretest sheet given before treatment to determine the student's initial ability and a posttest given after the implementation of three learning times to determine the student's final ability. In addition, to see the significance of student learning outcomes, an inferential statistical test will be carried out.

The student pretest activity was carried out on 13 November 2024 by providing 15 multiple-choice questions regarding temperature and heat. Then the posttest activity was carried out on 25 November 2024 by providing 15 multiple-choice questions that were similar to the pretest but the order of the questions had been changed.

a. Analysis of Pretest and Posttest Students Using N-Gain

In the overall data from 31 students, N-Gain have got about 0.40 with a "Medium" interpretation. Based on data obtained from student learning outcomes, there is an assessment of three categories, namely low, medium, and high. Low category is shown by students such as those who have an N-Gain below 0.3 as many as 11 students show a minimal increase in learning outcomes. In the medium category, there were 15 students ($0.30 \leq$ N-gain < 0.70). On the other hand, students who are included in the high category, namely N-Gain above 0.7, as many as 5 students, which indicates a significant increase after participating in learning activities.

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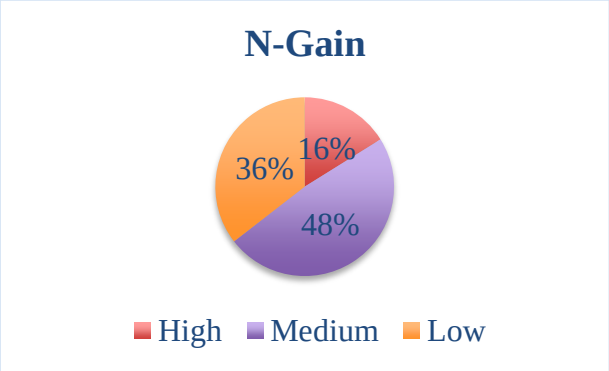

Figure 1. Student N-Gain Acquisition Diagram

Based on figure 1, the percentage of students who obtained the high N-Gain criterion was 16% for 5 students, for the medium N-Gain criterion was 48% for 15 students, and the low N-Gain criterion was 36% for 11 students.

b. Analysis of the Significance of Student Learning Outcomes Using Statistical Tests

Before conducting an inferential statistical test, a normality test is carried out to see *whether the pretest* and *posttest* data are normally distributed or not. The normality test in this study used *the shapiro-wilk* test with the help of SPSS software with a significance level of 0.05. The results of the normality test can be seen in table 1.

Table 1. Normality Test

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	.243	31	.000	.881	31	.002
Posttest	.165	31	.031	.923	31	.029

Based on the normality test, Table 2 presents the results of the normality test from two data groups, namely *pretest* and *posttest*. The results of *the Shapiro-Wilk* test showed a significance value of 0.002 (smaller than 0.05) which indicates that *the pretest* data was not normally distributed. As for the posttest, the significance value was 0.029 (less than 0.05) which indicates that the data is not normally distributed. Overall, *the pretest* and *posttest* show that the data distribution does not meet the expected normality assumptions, based on the tests carried out, a non-parametric statistical test will be carried out, namely the *Wilcoxon test*.

In the normality test, it was found that *the pretest* and *posttest* values were not distributed normally, so to test the hypothesis, a non-parametric test, namely *the wilcoxon* test, would be carried out. In this study, *the wilcoxon* test will be carried out using the help of SPPS software. The results of *the wilcoxon* test can be seen in tables 2 and 3.

Table 2. Wilcoxon Test Rank Results

Ranks

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		N	Mean Rank	Sum of Ranks
Posttest - Pretest	Negative Ranks	0[a]	.00	.00
	Positive Ranks	31[b]	16.00	496.00
	Ties	0[c]		
	Total	31		

Information
a. Posttest < Pretest
b. Posttest > Pretest
c. Posttest = Pretest

Based on the results of the analysis using the Wilcoxon Signed Ranks Test, it was shown that there was a significant difference between the post-test and pre-test scores of the 31 subjects tested. In the table, it can be seen that there were no subjects with negative scores, while 31 subjects showed positive scores with an average increase of 16 points. This shows that the majority of participants experienced an increase in results between pre-test and post-test measurements. Furthermore, the significance of student learning outcomes can be seen in table 3.

