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# Improving Project-Based Science Process Skills Through Learning Management System (LMS) for Science and Technology Courses

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## ABSTRACT

This study investigates the effectiveness of implementing project-based learning through the Learning Management System (LMS) in enhancing students' science process skills in the "Science and Technology" course. Employing a quasi-experimental pretest-posttest design, the research involved students from the elementary school teacher education study program at Universitas PGRI Semarang. The findings indicate a significant improvement in students' observation, experimentation, data analysis, and problem-solving skills after the implementation of project-based learning through LMS. These results highlight the potential of LMS as an effective learning model to enhance students' competencies in science and technology courses. This study benefits students, lecturers, higher education institutions, and researchers in education by providing insights into innovative teaching strategies that leverage digital learning platforms**.**
**Keywords**: Science Process Skills, Project Based Learning, Learning Management System, Students

## INTRODUCTION

Technological advances in education have driven various innovations in learning methods, including in teaching Science and Technology courses. One method that is increasingly used is the Learning Management System (LMS), which allows learning to be more flexible, interactive, and project-based. According to Anderson and Dron (2011), LMS provides a learning environment that can support various learning models, including constructivism-based approaches that encourage students to be more active in the learning process. In addition, Munir (2010) stated that the use of LMS in universities can increase student engagement and the effectiveness of online learning. The project-based learning approach contributes to improving students' conceptual understanding and strengthening science process skills that are very important in the academic and professional world. These skills include observation, data interpretation, hypothesis formulation, experimentation, and analysis and problem solving (Chiappetta & Koballa, 2010). Based on research by Amanda, Biru, and Suryani (2023), the project-based learning model has been shown to have a positive effect on students' science process skills. However, conventional teaching methods are often less effective in developing these skills because they tend to be more theoretical and provide less direct experience in scientific research and exploration.

According to Means et al. (2014), the implementation of project-based learning through LMS can increase student engagement and deepen their understanding of the material. LMS allows students to access various learning resources, collaborate on research projects, and systematically document and evaluate experimental results. In addition, LMS makes it easier for lecturers to provide more effective feedback and monitor student progress in a more

structured manner (Sun & Rueda, 2012). A study conducted by Wulandari and Tohir (2024) also emphasized that LMS plays an important role in improving the quality of online learning in higher education.

This study aims to examine the effectiveness of the implementation of project-based learning through LMS in improving students' science process skills in Science and Technology courses. With this research, it is hoped that it can contribute to the development of more innovative and technology-based learning strategies to improve the quality of science education in higher education. In addition, the results of this study are expected to provide recommendations for educational institutions in optimizing the use of technology in science and technology learning (Dianti, Pamelasari, & Hardianti, 2021).

## LITERATURE REVIEW

1. Science Process Skills (SPS) in Learning

Science Process Skills (SPS) are skills that support the understanding of science concepts and principles through direct experience. According to Harlen (2020), SPS consists of basic skills such as observing, classifying, measuring, interpreting data, and concluding. The application of SPS in science learning aims to train students to be able to think critically, creatively, and solve problems scientifically (Rezky et al., 2021).

2. Project-Based Learning in Science and Technology

Project-Based Learning (PBL) is an approach that involves students in in-depth exploration of a problem or project. According to Thomas (2019), PBL can improve high-level thinking skills, collaboration, and learning independence. In the context of science and technology learning, PBL allows students to apply theory in real projects, thereby improving their understanding and skills (Widodo et al., 2022).

3. Learning Management System (LMS) in Learning

A Learning Management System (LMS) is a digital platform used to manage online learning and provide systematic access to materials, discussions, and evaluations. According to Sun et al. (2020), LMS such as Moodle and Google Classroom can increase student engagement and learning effectiveness. The use of LMS in project-based learning allows students to more easily access materials, collaborate, and get feedback from lecturers in real time (Hidayat et al., 2023).

4. Integration of Science Process Skills, PBL, and LMS in Science and Technology Learning

The integration of Science Process Skills, PBL, and LMS in science and technology learning aims to improve students' science process skills. This learning model encourages students to be active in scientific exploration, develop problem-based projects, and access various resources through LMS. Research by Sari et al. (2021) shows that this combination can improve students' conceptual understanding and experimental skills.

