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Implementation of Online Think Pairs Share (OTPS) Model to Improve Student Learning Outcome

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Abstract

This study was an online classroom action research (PTK) due to the COVID-19 pandemic. This study aimed to improve learning outcomes in calculus classes for physics engineering students using think pairs share. The online think pairs share (OTPS) learning model was optimized using the Learning Management System (LMS) platform in two learning cycles. The research sample was 46 students in the study program of physics engineering. The data were obtained from the pre-test-post-test scores, group discussions, and individual presentations. The results showed that the pre-test and post-test scores in cycle I were 37.16 and 68.41, while in cycle II, 41.20 and 68.65, respectively. In addition, the daily student score from the group discussion and individual presentation was 60.68 for the cycle I and 60.15 for cycle II. Furthermore, inferential analysis using the Kolmogorov-Smirnov test proves that $t_{count} > t_{table}$. Hence, the result indicated that implementing the OTPS learning model optimized using LMS could improve the student learning outcomes in calculus.

Keywords: Think Pairs Shared; LMS; Online Learning; Calculus

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INTRODUCTION

The success of learning physics is influenced by the ability of physics possessed (Kattayat & Josey, 2019). Therefore, in the physics engineering class, students are given a discussion of calculus for physics as a compulsory course in the first semester. This course provides a fundamental scientific subject of science engineering and enables students to apply it in engineering.

As a fundamental discussion, calculus should be well mastered by every student. Not only theoretically, but students are also required to be able to apply calculus in various contexts, especially to solve physics problems (Burkholder et al., 2021). However, lately, the level of student mastery of concepts related to calculus has tended to decrease. This fact is shown by the inability of students to solve physics problems that require an advanced understanding of calculus (Ashraf, 2020; Hitt & Dufour, 2021; Quimson, 2021; Susilo et al., 2021) An empirical study found that student achievement on calculus subject in the last 3 years (2017-2019) still low in which the percentage of students who have not earned a grade of 50 (grade C) reaches 25% to 40%. Therefore, more appropriate actions are needed in

lectures to improve the quality of learning. Hence, the number of students who pass this course is even greater.

The challenges of calculus learning are increasing during the COVID-19 pandemic. Not only student problems also occur for teachers who must be able to redesign learning with online learning schemes. The reason is that online learning activities are carried out synchronously and asynchronously, which previously were not prepared for students, especially in calculus courses. An alternative learning design that is very likely to be optimized is the think pair shared model (TPS).

Previous studies of the application of the TPS model, for instance, prove that the TPS model could improve conceptual understanding (CU). In addition, it also gets a positive response from students for the learning process activities (Izzah & Qohar, 2020). Furthermore, another research proves that the increase of the understanding abilities among students and completeness scores on Introduction to Basic Mathematics material once lecture with the TPS model was applied (Nasution, 2019). Another study stated that applying the TPS model effectively improved the results of initial mathematical abilities (Sugiharti, 2018). Previous studies prove that the values of learning outcomes using the TPS model in terms of understanding mathematical concepts were higher than that of the direct model now that TPS learning was more innovative and creative (Faqih, 2019).

By adapting to pandemic conditions, the think pair shared model was modified to become the Online Think Pair Shared (OTPS) model. Specifically, in this study, the OTPS model was tested in learning with the support of Moodle LMS. Therefore, online calculus courses can be optimized.

Moodle LMS was chosen based on several considerations, including completeness of features (Athaya et al., 2021), ease of access (open sources) (Kumar et al., 2011), and is quite familiar in many universities in Indonesia (Dhika et al., 2020). Therefore, many tertiary institutions can easily duplicate the learning design that will be developed and become a solution for organizing online or hybrid learning (Hanum, 2013). The results of previous studies also explain that appropriate learning designs, such as optimizing multimedia, allow LMS to increase student enthusiasm during the learning process (Alfina, 2020), make it easier for students to study independently (Bakri & Muliyati, 2017), and make it easier for lecturers to provide lectures and evaluation (Ambarita, 2016). Using LMS during the COVID-19 pandemic can be an alternative to supporting the lecture process.

