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The Influence of the Problem-Based Learning Model Assisted by PhET Media on Students' Science Process Skills on the Subject of Fluid Dynamics

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Abstract: The problems in this research are related to the problem based-learning model, PhET media, and students' science process skills on the subject of fluid dynamics. This research is experimental; the design used is a non-equivalent control group design. The population in this study were all class XI students at SMAN 1 Gunungsari West Lombok; the sample used was class XI B as the control class, and class The experimental class uses a problem-based learning model assisted by PhET media, while the control class uses a direct instruction learning model. The test instrument used is an essay test with six questions on the subject of fluid dynamics. The results of the pretest data analysis of the science process skills of students in the experimental class and control class were not much different. After being given treatment, the average posttest score for the experimental class was 76.92, and the average score for the control class was 70.11. The results of the posttest t test were less than 0.050, so it can be concluded that the problem based-learning model assisted by PhET media has an influence on students' science process skills on the subject of dynamic fluids.

Keywords: Dynamic Fluid; PhET; Problem-Based Learning; Science Process Skills.

Introduction

Today's global world really needs quality human resources so that nations can compete with other nations. One way to prepare for this is by improving the quality of education. Education is the most important thing for every country to develop. The education level of this country, which is very rich in natural resources, lags far behind neighboring countries. High levels of education do not reduce high levels of unemployment. It is nothing new that many people are unemployed now due to the low quality of education in this country.

Quality is a major problem in the world of education in Indonesia. The root of the problem often arises from input, processing, and output. These three things are actually interrelated. With each other, input greatly influences the sustainability of the learning process. The learning process also greatly influences the results or output. Then the output will continue to be input at a higher level of education until entering the world of work, where theory begins to be put into practice. Talking about theory and practice cannot be separated from science, especially physics.

Science does not only consist of facts, concepts, and theories but also includes activities or skill processes for responding to natural symptoms or phenomena. According to Saputra *et al.* (2020) science is a branch of knowledge to understand natural patterns, including facts, concepts, principles, discovery processes, and scientific attitudes. One of the sciences includes physics. Physics is a part of science, which is knowledge whose truth has been tested through research or experiments. According to Gunawan *et al.*, (2015) stated that physics is a part of science that focuses more on the study of matter and energy and the

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relationship between the two. Students not only know theory but must also be able to relate it to phenomena in everyday life. In physics education, we are also taught directly how to develop various process skills to find out what natural symptoms or phenomena are like. Therefore, it is very important to develop process skills, especially in science.

Quality learning cannot be separated from careful planning, so in order to create good learning, a good learning model is also needed to be used as a teaching reference. Susilawati (2019) explained that using the right learning model can train students in terms of knowledge, attitudes, and skills so that students are able to understand the material better and can feel the benefits of the learning process carried out. One learning model that can be used is the problem-based learning model. Problem-based learning is a learning model that uses problems, scenarios, and real-world cases to improve students' problem-solving abilities (Anderson et al., 2020). Problem-based learning is a learner-centered learning model that contextualizes learning in authentic problem-solving situations and has been designated as an experimental teaching method (Yin et al., 2021).

The problem-based learning model is a learning concept that helps students build a learning environment that begins with important and relevant problems so that they gain a more real learning experience. In this problem-based learning, students will be given clinical problems and trained to identify what they need to learn to solve these problems. According to Kibret et al. (2022), this problem-based learning tutorial usually involves 5 to 8 students discussing and analyzing the problem.

Apart from using appropriate learning models, media also greatly influences learning success. According to Anwarningsih et al. (2022), learning media can be defined as graphic, photographic, or electronic tools to capture, process, and reorganize students' visual and verbal information. One of the media that is widely used today is media*PhET (Physics Education Technology*). The world of education was faced with various problems, such as in Covid-19, the learning system both at home and abroad has become abnormal. This has caused many changes, especially in the teaching and learning process, up to the implementation of online learning systems and media PhET this, is a very appropriate medium to use in the learning process.

PhET simulation is a very effective learning medium for improving the quality of students' mastery of concepts (Yunita et al., 2020). This PhET simulation can make it easier for students to understand the physics concepts being studied by displaying animated visual and conceptual models (Susilawati et al., 2022). In the PhET simulation, there are theoretical and experimental simulations that actively involve the user. According to Ginting et al. (2020), users can manipulate activities related to experiments so that PhET media can be used for physics learning.

