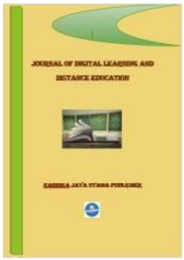

JOURNAL OF DIGITAL LEARNING AND DISTANCE EDUCATION (JDLDE)

ISSN: 2964-6685

https://www.rjupublisher.com/ojs/index.php/JDLDE

Process Skills through Student Worksheet Based on Around Nature in Materials Temperature and Heat

AZHAR[a], Ruth Rize Paas MEGAHATI S[b*]

[a]*Physics Education Study Program, Universitas Riau, Pekanbaru, Riau, Indonesia;*
[b]*Medical Laboratory Engineering Study Program, Politeknik Kesehatan, Bandar Lampung, Lampung,Indonesia*

*Corresponding author: megahati71@gmail.com

Abstract

This study aims to describe and determine the differences in students' physics process skills through the LKS based on Natural Exploration (JAS) on temperature and heat at SMAN 2 XIII Koto Kampar. The research design used in this study was an intact-group comparison design. The data collection technique in this study was giving tests to the experimental and control classes, after learning through LKS based on Exploring the Surroundings. The average absorption power of the experimental class is 80% in the good category, while the control class is 74% in the good category. Based on students' absorption, it can be said that learning in the experimental and control classes is effective. Classical student learning completeness in the experimental class is 84% and in the control class is 62.5% otherwise incomplete. The classical completeness of the process skill indicator in theexperimental class is 100% and in the control class is 75%. In classical completeness, the indicator of process skills in the experimental class is declared complete and the control class is declared incomplete. After the t-test was conducted, it was found that there was a significant difference in physics process skills through LKS based on Exploring the Surroundings by using ordinary LKS.

Keywords**:** process skills, student worksheet, materials temperature, and heat

Acknowledgments: Thank you to all those who have participated in helping in the process ofcarrying out until the completion of this research.

For citation:
Azhar., & Megahati, R. R. P. (2022). Process Skills through Student Worksheet Based on Around Nature in Materials Temperature and Heat**.** *Journal of Digital Learning and Distance Education***,** *1*(3), 110-115. https://doi.org/10.56778/jdlde.v123.228.

Introduction

Science process skills (SPS) are fundamental skills that every student should have. These basic skills include the skills of observing, making hypotheses, planning research, controlling variables, interpreting data, drawing up tentative conclusions, predicting, applying, and communicating which is also called the scientific approach. Physics is the knowledge that studies physical events that include processes, products, and scientific attitudes that are cyclic, and interconnected, and explains how natural phenomena are measured through observation and research. A product is a collection of knowledge that can be in the form of facts, concepts, laws, principles, and theories. The process is the steps that must be taken to acquire knowledge for example observing, interpreting observations, clarifying, predicting, applying concepts, planning experiments, communicating, and concluding (Pedaste et al., 2015).

Based on observations and interviews with teachers in the field of Physics, information was obtained, in class X semester II SMA N 2 XIII Koto Kampar found problems with the lowlearning outcomes for Physics subjects where the learning outcomes of students' Physics processskills could not be said to be fully successful. The problem is, as follows:

1. When studying students have not learned the lesson to be learned. When studying students only listen to lectures from the teacher.
2. The teacher pursues the next target material, the teacher does not give students many opportunities to ask about the extent of students’ understanding of the material that has been studied.
3. Judging from the results of the minimum criteria completeness (KKM) only a small number of students can complete it (40%).

Learning time in class is limited so there needs to be encouragement for students to beable to learn outside class hours (Coman et al., 2020); (Darling-Hammond et al., 2020). Activities that can be done outside of learning hours are not only in the form of questions but also experimental activities. The learning flow is by giving physics problems (Sun et al., 2021); (Tucny et al., 2024); (Prahani et al., 2018). Then, prediction and observation activities are presented which are designed to be done at home (Hong et al., 2019). Furthermore, class learning can be filled by discussing the results of the experiment (Jensen et al., 2018); (Van Alten et al., 2019). The material of temperature and heat is very close to students' lives, even by using kitchen utensils, experiments can be carried out that support the delivery of temperature and heatmaterial. The JAS approach is an approach designed for biology learning but can be applied to other subjects including physics (Ridlo et al., 2019). This study aims to describe and determine the differences in students' physics process skills through the LKS based on Natural Exploration (JAS) on temperature and heat at SMAN 2 XIII Koto Kampar.