Tabel 3. Hasil Uji Wilcoxon Keseluruhan

Test Statistics[a]

	Posttest - Pretest
Z	-4.887[b]
Asymp. Sig. (2-tailed)	.000

Information:
a. Wilcoxon Signed Ranks Test
b. Based on negative ranks

Furthermore, the statistical value with asymptotic significance (2-tailed) was 0.000. This shows that *the post-test* results are significantly better than *the pre-test*, because the value obtained is below the predetermined significance value (sig < 0.05). In other words, it can be concluded that the treatment applied in this study showed a significant improvement in student learning outcomes.

Discussion

The learning outcomes of students were obtained from the results of the pretest given before the treatment and the posttest given after three meetings of providing guided learning

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treatment. According to Sudjana (In Yandi et al., 2023), learning outcomes are the abilities possessed by learners after students carry out learning activities. The learning outcomes on the temperature and heat material of students from this study showed an increase. This is evidenced by the N-Gain analysis of the pretest and posttest scores, which obtained an average N-Gain value of 0.40 in the "medium" category. This shows that there is an improvement in students' learning ability by implementing guided inquiry assisted by simulation media. In line with the research of Herniawan & Vivianti (2022), the N-Gain value in the medium category shows that the learning media used is feasible in improving student learning outcomes.

The improvement of student learning outcomes is significantly influenced by the learning model that applies a guided inquiry learning model assisted by simulation media. The guided inquiry learning process assisted by simulation media about temperature and heat is a learning activity that can allow students to reveal ideas or concepts independently. Students gain knowledge through mentoring from teachers to improve their ability to achieve learning goals, thereby improving learning outcomes (Lailiah et al., 2021). This is in line with research conducted by Hikmawati (2020), which shows that the guided inquiry learning model improves student learning outcomes during learning.

The increased learning outcomes of students are also influenced by learning media that help students' learning activities. The science learning simulation media that has been developed is "Vlab Suhu & Kalor" which has been developed by Qreatif.id company. This application contains materials and simulations in learning temperature and heat material for students in grades 7-8 of junior high school more practically and quickly, while the Vlab Suhu & Kalor learning media is shown in figures 2 and 3. Through the use of the Vlab Suhu & Kalor application, it can improve students' learning outcomes. In line with Bogar (2023) research, virtual laboratory simulation media can help improve students' understanding.

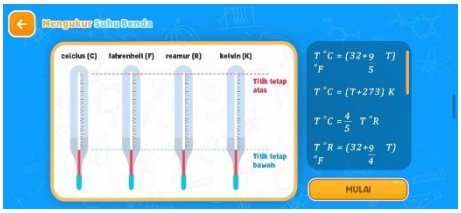

Figure 2. Figure 4 types of thermometers and their formulas

Figure 1. Features for simulation of the arrangement of experimental tools

4. CONCLUSION

Following the data analysis and subsequent discussion in the preceding chapter, the researcher believes that the application of the guided inquiry enhances the learning outcomes of seventh-grade students at UPT SMPN 18 Gresik. The mean score of the pretest exceeds that of the posttest. Based on the data analysis, the research hypothesis is accepted. The learning outcomes obtained by students increased with an increase in N-Gain of 0.40 with a "Medium" interpretation. In addition, the results of the significance of the pretest and posttest scores showed a value of 0.000 (<0.05) which means that there was a significant increase in the results of the pretest and posttest.

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Suggestion

This research can be used as an evaluation of students' learning outcomes on the learning to be carried out, so that it can have a positive impact on learning, especially by applying the guided inquiry learning model with simulation media.

5. REFERENCES

Aisyah, D. D., & Sucahyo, I. (2022). Pengembangan Media Pembelajaran E-Book Berbasis Mobile Learning dan Pendekatan Inkuiri pada Materi Gelombang untuk Meningkatkan Pemahaman Konsep Siswa. *IPF: Inovasi Pendidikan Fisika*, *11*(3), 23–31.