This PhET simulation also stimulates students' science process skills through the experiments carried out. Science process skills can make students actively participate in the learning process, able to form correct and good habits as scientists in solving problems and planning experiments, and able to help students learn to know how to apply science so they don't just learn concepts and concepts, just the law. According to Akani (2015), science process skills contribute to students' cognitive and psychomotor abilities in carrying out scientific investigations and studying concepts, principles, and theories to develop pre-existing concepts.

According to Sahidu (2016), there are several reasons why it is important to develop science process skills, namely: (1) students can more easily understand complex and abstract concepts if they are accompanied by real examples and practice them themselves; (2) the learning process is the development of concepts that cannot be separated from the development of attitudes and values, so that students need to be equipped with the skills to search for and process information from various sources, not just from teachers.

Based on the results of observations made at SMAN 1 Gunungsari, West Lombok, it can be concluded that students' interest in studying physics is still relatively low. This happens because students think that physics is a difficult lesson, and there are only mathematical equations, so it is very difficult to understand during the learning process. Based on these problems, the researcher believes that an appropriate learning model and the media used are needed. Therefore, researchers are interested in conducting research entitled "The Effect of the Problem Based-Learning Model Assisted by PhET Media on Students' Science Process Skills on the Subject of Fluid Dynamics".

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Method

This research is a type of quasi-experimental research (*quasi-experimental)* with a non-equivalent control group design. SMAN 1 Gunungsari was chosen as the location for this research, which will be implemented in August 2023. The population used in this research is all class XI students. The sample for this research is students in classes XI.B as the control class and XI.C as the experimental class. The sampling technique is carried out using the technique of purposive sampling, taking certain things into consideration (Hermawan, 2019). The implementation stages in this research were carried out in three stages, including the preparation stage, the implementation stage, and the final stage.

The instrument used in this research was an essay test instrument with five questions which were created based on indicators of scientific process skills, namely observing, predicting, making hypotheses, interpreting and communicating. This essay test instrument has previously passed the instrument testing stage in the form of a validity test, reliability test, difficulty level test and discrimination test. Test instruments that have passed the trial are then given to the control class and experimental class twice, namely in the initial test (pretest) and final test (posttest) which aims to determine the increase in science process skills before and after being given treatment. The previous data was analyzed first through prerequisite tests in the form of normality tests and homogeneity tests, then continued with hypothesis testing carried out using the t test to determine the effect of the variables studied.

Result and Discussion

The results of the research are an increase in students' science process skills obtained from a comparison of pre-test and post-test scores in both classes. Average value*pretest* science process skills of experimental and control class students were respectively 47.95 and 48.50 while the average value posttest experimental and control class students respectively namely 76.92 and 70.11 as for the results data pretest and posttest Data on science process skills in the experimental and control classes can be seen in Table 1 and Table 2.

Table 1. Science Process Skills Pretest Recapitulation

	Pretest	
	Experiment	Control
Number of students	26	29
The highest score	73.33	60.00
Lowest value	33.33	13.33
Rate by rate	47.95	48.50

Table 2. Science Process Skills Posttest Recapitulation

	Posttest	
	Experiment	Control
Number of students	26	29
The highest score	93.33	86.66
Lowest value	46.66	53.33
Rate by rate	76.92	70.11

In table 1 of the students' pretest results it is known that the initial abilities of students in the control class look higher than those in the experimental class, however in table 2 the results of the students' posttest show that there was an increase in both classes, both in the experimental class and the control class, this is due to the implementation the learning model that has been applied and the media used. To find out whether there is a significant increase in students' science process skills, a hypothesis test is carried out. However, beforehand the data must pass a normality test and homogeneity test. The results of the pretest and posttest average values of science process skills for both classes based on the table above can be presented in the following image.