However, among the many studies that optimize LMS as an alternative to online learning, only a few have redesigned learning to suit the characteristics of online learning. Many of these studies are still moving the face-to-face learning environment into a virtual learning environment, especially for the characteristics of classroom action research. These two learning processes have very different characteristics. Therefore, this study bridges the process of redesigning the learning process to adapt the characteristics of virtual learning.

Therefore, this study aims to analyze the application of the Think Pairs Shared (OTPS) Online learning model using Moodle LMS. The application of the OTPS model is predicted to provide opportunities for students to actively participate in learning and obtain better learning outcomes, especially in Calculus courses, even though the learning process is carried out online.

METHOD

The subjects of this study were undergraduate students of Engineering Physics. The research design used was classroom action research, as seen in Figure 1.

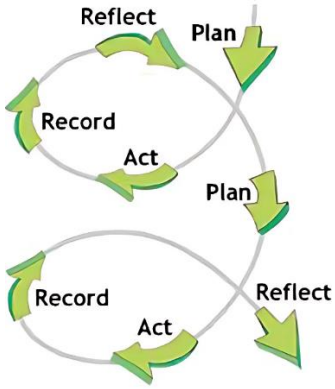

Figure 1. Spiral Model (Altrichter et al., 2002)

The distinction of this research design is that the cycle can be repeatedly conducted if there is still inadequacy in cycle 1. Hence, an improvement action can be done in the design of the next cycle. Cycles 2 and 3 are planned based on the input or findings from the previous cycle reflection with an expectation that the problems identified in the learning process can gradually be coped with well (Soesatyo et al., 2017).

In this study, data were collected with instruments in the form of 10 essay test questions. The questions are about limits and functions, line equations, function derivatives, and extreme values on a curve. This material is adapted to the context of ongoing learning. The questions used have gone through a selection and brainstorming process so that it can be stated that the items are valid. The data analysis through the test of Kolmogorov-Smirnov followed by the t-test paired hypothesis test of using Microsoft excel.

RESULTS AND DISCUSSION

The implementation of online Think Pairs Shared learning

Before the lecture starts, an online pre-test is carried out using the quiz menu on the LMS platform. During the pre-test, the lecturer will monitor students directly online through a Google meet/enlarged video conference. The initial test consists of 10 questions. After the pre-test, the lecture process is carried out by applying the OTPS model, which consists of the following stages.

Think phase

This stage involves asking students to watch the learning videos provided. It aims to prepare students to participate in lectures by submitting resumes before the meeting. Previous studies state that students who are not ready to attend lectures, such as studying the material before a meeting, affect their understanding of concepts (Sumarni, 2016). In online learning, students who are more prepared to "think" tend to contribute more actively to learning. Not only that, both online and offline, the readiness of students greatly influences their contribution of students when carrying out collaborative activities in groups (Putpuek & Kiattikomol, 2017).

Pairs Phase

This phase is carried out after the face-to-face meeting ends. Each student in his group was assigned to discuss through the group discussion forum provided at LMS, as shown in Figure 2. The discussion took place 2 days after the lecture was held. The students were assigned to answer practice questions and submit them before the next face-to-face meeting. The pair phase aims to train students to be able to argue and be responsible for their group assignments. Thus, all group members can better understand the material being studied. This phase is in line with the results of Ariana's research, which concluded that TPS learning

allows students to be more confident in expressing ideas and actively participating in discussions with their group members (Sampsel, 2013).