## METHODOLOGY

This study used a quasi-experimental method with a pretest-posttest design. The population of the study was students of the science education study program in a certain semester. The sample was selected by purposive sampling and divided into two groups: an experimental group that implemented project-based learning through LMS and a control group that used conventional learning methods. The control group used class 7I PGSD UPGRIS, while the experimental group used class 7H. The research instruments included a science process skills

test, a student perception questionnaire, and observations of learning activities. Data were analyzed using a paired t-test statistical test to determine the difference in science process skills before and after the intervention.

## RESULTS

After the implementation of project-based learning through the Learning Management System (LMS), an analysis was conducted on the improvement of students' science process skills. Measurements were conducted using pretests and posttests on the experimental and control groups. The following are the results obtained:

**Table 1.** Average Pretest and Posttest Values

| Class | Pretest | Posttest |
|---|---|---|
| Control Class | 54,8 | 65,7 |
| Experimental Class | 55,2 | 80,4 |

Paired t-test in the experimental group showed a t value = -29.581 with a significance of $p < 0.05$, indicating a significant increase in science process skills after project-based learning intervention through LMS. Paired t-test in the control group also showed a significant increase, but with a lower t value than the experimental group.

**Table 2.** Average Pretest and Posttest Values

| | N-gain | Category |
|---|---|---|
| Control Class | 0,45 | Medium |
| Experimental Class | 0,72 | High |

Based on table 2, it was found that the N-gain in the control class was 0.45 with a medium category and the N-gain in the experimental class was 0.72 with a high category.

## DISCUSSION

The results of this study indicate that the implementation of project-based learning through LMS significantly improves students' science process skills. The higher improvement in the experimental group compared to the control group indicates the effectiveness of this method. The use of learning management systems (LMS) in lectures is indicated by an assessment scheme consisting of student activity (10%), quizzes (10%), projects (50%), Mid-Semester Exams (10%), assignments (10%), and Final Semester Exams (10%) as shown in Figure 1.

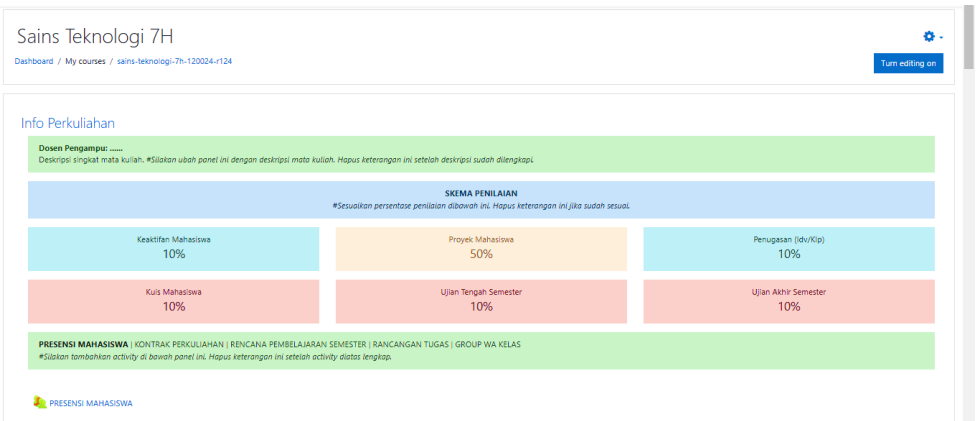

**Figure 1.** Student project assessment scheme through Learning Management System (LMS)

In Figure 2, it is known that students get a structured task to make a video of a science technology project and collect it through the LMS. The videos collected must reflect science process skills activities and be accompanied by Student Worksheets.