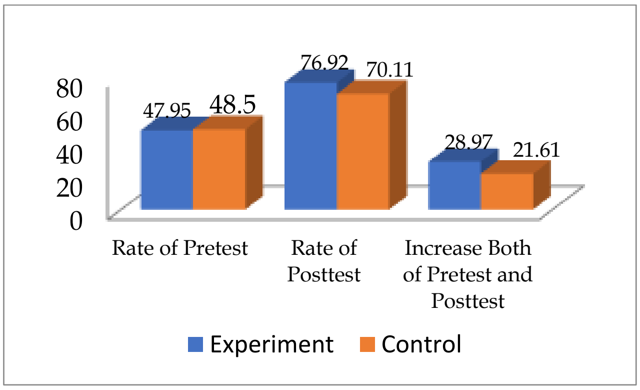

Figure 1. Graph of Average Pretest and Posttest Scores for Science Process Skills of Experimental Class and Control Class Students

Normality Test

The normality test was carried out on the posttest results of the experimental class and control class to find out whether the final data on science process skills for both classes were normally distributed or not. The normality test is also used to determine follow-up statistical tests that will be used to test research hypotheses. The calculation results of the posttest normality test for students' science process skills in both classes can be seen in table 3 below.

Tabel 3. Posttest Normality Test Results for Students'Science Process Skills

Group	x_{count^2}	x_{table^2} (α = 0,05)
Experiment	0.64	9.48
Control	4.58	9.48

Based on table 3, the results of the posttest data normality test calculation of students science process skills show that the data obtained x_{count^2} experimental class of 0,64 and x_{table^2} as big as 9,48, so $x_{count^2} < x_{table^2}$ while in the control class x_{count^2} as big as 4,58 and x_{table^2} as gig as 9,48, so $x_{count^2} < x_{table^2}$. So the data in both classes is declared to be normally distributed.

Homogeneity Test

The homogeneity test was carried out on the pretest and posttest data. The homogeneity test is calculated using the variance test (F). The pretest data homogeneity test was carried out to determine the initial abilities of the two classes before being given treatment. The results of the homogeneity test of pretest data for both classes can be seen in table 4 below.

Table 4. Ressult of The Pretest Homogenity of Science Proces Skills

Group	F_{cour}	F_{tab}	Information
Experiment Control	1.03	2.45	Homogen

Based on table 4, it is obtained $F_{count} < F_{table}$or 1,03 < 2,45 From this information it can be concluded that the two classes are homogeneous (have the same initial abilities) with a significance level of 5%.

Meanwhile, the results of the posttest data homogeneity test are used to determine the follow-up hypothesis test (t-test) that will be used. The results of the posttest data homogeneity test calculation of students' science process skills can be seen in table 5 below.

Table 5. Ressult of The Posttest Homogenity of Science Proces Skills

Group	F_{cour}	F_{tabl}	Information
Eksperiment Control	1.05	2.45	Homogen

Based on table 5, it is obtained $F_{count} < F_{table}$ or 1,04 < 2,4 From this information it can be concluded that the two classes are homogeneous with a z

Hypothesis test

The data that has been analyzed and meets the requirements, namely normally distributed and homogeneous data, is then carried out to test the hypothesis using parametric statistical tests. The parametric statistical test used is a two-party t-test using the t-polled variance formula with the test criteria, namely if $t_{count} > t_{table}$ so, H_a accepted and H_0 rejected. The results of the t-test analysis of the posttest data on student learning outcomes are presented in table 6 below.

Table 6. Result of Hypotesis test analysis of Science Process Skills

Group	Number of Students (n)	Varians (S^2)	t_{count}	t_{table}
Experimen	26	134.12	2.25	2.00
Control	29	127.56		

Based on the table 5 above, it can be seen that $t_{count} > t_{table}$ that is 2,25 > 2,00,jika $t_{count} > t_{table}$ At a significance level of 5% then, H_a accepted and H_0 rejected. This shows that there is an influence of the problem based learning model assisted by PhET media on the science process skills of students in class XI of SMAN 1 Gunungsari for the 2023/2024 academic year.

The results of the hypothesis test clearly illustrate that there are quite significant differences in students' science process skills, thus indicating the influence of different learning models applied in the experimental class. This shows that the problem based learning model assisted by PhET media which was applied in the experimental class had a better effect compared to the direct instruction learning model which was applied in the control class.

The benefits of problem based learning are also conveyed in the results of research conducted by Orji & Ogbuanya (2018) which states that there are differences between the experimental class which is taught using the problem based learning model and the control class which is taught using conventional learning models. Likewise, the results of research from Schmidt et al (2011) showed that the problem based learning model has a fairly strong effect on learning and achievement, compared to conditions where learning does not use promblems.