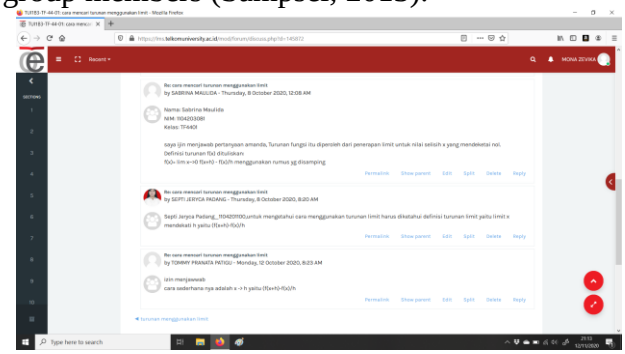

Figure 2. The college students' discussion in the discussion forum of LMS

Share Phase

This stage was carried out in an online, face-to-face meeting. The college students were randomly selected to present the answers to the questions via *Google Meet* media. It aimed to figure out the concepts and understanding of the college students after discussions with their group. All students were allowed to respond and ask questions to other groups. The previous research showed that through the sharing stage, college students found it effective in breaking the deadlock as they could share with friends in various ways during the learning process (Apriyanti & Ayu, 2020). Meanwhile, another research showed that TPS learning became an appropriate method to improve speaking skills in front of the class (Putri et al., 2020).

These three phases were carried out repeatedly in each meeting in one cycle. Once the material for one cycle was completely learned, the post-test with the question was conducted using a similar method as the pre-test.

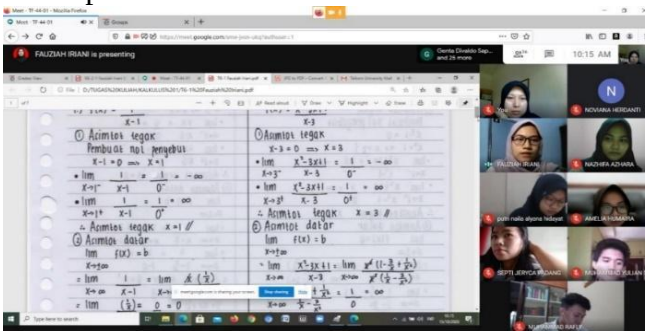

Figure 3. The college students' presentation in the *shared* activity

The Learning Outcomes of the College Students

The learning outcomes of the college students were seen based on the scores obtained in the pre-test and post-test, and the scores of the N-gain, normality test, and hypothesis test were determined to determine the effects of the implementation of the online Think Pairs Shared model using LMS. Table 1 presents the achievement of cycle 1 and cycle 2.

Table 1. The scores of pre-tests, post-test, gain, and N gain of Cycle 1 and Cycle 2

	Cycle 1	Cycle 2
Pre-test	37,16	41,20
Post-test	68,41	68,65
Gain	31,25	27,45
N-gain	0,518	0,468
Category	moderate	moderate

As shown in Table 1 above, there were some increases in the pre-test and post-test scores between cycle 1 and cycle 2. Meanwhile, the score of N-gain was in the moderate category. The achievement in the outcomes of the post-test in cycle 1 showed that about 61%

of college students got scores above 50; meanwhile, for cycle 2, it increased where 74% of college students got scores above 50. This score indicated the lecture's effectiveness in using the OTPS learning model for Calculus 1.

Data Normality Test

The Kolmogorov-Smirnov test was carried out to determine whether the data obtained had been normally distributed. This test compared the results of D_{count} to D_{table} with the provision: if $D_{count} > D_{table}$, then the data were not normally distributed; if $D_{count} < D_{table,}$ then the data were normally distributed (Quraisy, 2020).

Table 2. Normality Test of Cycle 1 and Cycle 2

	Pre-test 1	Post-test 1	Pre-test 2	Post-test 2
Mean	37,162	68,414	41,200	68,650
Standard Deviation	11,827	23,614	6,486	12,104
D_{count}	0,127	0,110	0,221	0,172
D_{table}	0,409	0,409	0,409	0,409
Criteria	Normal	Normal	Normal	Normal

Table 2 shows the calculation results using the Kolmogorov-Smirnov test for the data of the pre-test and post-test in cycle 1 and cycle 2, in which it showed $D_{count} < D_{table}$ Thus, all data were normally distributed, and the hypothesis test uses a t-test.