Methodology

This type of research is a quasi-experimental research (quasi) experiment. In quasi-experimental research, researchers do not have the flexibility to manipulate subjects, meaning that random groups are usually used as the basis for determining the treatment and control groups. The population in this study were all students of class X IPA SMA Negeri 2 XIII Koto Kampar. The determination of experimental class and the control class were determined by random sampling, namely the simple random sampling technique using alottery. This lottery technique is carried out to avoid subjective elements, namely by giving equalrights to each subject to have the opportunity to become an experimental class or control class. Class X IPA 1 is the experimental class and class X IPA 2 is the control class. The research design used in this study was an intact-group comparison design. The data collection techniquein this study was giving tests to the experimental and control classes, after learning through LKS based on Exploring the Surroundings.

Results

Process Skills Analysis

1. Descriptive Analysis

The data collected in this study is data on students' physics process skills on the subject matter of temperature and heat which includes the experimental class and control class consisting of process skills test scores which are carried out after the end of the teaching and learning process through LKS learning based on Natural Surroundings (JAS). Learning outcomes of students' physics science process skills on the material of temperature and heat through LKS Based on Exploration of the Environment. Based on Appendix 10 and Appendix 11 a description of absorption, learning effectiveness,classical completeness, and completeness of process skill indicators is shown in the tablebelow.

Table1. Absorption, learning effectiveness, classical completeness, completeness of process skills indicators

Aspect	Experiment Class		Control Class	
	(%)	Category	(%)	Category
Average Absorption Capacityof Students	80	Good	74	Good
Learning Effectivity	80	Effective	74	Effective
Classical Learning Completeness	84	Not finished	62.5	Not finished
Completeness of IndicatorItems				
Prediction	96	Finished	100	Finished
Observation	100	Finished	95	Finished
Analyzed	88	Finished	79	Finished
Conclusion	76	Finished	41	Not Finished

After the implementation of the learning, it was found that the absorption capacity of the two classes was good with effective effectiveness. The classical completeness of the experimental and control classes was both incomplete because classically they had to reach 85%. The completeness of the process skill indicator items after the implementation of the experimental class learning is complete while the control class is not complete because it is less than 85%.

2. Inferential Analysis

After obtaining the test data for learning outcomes after learning the LKS Based on Exploration of the Environment (JAS), a normality test was carried out. By using SPSS 16 as shown in Appendix 12, it can be seen that the experimental class and control class data are normally distributed.

In Q-Q plots, the sample points are attached to a linear line. A linear line is an ideal reference for data distribution which is normally distributed. In the Q-Q plots, the data on temperature and heat test values meet the criteria so that the data for both classes are normally distributed. Then the homogeneity test was carried out, it was found that both classes had homogeneous variance. This is shown in the test table of homogeneity of variances that the significance value is > 0.05 (0.820 > 0.05).

After the prerequisite tests are met, the hypothesis testing is carried out in two ways, namely through the calculation of the statistical value of the t-test manually using the t-test polled variance formula and through the SPSS 16 (Independent-Sample T-Test) program as shown in Appendix 14. Hypothesis testing aims to see whether there are differences in learning outcomes between the experimental class and the control class, where the proposed hypothesis is:

1) Ho: There is no significant difference between students' physics process skills throughLKS based on Exploring the Surroundings (JAS) and conventional LKS
2) Ha: There is a significant difference between students' physics process skills through the LKS based on Exploring the Surroundings (JAS) and conventional LKS

The t-test was conducted to test the Ho hypothesis. From the results of calculationsusing the t-test polled variance formula and using the SPSS 16 program in Appendix 14,the results of the t calculation are t count = 2.167. Based on the calculation of the t-tablevalue by the provisions of the t-test formula polled variance for the 95% significance level and DK = n1 + n2 – 2 obtained t table = 2.012. Based on the test criteria for the t-value, the results obtained are t count > t table or (2.167 > 2.012), so based on the comparison of the t-value, Ha is accepted. Thus, it can be concluded that there is a difference between students' physics process skills through natural exploration-based worksheets (JAS) and conventional worksheets.