The learning process that allows students to improve science process skills to solve problems is problem based learning, this learning model is based on constructivism theory. This problem based learning model is often used to stimulate high level thinking in real life problem orientation. According to Ayuningrum, et al., (2015) that unlike the teacher-centered learning model, the problem-based learning model is a student-centered learning process so this learning method is very appropriate to be applied in learning. The problem-based learning model can make students independent in solving the problems given (Gulo, 2022). Furthermore, Zagoto, et al., (2019) argue that efforts to find solutions independently will provide experience to solve the problems given. Therefore, the problem-based learning model can provide students with experience in solving problems so that student learning outcomes increase.

The application of the problem based learning model assisted by PhET media not only improves students' science process skills in the classroom, but can also train students to work together, this is in accordance with the syntax of the problem based learning model itself. The use of PhET media as a tool in carrying out practical work is also felt to be very effective, because students are more enthusiastic about something that is virtual. Apart from that, students can also try to carry out experiments without having to bring or buy practical equipment, just with a cellphone or laptop, they can practice. wherever and whenever. This problem-based learning model is also supported by the media used during the learning process. Media is a tool that conveys or delivers learning messages (Arsyad, 2014).

According to Yuafi et al., (2015) Physics Education Technology (PhET) is interactive physics simulation software available on sites that can be run online or offline.Simulation media PhET (Physics Education Technology) is learning in which there are several physics learning simulation materials to help learning in class or can be used individually (Saputraet al., 2020). With media PhET (Physics Education Technology) This learning can be done more practically, namely being able to explain various phenomena directly. This is supported by research by Ramadhan et al., (2019) who argue that learning using PhET media and simple demonstrations will be more effective than conventional learning using blackboard media. According to Susilawati et al., (2022) said that PhET can improve science process skills.

Learning that involves experimentation can have a good impact on learning outcomes. This research is in line with research conducted by Apriwahyuni, et al., (2021) with the discovery that an effective learning model makes students more active in the learning process which has been designed with learning procedures that begin with problems and in learning activities using media, namely PhET to conduct virtual experiments using cellphones to conduct discussions in groups. Apart from that, other research that is in accordance with this research is byjauhari, et al., (2016) which states that the problem-based learning model assisted by PhET media can activate students through problem solving activities in groups with the results seen from the students' activity and enthusiasm in carrying out learning process, so that the impact on the learning outcomes of the experimental class is higher compared to the control class.

The ongoing learning process makes students more confident, active and able to communicate very well through discussion activities and presentation activities and can apply the knowledge gained in the real world through learning using the problem based learning model assisted by PhET media. This research is in line with research conducted by Setyawan, et al., (2021), namely that the problem based learning model can be an effective solution that can make students more active in participating in classroom learning and improve students' thinking abilities. The results of this research are also confirmed by research by Sudiarta (2019) which states that the application of the problem based learning model in physics learning is very appropriate, because it leads students to be more active in learning, so that it can improve students' physics learning outcomes.

This is in accordance with the results of research by Helyandri et al., (2020) stating that the experimental class applied to the problem based learning model has the adventage of being able to get used to dealing with and solving problems skillfully and can stimulate and develop creative thinking skills. Application of media PhET proven to be able to improve science process skills and can improve student learning outcomes in the classroom, this is in line with research conducted by Ngadinem (2019) based on the research results obtained showing that the use of simulation PhET model problem based learning can improve students' science process skills. Based on a description of learning problems and media use PhET, appropriate models and methods are needed to improve students' science process skills in physics learning.

Other similar research was carried out by Handika et al., (2013), who found that the application of problem-based learning had a better and more significant influence on students' science process skills in terms of observing, grouping, measuring, predicting, concluding and communicating. According to Emrisena et al., (2018) stated that the results of his research showed that there were significant differences in science process skills between groups of students who were taught using the learning model problem based learning (PBL) and groups of students who are taught using conventional learning models. This research is in line with research conducted by Doyan (2020) This research is in line with research conducted by Doyan (2021) it was found that the effect of learning with a problem-based model was better for student learning outcomes and science process skills

Conclusion

Based on the research results and discussion, it can be concluded that there is a model influence *problem based learning* media assisted *PhET* on students' science process skills on the subject of dynamic fluids

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All authors listed in this article contributed to the research and development of the article. Conseptualization: W.W, data curation: A.D, funding acquisition: W.W, methodology: W.W, visualization: A.D, original drafts: W.W, A.D, writing-review & editing: W.W, A.D.