Hypothesis Test

The hypothesis test used a t-test paired since the data used were paired, and 2 different actions were done in a similar sample with the normal distribution of the data. The hypotheses in the research are presented in Table 3.

Table 3. Hypothesis test of t-test paired in Cycle 1 and Cycle 2.

	Cycle 1	Cycle 2
t count	-5,282	-7,506
t table two-tail	2,262	2,262

As seen in Table 3, the calculation of the hypothesis test in cycles 1 and 2 obtained the results of $t_{count} > t_{table}$. Hence, H_0 was rejected, or H_1 was accepted. It showed that the application of the *Think Pairs Shared* model was able to improve the learning outcomes of college students in the subject of Calculus 1. These results were obtained from the TPS learning process, emphasizing the students to think first, individually study the questions given by the lecturer, and be responsible for finding solutions. Subsequently, each student discussed and shared their opinions with groups (pairs). Also, the students must be able to explain the results of their discussions related to the problems given in front of the class (*shared*). In other words, the students are automatically required to understand the concepts they have learned before presenting the results of their group discussions (Sari et al., 2018). TPS cooperative learning requires active interaction, mutual help, and respect for fellow group members purposely to improve student learning outcomes (Kasimuddin, 2016).

Daily Scores of College Students

According to Figure 4, the daily scores of cycles 1 and 2 were obtained almost similarly, i.e., in the range of 60 to 61. This indicated the very good consistency and learning spirit of the college students through the learning this semester was carried out online, but there was no drawback in its implementation.

Students' enthusiasm during lectures could be seen from their daily assessments, where all assignments, both resumes and practice questions, were well done. Here, each group was asked to hold a tutorial for friends using Google Meet media or other platforms; thus, they could help each other complete the assignments given. It is in line with the research stating that the application of learning using the TPS model can increase enthusiasm and interest in student learning given the continuous assessment carried out by teachers and the active

involvement of students to improve their learning outcomes (Kurniawan et al., 2020). Similar results are also obtained concerning the TPS model, which could foster a sense of enthusiasm and provide a positive response to the learning process, enabling mathematical communication skills (Marlina et al., 2014).

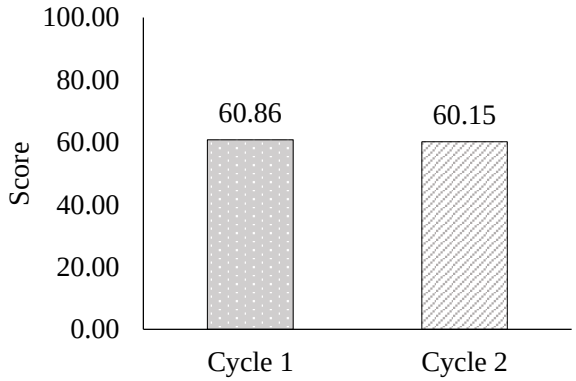

Figure 4. The Mean Daily Score of Cycle 1 and Cycle 2

CONCLUSION

Based on the analysis and discussion, it can be concluded that the implementation of the OTPS lecture for the subject of Calculus 1 has run smoothly with the following achievements: for cycle 1, the achievement of the average class score for the pre-test was 37.16, while for post-test it was 68.41 and the N-gain was 0.518 in the moderate category. Meanwhile, for cycle 2, the achievement of the average class score for the pre-test was 41.20, and the pre-test was 68.65, with an N-gain of 0.468 in the moderate category. The data test of the pre-test and post-test in cycles 1 and 2 using the Kolmogorov-Smirnov test showed that the data were normally distributed. Furthermore, the results of the hypothesis test of paired t-test gave the result of $t_{count} > t_{table}$; thus, H1 was accepted. It can be concluded that the application of online *Think Pairs Shared* learning using the *Learning Management System* can improve students' conceptual understanding of Calculus 1 material. Overall, the mean daily score of students in lecture activities for cycle 1 was 60.68, and for cycle 2, it was 60.15. This showed the consistency of college students in attending lectures in each cycle.