Discuss

Based on the analysis and absorption, the effectiveness of learning, the mastery of student learning, and the completeness of the indicators of process skills of the subject matter of temperature and heat can be explained as follows:

a. Absorption

Student learning absorption is an index or level of student understanding in learning, responding, and practicing what is taught, read, heard, and learned (Dwivedi et al., 2023); (Ganie et al., 2019). Many process skills are taken from everyday life (Siahaan et al., 2017); (Deta et al., 2020). The absorption of the implementation of learning is not only obtained by students from their daily lives of students but also from the learning that has beencarried out at school (Ketut Sudarsana et al., 2019). The results of this study indicate that the absorption capacity of each student is different. This is due to differences in the ability of students to receive and absorb learning materials, differences in the seriousness of students, differences in student activity in answering teacher questions, and different levels of material difficulty (Lodge et al., 2018). The average absorption power after the implementation of learning in the experimental classis 80% while the average post-test absorption in the control class is 74% with a difference of 6%, meaning that there is a difference between the experimental class and the control class but not too different. This is because the experimental class uses JAS-based worksheets whilethe control class only uses ordinary worksheets.

The experimental class obtained higher results than the control class because the experimentalclass conducted experiments at home using existing media at home to find out the concepts of temperature and heat (Flegr et al., 2023). While the control class only uses ordinary worksheets without doingany experiments.

We can see that the JAS components of exploration, constructivism, and Bioedutainment havebeen well-trained. The exploration component can be seen when students explore their environment. Students discover experiences and raise questions or problems. And solve the problem with scientific reasoning (Jirout, 2020). The constructivism component can be seen when students interact with their environment through their senses, seeing, hearing, touching, smelling, andfeeling to find problems with scientific reasoning. Bioedutainment components can be seen from the cognitive, affective, and psychomotor aspects.

b. Learning Effectiveness

Effectiveness refers to the ability to achieve the goals that have been set. Effectiveness is an important factor in learning. Effectiveness is how someone manages to get and use learning methods to get good results. The effectiveness of learning cannot happen by itself but must be pursued with the creation of conducive learning. Effective learning is a match between students who carry out learning with learning goals or objectives to be achieved. The success of teaching and learning activities determines the success of teachers and schools in implementing education. A teacher must pay attention to the effectiveness of learning in schools, especially in the classroom.

On average, the effectiveness of learning obtained good results. In the experimental class 80%and the control class 74% with a difference of 6%. The effectiveness of the experimental classis higher than the control class, this is because the experimental class uses JAS-based worksheets while the control class only uses ordinary worksheets. learning effectiveness canbe seen during the learning process (Panigrahi et al., 2021); (Muhtadi et al., 2021). In the experimental class, students are very active in carrying out learning because they have done experiments at home so at school they discuss well and compare the results obtained from experiments conducted at home. While inthe control class, the LKS was used without experimenting so that students were less serious when learning. It may also be because students do not have preparation while studying. The discussion did not run smoothly.

Conclusion

The average absorption power of the experimental class is 80% in the good category, while the control class is 74% in the good category. Based on students' absorption, it can be said that learning in the experimental and control classes is effective. Classical student learning completeness in the experimental class is 84% and in the control class is 62.5% otherwise incomplete. The classical completeness of the process skill indicator in the experimental class is 100% and in the control class is 75%. In classical completeness, the indicator of process skills in the experimental class is declared complete and the control class is declared incomplete. After the t-test was conducted, it was found that there was a significant difference in physics process skills through LKS based on Exploring the Surroundings by using ordinary LKS.

Conflicts of Interest

The authors declare no conflict of interest

References

Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online Teaching and Learning in Higher Education during the Coronavirus Pandemic: Students' Perspective. *Sustainability*, *12*(24), 10367. https://doi.org/10.3390/su122410367

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, *24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

Deta, U. A., Prakoso, I., Agustina, P. Z. R., Fadillah, R. N., Lestari, N. A., Yantidewi, M., Admoko, S., Zainuddin, A., Nurlailiyah, A., & Prahani, B. K. (2020). Science Process Skills Profile of Non-Science Undergraduate Students in Universitas Negeri Surabaya. *Journal of Physics: Conference Series*, *1491*(1), 012067. https://doi.org/10.1088/1742-6596/1491/1/012067

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., … Wright, R. (2023). Opinion Paper: "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges, and implications of generative conversational AI for research, practice, and policy. *International Journal of Information Management*, *71*, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Flegr, S., Kuhn, J., & Scheiter, K. (2023). When the whole is greater than the sum of its parts: Combining real and virtual experiments in science education. *Computers & Education*, *197*, 104745. https://doi.org/10.1016/j.compedu.2023.104745