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Conflicts of Interest

For the publication of this article, we certify that there is no conflict if interest.

Rerences

Akani, O. (2015). Levels of possession of science process skills by final year students of colleges of education in South-Eastern States of Nigeria. *Journal of Education and Practice*. 6 (27): 94–102.

Anderson, R., Loviscek, A., & Webb, J. (2020). Problem Based Learning in Real Estate Education. *Journal of Real Estate Pratice and Education*. 3, 35-41. https://doi.org/10.1080/10835547.2000.120091568

Anwarningsih, S. H & Anwar, A. K. (2022). Media Pembelajaran Berbasis Animasi (Vol. 6, Issue. 1). Rajawali.

Apriwahyuni, R., Yunus, S & Wahyuni, D. (2021). Penerapan Model Pembelajaran problem Based Learning (PBL) Menggunakan Media Simulasi PhET untuk Meningkatkan Hasil Belajar IPA Peserta Didik. *Jurnal Profesi kependidikan*. 2(1): 89-100.

Arsyad, A. (2014). *Media Pembelajaran*. Jakarta: Rajawali Press.

Ayuningrum, D., & Susilowati, S. E. M. (2015). Pengaruh Model Problem Based Learning Terhadap Keterampilan Berfikir Kritis Siswa Sma Pada Materi Protista. *Unnes Journal of Biology Educatioan*. 4(2): 124-133. https://doi.org/10.15294/jbe.v4i2.8904

Doyan, A., Susilawati, S., Gunada, I. W., & Hilfan. (2021). The Effect of Problem-Based and Discovery LearningModels With the Science Approach to the Understanding Concept and Science Process Skills of the Student. *Advances in Social Science, Education and Humanities Research.* 566: 2352-5398. http://creativecommons.org/licenses/by-nc/4.0/

Emrisena, A; Abdurrahman & Eko, S. (2018). Pengarfuh Model Pembelajaran Problem Based Learning Terhadap Keterampilan Proses Sains Ditinjau Dari Self-Efficacy Siswa. *Jurnal Pendidikan Fisika*. 6 (1): 196-20.

Ginting, F. W., Novita, N., & Rahmadani, Y. (2020). Penerapan Model TGT Melalui Simulasi PhET Terhadap Peningkatan pemahaman Siswa pada Alat-alat Optik . Jurnal Riset Inovasi Pembelajaran Fisika. 3(2):1-9. https://doi.org/10.29103/relativitas.v3i2.3341

Gulo, A. (2022). Penerapan Model Pembelajaran problem Based Learning Dalam Meningkatkan Motivasi dan Hasil Belajar IPA. *Educativo: Jurnal Pendidikan*. 1(1): 334-341. http://doi.org/10.56248/educativo.v1i1.58

Gunawan, G. (2015). *Model Pembelajaran Sains Berbasis ICT*. Mataram: FKIP UNRAM.

Handika, I., & Wangid, M. N. (2013). Pengaruh Pembelajaran Berbasis Masalah Terhadap Penguasaan Konsep Dan Keterampilan Proses Sains Siswa Kelas V. *Jurnal Prima Edukasia*, 1 (1): 85-93.

Helyandri, B. H., Sahidu, H & Hikmawati. (2020). Pengaruh Model problem Based Learning terhadap Hasil Belajar Fisika Peserta Didik MA Darul Hikmah darek Tahun Pelajaran 2019/2020. *Jurnal Fisika dan Pendidikan Fisika*. 5(1): 10-17. https://doi.org/10.20414/konstan.v5i1.46

Hermawan, I. (2019). *Metodologi Penelitian Pendidikan Kuantitatif, Kualitatif dan Mixed Metode*. Hidayatul Quran Kuningan.

Jauhari, T., Hikmawati., & Wahyudi. (2016). Pengaruh Model Pembelajaran Berbasis Masalah Berbantuan Media PhET Terhadap Hasil Belajar Fisika Siswa Kelas X SMAN 1 Gunungsari Tahun Pelajaran 2015/2016. *Jurnal Pendidikan Fisika dan Teknologi*. 2(1): 7-12.