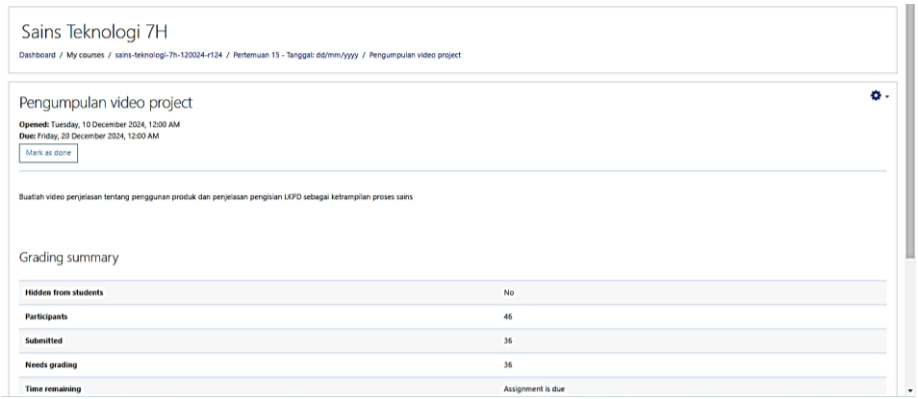


**Figure 2.** Science technology project video collection activity

Several factors that contributed to this increase include active student involvement, utilization of LMS, and development of science process skills. The first factor, Active Student Involvement means that project-based learning encourages students to be directly involved in the learning process, from planning to project implementation. This is in line with research stating that project-based learning models can improve students' science process skills. The second factor, Utilization of LMS means that the use of LMS facilitates access to learning resources, communication between lecturers and students, and collaboration between students. These facilities support a more structured and interactive learning process. The third factor, Development of Science Process Skills means that through designed projects, students are trained to observe, formulate hypotheses, design and carry out experiments, and analyze data. These skills are essential in the science process and have been shown to improve through this learning method. Science process skills activities are shown in the video shown in Figure 3.

The results of the study showed that the use of LMS significantly improved students' academic performance, especially in terms of material accessibility, interaction between lecturers and students, and efficiency in managing assignments and assessments. This study is in line with research by Subiyantoro and Ismail (2017) which discussed the effect of LMS use on students' academic performance in higher education. With a wider implementation of LMS in higher education institutions, it can support a more effective and efficient learning process.

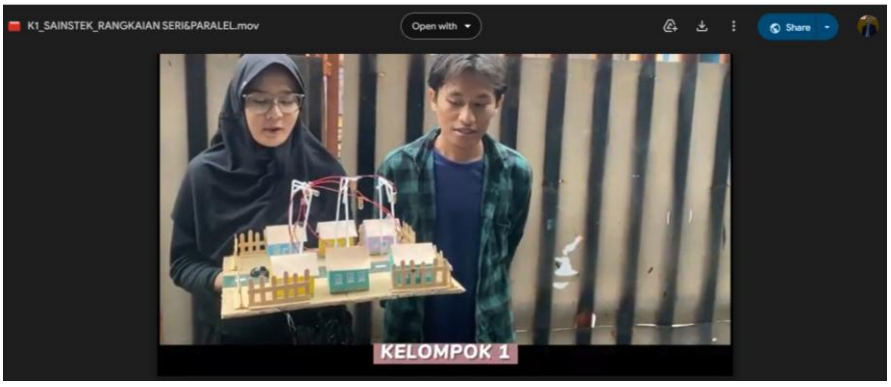


Figure 3. Science process skills in a Science technology project

This finding is consistent with previous studies showing that project-based learning is effective in improving science process skills. In addition, the use of LMS as a learning platform provides greater flexibility and accessibility for students, which in turn improves motivation and learning outcomes. The results of this study are also in line with research by Sun and Rueda (2012) that there is a relationship between motivational and learning variables, namely situational interest, computer self-efficacy, and self-regulation, with three types of student engagement in distance education: behavioral, emotional, and cognitive engagement. The results showed that situational interest and self-regulation had significant correlations with all three types of engagement (behavioral, emotional, and cognitive), while computer self-efficacy showed no relationship with the three engagement variables.

Another study conducted by Wismaningati et al. (2019) also discussed the effectiveness of implementing a project-based learning model in training students' science process skills. Project-based learning has been shown to improve students' science process skills. This is because this method encourages students to be actively involved in scientific investigations, problem solving, and the application of science concepts in real contexts. In addition, project-based learning can also improve students' critical and creative thinking skills. Wulandari and Tohir (2024) also explained the use of Learning Management Systems (LMS) in improving the quality of online learning in higher education. Although LMS has many advantages, there are several challenges, such as the need for lecturers to adjust the curriculum from face-to-face to online and the potential for low interactivity if the material is not properly adapted to the online format. Overall, effective LMS implementation can improve the quality of online learning in higher education by providing a structured platform for teaching and learning, as well as facilitating interaction and feedback between lecturers and students.