Awwaludin, F. R. N., & Novita, D. (2024). Pengembangan E-Lkpd Inkuiri Terbimbing Berbasis Liveworksheets Untuk Melatihkan Keterampilan Proses Sains Peserta Didik Pada Materi Kesetimbangan Kimia. *UNESA Journal of Chemical Education*, *13*(3), 192–198. https://doi.org/10.26740/ujced.v13n3.p192-198

Bogar, D. Y., Jufriansah, A., & Prasetyo, E. (2023). Pengembangan Laboratorium Virtual untuk Meningkatkan Hasil Belajar Peserta Didik. *Buletin Edukasi Indonesia*, *2*(03), 102–112. https://doi.org/10.56741/bei.v2i03.397

Fahmi, M., Wiguna, S., & Hasbullah. (2023). Efektivitas Model Pembelajaran Inquiry Learning Dalam Meningkatkan Pemahaman Siswa Pada Mata Pelajaran Fiqih Kelas X MAS Ar-Rahman Bubun. *Tut Wuri Handayani : Jurnal Keguruan Dan Ilmu Pendidikan*, *2*(4), 134–140. https://doi.org/10.59086/jkip.v2i4.165

Farida, A., Kasiyun, S., Ghufron, S., & Djazilan, M. S. (2022). Pengaruh Model Pembelajaran Analogi Terhadap Keterampilan Berpikir Kritis pada Mapel Bahasa Indonesia Siswa Sekolah Dasar. *Jurnal Basicedu*, *6*(2), 2922–2930. https://doi.org/10.31004/basicedu.v6i2.2407

Feri, A. & Zulherman. (2021). Analisis Kebutuhan Pengembangan Media Pembelajaran IPA Berbasis Nearpod. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *5*(3), 418. https://doi.org/10.23887/jipp.v5i3.33127

Hasanah, A. (2017). Efek Jus Bawang Bombay (Allium cepa Linn.) Terhadap Motilitas Spermatozoa Mencit Yang Diinduksi Streptozotocin (STZ). *Saintika Medika*, *11*(2), 92. https://doi.org/10.22219/sm.v11i2.4203

Hasibuan, M. S. & Sapri. (2023). Pendidikan karakter peduli lingkungan melalui pembelajaran ilmu pengetahuan alam (IPA) di madrasah ibtidaiyah. *Jurnal EDUCATIO: Jurnal Pendidikan Indonesia*, *9*(2), 700. https://doi.org/10.29210/1202323151

Hermana, A. H. D., & Subekti, H. (2022). Implementasi Laboratorium Virtuak Untuk Meningkatkan Motivasi Belajar dan Keterampilan Proses Sains Siswa SMP dalam Pembelajaran IPA. *PENSA: E-Journal Pendidikan Sains*, *10*(2).

Herniawan, M., & Vivianti, V. (2022). Multimedia Pembelajaran Interaktif Augmented Reality Pengenalan Kamera Dan Teknik Fotografi. *Jurnal Edukasi Elektro*, *6*(1), 49–57. https://doi.org/10.21831/jee.v6i1.45591

Hikmawati, Kusmiyati, & Sutrio. (2020). Inquiry Learning Model to Improve Student Cognitive Learning Outcomes in Temperature and Heat. *Jurnal Penelitian Pendidikan IPA*, *6*(1), 97–100. https://doi.org/10.29303/jppipa.v6i1.330

Khalida, B. R., & Astawan, I. G. (2021). Penerapan Metode Eksperimen untuk Meningkatkan Hasil Belajar IPA Siswa Kelas VI SD. *Jurnal Ilmiah Pendidikan Profesi Guru*, *4*(2), 182–189.

Multidisciplinary Indonesian Center Journal (MICJO)
Journal page is available to
https://e-jurnal.jurnalcenter.com/index.php/micjo
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Kotimah, E. K. (2024). Efektivitas Media Pembelajaran Audio Visual Berupa Video Animasi Berbasis Powtoon Dalam Pembelajaran IPA. *Jurnal Pelita Ilmu Pendidikan*, *2*(1), 1–18. https://doi.org/10.69688/jpip.v2i1.55

Lailiah, I., Wardani, S., Sudarmin, & Sutanto, E. (2021). Implementasi Guided Inquiry Berbantuan E-Lkpd Terhadap Hasil Belajar Kognitif Siswa Pada Materi Redoks Dan Tata Nama Senyawa Kimia. *Jurnal Inovasi Pendidikan Kimia*, *15*(1), 2792–2801. https://journal.unnes.ac.id/nju/JIPK/article/view/26204

Lestari, P., Fakhriyah, F., & Masfuah, S. (2024). Pengaruh Inquiry Learning Berbasis Tpack Dengan Media Virtual Laboratory Terhadap Keterampilan Proses Sains Siswa. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, *10*(1).