Kibret, S., Teshome, D., Fenta, E., Hunie, M., Taye, M.G., Fentie, Y., & Tamire, T. (2022). Medical and Health Science Students' Perception Towards a Problem Based Learning Method: A Case of Debre Tabor University. Advances in Medical Education and Practice. 12, 781-786. https://doi.org/10.2147/AMEP.S316905

Ngadinem, N. (2019). Pengaruh Media Simulasi Phet Untuk Meningkatkan Keterampilan Proses Sains. *Jurnal Ilmiah WUNY*. 1 (1):1-9.

Oriji, C. T., & Ogbuanya, T. C. (2018). Assesing The Effectiveness Of Problem Based Learning And Lecture Based Learning Environments On Students' Achivements In Electronic Works. International Journal of Electrical Engineering and Education. 55(4): 334-353. https://doi.org/10.1177/0020720918773983

Ramadhan, A., Hasyim, F., & Wibowo,H. A. C. (2019). Efektifitas Pembelajaran Fisika Bab Gaya Menggunakan Media Simulasi PhET dan Alat Peraga Sederhana Pada Siswa SMP Kelas 8 Untuk meningkatkan Penguasaan Materi. *Prosiding Seminar Nasional Pendidikan Fisika*. 4(1): 125-128. https://jurnal.unej.ac.id/index.php/fkip-epro/article/view/15151

Sahidu, H. (2016). *Pengembangan Perangkat Pembelajaran Fisika (P3F).* Mataram: FKIP UNRAM Press.

Saputra, R., Susilawati & Verawati, Ni, N, Sri, P. (2020). Pengaruh Penggunaan Media Simulasi *PhET*

(*Physics Education Technology*) Terhadap Hasil Belajar Fisika. *J.Pijar MIPA*. 15 (2): 110-115.

Schmidt, H. G., Rotgans, J. I., & Yew, E. H. J. (2011). The Process of Problem Based Learning: What Works and Why. *Medical Education*. 45(8): 792-806. https://doi.org/10.1111/j.1365-2923.2011.04035.x

Setyawan, M., & Koeswanto, H. (2021). Pembelajaran Problem Based Learning Terhadap Berfikir kritis Peserta Didik Sekolah Dasar. Jurnal Mimbar PGSD Undiksha. 9(3): 489-496.

Sudiarta, N. (2019). Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Hasil Belajar Fisika Materi Suhu dan kalor. *Journal of Education Action Research*. 3(4): 440-447.

Susilawati, S., Doyan, A & Ayub, S. (2019). Pendekatan Keterampilan Generik Sains Antara Model Pembelajaran Berbasis Masalah dengan Inkuiri Terbimbing Ditinjau dari Kemampuan Berpikir Kritis Siswa SMA. *Jurnal Pendidikan Fisika dan Teknologi*. Vol 5(1): 16-23.

Susilawati, S., Doyan, A., Mulyadi, L., Abo, C.P., & Pineda, C. I. S. (2022). The effectiveness of Modern Physics Learning Tools Using the PhET Virtual Media Assistes Inquiry Model in Improving Cognitive Learning Outocomes, Science Process Skills, and Scientific. *Jurnal Penelitian Pendidikan IPA*. 8(1): 291-295. https://doi.org/10.29303/jppipa.v8i1.1304

Yin, Q., Guo, C., Dong,C., & Wang, T. (2021). May Problem Based Learning Get Higher Evalution From Student. International Journal of Crowd Science. 5(1): 92-111. https://doi.org/10/1108/IJCS-12-2020-0019

Yuafi, M.E.D & Endryansyah. (2015). Pengaruh Penerapan Media Pembelajaran *PhET* (Physics Educations Technology) Simulation Terhadap Hasil Belajar Siswa Kelas X TITL Pada Standar Kompetensi Mengaplikasikan Rangkaian Listrik di SMKN 7 Surabaya. *Jurnal Pendidikan Elektro UNESA*. 04 (02): 407-414.

Yunita, Y., Hali, A., & Safitri, R. (2020). Meningkatkan Penguasaan Konsep Mahasiswa dengan Simulasi Physics Education Technology (PhET). Jurnal pendidikan Sains Indonesia. 7(1): 16-22. https://doi.org/10.24815/jpsi.v7i1.13492

Zagoto, M. M., Yarni,N., & Dakhi, O. (2019). Perbedaan Individu Dari Gaya Belajarnya Serta Implikasinya Dalam Pembelajaran. *Jurnal Review Pendidikan Dan Pengajaran*. 1(1): 1-7. http://doi.org/10.31004/jrpp.v2i2.481