Ganie, R., . D., & Rangkuti, R. (2019). Reading Comprehension Problems on English Texts Faced By High School Students in Medan. *KnE Social Sciences*. https://doi.org/10.18502/kss.v3i19.4896

Hong, J.-C., Tsai, C.-R., Hsiao, H.-S., Chen, P.-H., Chu, K.-C., Gu, J., & Sitthiworachart, J. (2019). The effect of the "Prediction-observation-quiz-explanation" inquiry-based e-learning model on flow experience in green energy learning. *Computers & Education*, *133*, 127–138. https://doi.org/10.1016/j.compedu.2019.01.009

Jensen, J. L., Holt, E. A., Sowards, J. B., Heath Ogden, T., & West, R. E. (2018). Investigating Strategies for Pre-Class Content Learning in a Flipped Classroom. *Journal of Science Education and Technology*, *27*(6), 523–535. https://doi.org/10.1007/s10956-018-9740-6

Jirout, J. J. (2020). Supporting Early Scientific Thinking Through Curiosity. *Frontiers in Psychology*, *11*, 1717. https://doi.org/10.3389/fpsyg.2020.01717

Ketut Sudarsana, I., Bagus Made Anggara Putra, I., Nyoman Temon Astawa, I., & Wayan Lali Yogantara, I. (2019). The use of Google Classroom in the learning process. *Journal of Physics: Conference Series*, *1175*, 012165. https://doi.org/10.1088/1742-6596/1175/1/012165

Lodge, J. M., Kennedy, G., Lockyer, L., Arguel, A., & Pachman, M. (2018). Understanding Difficulties and Resulting Confusion in Learning: An Integrative Review. *Frontiers in Education*, *3*, 49. https://doi.org/10.3389/feduc.2018.00049

Muhtadi, A., Wahyuningsih, D., & Sidabutar, M. (2021). The Effectiveness of Online Learning Model Implementation. *KnE Social Sciences*. https://doi.org/10.18502/kss.v6i2.10012

Panigrahi, R., Srivastava, P. R., & Panigrahi, P. K. (2021). Effectiveness of e-learning: The mediating role of student engagement on perceived learning effectiveness. *Information Technology & People*, *34*(7), 1840–1862. https://doi.org/10.1108/ITP-07-2019-0380

Pedaste, M., Mäeots, M., Siiman, L. A., De Jong, T., Van Riesen, S. A. N., Kamp, E. T., Manoli, C. C., Zacharia, Z. C., & Tsourlidaki, E. (2015). Phases of inquiry-based learning: Definitions and the inquiry cycle. *Educational Research Review*, *14*, 47–61. https://doi.org/10.1016/j.edurev.2015.02.003

Prahani, B. K., Suprapto, N., Suliyanah, Lestari, N. A., Jauhariyah, M. N. R., Admoko, S., & Wahyuni, S. (2018). The effectiveness of the collaborative problem-based physics learning (CPBPL) model in improving student's self-confidence in physics learning. *Journal of Physics: Conference Series*, *997*, 012008. https://doi.org/10.1088/1742-6596/997/1/012008

Ridlo, S., Ngabekti, S., Isnaeni, W., & Prasetyo, A. P. B. (2019). Natural experience approach in science learning: An impact study of socialization to the science teacher. *Journal of Physics: Conference Series*, *1321*(3), 032098. https://doi.org/10.1088/1742-6596/1321/3/032098

Siahaan, P., Suryani, A., Kaniawati, I., Suhendi, E., & Samsudin, A. (2017). Improving Students' Science Process Skills through Simple Computer Simulations on Linear Motion Conceptions. *Journal of Physics: Conference Series*, *812*, 012017. https://doi.org/10.1088/1742-6596/812/1/012017

Sun, Y., Sun, Q., & Qin, K. (2021). Physics-Based Deep Learning for Flow Problems. *Energies*, *14*(22), 7760. https://doi.org/10.3390/en14227760

Tucny, J.-M., Durve, M., Montessori, A., & Succi, S. (2024). Learning of viscosity functions in rarefied gas flows with physics-informed neural networks. *Computers & Fluids*, *269*, 106114. https://doi.org/10.1016/j.compfluid.2023.106114