Ndruru, S., & Harefa, Y. (2023). Analisis Metode Pembelajaran Inquiry Terbimbing Terhadap Kemampuan Berpikir Kritis Siswa. *Jurnal Pendidikan Dan Konseling (JPDK)*, *5*(4), 686–702. https://doi.org/10.31004/jpdk.v5i4.18058

Ristina, Khairil, & Artika, W. (2020). Desain Pembelajaran Virtual Laboratorium Berbasis Inkuiri Terbimbing untuk Meningkatkan Hasil Belajar dan Aktivitas Peserta Didik pada Materi Sistem Ekskresi Manusia. *Jurnal Pendidikan Sains Indonesia*, *8*(1), 114–127. https://doi.org/10.24815/jpsi.v8i1.15761

Riyadi, A., Mansur, H., & Utama, A. H. (2021). Pengembangan Multimedia Pembelajaran Interaktif Untuk Meningkatkan Hasil Belajar Siswa Mata Pelajaran IPA Kelas VII. *J-INSTECH*, *2*(1), 115–123.

Sakti, I., Nirwana, N., & Defianti, A. (2022). Implementasi Pembelajaran Berbasis STEM Pada Mata Kuliah Kajian IPA-1 Materi Suhu dan Kalor Untuk Meningkatkan Literasi Sains Mahasiswa. *Jurnal Kumparan Fisika*, *5*(2), 131–140. https://doi.org/10.33369/jkf.5.2.131-140

Sari, R. N., Nazmi, R., & Zulfa, Z. (2021). Pengaruh Game Word Wall Terhadap Hasil Belajar Sejarah Kelas X MIPA SMA 2 Lubuk Basung. *Puteri Hijau : Jurnal Pendidikan Sejarah*, *6*(2), 76. https://doi.org/10.24114/ph.v6i2.28828

Suárez, Á., Specht, M., Prinsen, F., Kalz, M., & Ternier, S. (2018). A review of the types of mobile activities in mobile inquiry-based learning. *Computers & Education*, *118*, 38–55. https://doi.org/10.1016/j.compedu.2017.11.004

Subekti, R. S., Astriani, D., & Qosyim, A. (2022). Media Simulasi PhET Berbasis Ikuiri Terbimbing Materi Getaran Dan Gelombang Terhadap Peningkatan Keterampilan Proses Sains Peserta Didik. *PENSA: E-Journal Pendidikan Sains*, *10*(1), 75–80.

Sudria, I. B. N., Redhana, I. W., Kirna, I. M. K., & Aini, D. (2018). Effect of Kolb's Learning Styles under Inductive Guided-Inquiry Learning on Learning Outcomes. *International Journal of Instruction*, *11*(1), 89–102. https://doi.org/10.12973/iji.2018.1117a

Sugiyono. (2019). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung: ALFABETA.

Verdian, F., Jadid, M. A., & Rahmani, M. N. (2021). Studi Penggunaan Media Simulasi PhET dalam Pembelajaran Fisika. *Jurnal Pendidikan Dan Ilmu Fisika*, *1*(2), 39. https://doi.org/10.52434/jpif.v1i2.1448

Wahyuningtyas, R., & Sulasmono, B. S. (2020). Pentingnya Media dalam Pembelajaran Guna Meningkatkan Hasil Belajar di Sekolah Dasar. *EDUKATIF : JURNAL ILMU PENDIDIKAN*, *2*(1), 23–27. https://doi.org/10.31004/edukatif.v2i1.77

Wiyono, K., Sury, K., Hidayah, R. N., Nazhifah, N., Ismet, I., & Sudirman, S. (2022). STEM-based E-learning: Implementation and Effect on Communication and Collaboration

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Journal page is available to
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Skills on Wave Topic. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, *8*(2), 259–270. https://doi.org/10.21009/1.08208

Yandi, A., Putri, A. N. K., & Putri, Y. S. K. (2023). Faktor-Faktor Yang Mempengarui Hasil Belajar Peserta Didik (Literature Review). *Jurnal Pendidikan Siber Nusantara*, *1*(1). https://doi.org/10.38035/jpsn.v1i1

Yusuf, N. S., Al Farizi, Z., & Rusdin, M. E. (2024). Implementasi Pembelajaran Kooperatif Tipe Student Team Achievement Division Berbasis Blended Pengembangan E-Modul Berbantuan PhET pada Materi Listrik Dinamis. *Jurnal Praktik Baik Pembelajaran Sekolah Dan Pesantren*, *3*(03), 133–143. https://doi.org/10.56741/pbpsp.v3i03.696