## CONCLUSION

Based on the results of the research that has been conducted, it can be concluded that:

1. Project-based learning through the Learning Management System (LMS) is effective in improving students' science process skills in Science and Technology courses. The results of the analysis show that there is a significant increase in the posttest scores of the experimental group compared to the control group, as indicated by the results of the t-test and N-Gain analysis.
2. The science process skills that have increased include observation skills, hypothesis formulation, experimental design, data analysis, and drawing conclusions. Students who learn through LMS with a project-based approach are more active in exploring concepts and applying scientific methods directly.
3. The use of LMS in project-based learning provides flexibility, accessibility, and increases student collaboration. LMS facilitates more intensive interaction between students and lecturers and allows students to access materials and complete projects independently or in groups.
4. Project-based learning through LMS is recommended to be widely applied in science and technology learning, especially in efforts to improve students' science process skills at the higher education level.

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provide benefits for the world of education, especially in improving students' science process skills through a project-based learning approach.

## CONFLICT OF INTEREST STATEMENT

The author declares that there is no conflict of interest in this research. All data, analysis, and conclusions presented in this article are purely based on research results without any influence from certain parties, either in the form of financial interests, institutional affiliations, or personal relationships that can affect the objectivity of the research. In addition, there is no funding from third parties that could potentially affect the results of this research.

## REFERENCES


[1] Amanda, N. G., Biru, L. T., & Suryani, D. I. (2023). Pengaruh Model Pembelajaran Project Based Learning terhadap Keterampilan Proses Sains. PENDIPA Journal of Science Education, 7(1), 27922.

[2] Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. The International Review of Research in Open and Distributed Learning, 12(3), 80-97.

[3] Chiappetta, E. L., & Koballa, T. R. (2010). Science instruction in the middle and secondary schools: Developing fundamental knowledge and skills. Pearson.

[4] Dianti, S. A. T., Pamelasari, S. D., & Hardianti, R. D. (2021). Penerapan Pembelajaran Berbasis Proyek dengan Pendekatan STEM terhadap Peningkatan Kemampuan Literasi Sains Siswa. Seminar Nasional Pendidikan IPA 2021, 432-437.

[5] Harlen W. The teaching of science in primary schools. Routledge; 2020.

[6] Hidayat R, Putri M, Setiawan D. The effectiveness of LMS-based learning in higher education. J Educ Technol. 2023;10(2):145-60.

[7] Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2014). The effectiveness of online and blended learning: A meta-analysis of the empirical literature. Teachers College Record, 115(3), 1-47.

[8] Munir. (2010). Penggunaan Learning Management System (LMS) di Perguruan Tinggi: Studi Kasus di Universitas Pendidikan Indonesia. Cakrawala Pendidikan, 1(1), 111-118.

[9] Rezky R, Nugraha S, Dewi R. Enhancing science process skills through inquiry-based learning. J Sci Educ Res. 2021;8(3):87-102.

[10] Sari D, Wahyudi T, Priyono B. Integration of PBL and LMS in science learning: Impact on students' conceptual understanding. Int J STEM Educ. 2021;9(1):50-66.

[11] Subiyantoro, S., & Ismail. (2017). Dampak Learning Management System (LMS) pada Performa Akademik Mahasiswa di Perguruan Tinggi. Edudikara: Jurnal Pendidikan dan Pembelajaran, 2(4), 307-315.

[12] Sun L, Tang Y, Zuo M. Exploring the effectiveness of online learning in higher education: A meta-analysis. Educ Res Rev. 2020;31:100-17.

[13] Sun, J. C. Y., & Rueda, R. (2012). Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education. British Journal of Educational Technology, 43(2), 191-204.

[14] Thomas JW. A review of research on project-based learning. Buck Institute for Education; 2019.

[15] Wismaningati, P., Nuswowati, M., Sulistyaningsih, T., & Eisdiantoro, S. (2019). Pengaruh Pembelajaran Berbasis Proyek untuk Melatihkan Keterampilan Proses Sains Mahasiswa. Pedagogia: Jurnal Pendidikan, 8(1), 1-14.

[16] Wulandari, O., & Tohir, A. (2024). Penggunaan Learning Management System (LMS) dalam Meningkatkan Kualitas Pembelajaran Daring di Perguruan Tinggi. Jurnal Review Pendidikan dan Pengajaran, 7(3), 31682.