RECOMMENDATION

Lectures using the OTPS model can train college students to be responsible for themselves and their groups. Here, the students are required to have an active role during the lecture. For further research on the development and application of the TPS model in the learning process, dividing the groups or pairs by still concerned with the distribution of student abilities and student comfort in their groups is recommended. Although the students are adaptable to all their friends in their class, grouping them with friends, they are comfortable with increases students' willingness to discuss and ask questions regarding materials that are still not understood. The primary and common challenge in conducting online lectures is ensuring students stay focused during the lecture. The application of the TPS model can help keep students focused, considering that the learning process activities are not monotonous. The obstacles faced when the TPS learning model is applied online are mainly related to network disturbances since students are spread throughout Indonesia, and there is a need for more control from lecturers to monitor that each TPS process has been appropriately run.

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REFERENCES

Alfina, O. (2020). Penerapan lms-google classroom dalam pembelajaran daring selama pandemi covid-19. *Majalah Ilmiah Methoda*, *10*(1), 38–46. https://doi.org/https://doi.org/10.46880/methoda.Vol10No1.pp38-46

Altrichter, H., Kemmis, S., McTaggart, R., & Zuber-Skerritt, O. (2002). The concept of action research. *The Learning Organization*, *9*(3), 125–131.

Ambarita, A. (2016). Implementation of e-learning system using the software MOODLE. *IJIS-Indonesian J. Inf. Syst*, *1*(2), 47–58. https://doi.org/https://doi.org/10.36549/ijis.v1i2.17

Apriyanti, D., & Ayu, M. (2020). Think-Pair-Share: Engaging Students in Speaking Activities in Classroom. *Journal of English Language Teaching and Learning*, *1*(1), 13–19. https://doi.org/https://doi.org/10.33365/jeltl.v1i1.246

Ashraf, A. (2020). Challenges and possibilities in teaching and learning of calculus: A case study of India. *Journal for the Education of Gifted Young Scientists*, *8*(1), 407–433.

Athaya, H., Nadir, R. D. A., Indra Sensuse, D., Kautsarina, K., & Suryono, R. R. (2021). Moodle Implementation for E-Learning: A Systematic Review. *6th International Conference on Sustainable Information Engineering and Technology 2021*, 106–112.

Bakri, F., & Muliyati, D. (2017). Pengembangan Perangkat E-Learning untuk Matakuliah Fisika Dasar II Menggunakan LMS Chamilo. *Jurnal Wahana Pendidikan Fisika*, *2*(1), 25–30. https://doi.org/https://doi.org/10.17509/wapfi.v2i1.4868

Burkholder, E. W., Murillo-Gonzalez, G., & Wieman, C. (2021). Importance of math prerequisites for performance in introductory physics. *Physical Review Physics Education Research*, *17*(1), 10108.

Dhika, H., Destiawati, F., Sonny, M., & Jaya, M. (2020). Comparison of learning management system Moodle, Edmodo and Jejak Bali. *International Conference on Progressive Education (ICOPE 2019)*, 90–94.

Faqih, A. (2019). Model Think Pair Share: Apakah Mempengaruhi Pemahaman Konsep Matematika? *JNPM (Jurnal Nasional Pendidikan Matematika)*, *3*(1), 40–50.

Hanum, N. S. (2013). Keefetifan e-learning sebagai media pembelajaran (studi evaluasi model pembelajaran e-learning SMK Telkom Sandhy Putra Purwokerto). *Jurnal Pendidikan Vokasi*, *3*(1).

Hitt, F., & Dufour, S. (2021). Introduction to calculus through an open-ended task in the context of speed: representations and actions by students in action. *ZDM–Mathematics Education*, *53*(3), 635–647.

Izzah, J., & Qohar, A. (2020). Pembelajaran Matematika Berbasis Lesson Study Dengan Menggunakan Model Kooperatif Tipe Think Pair Share (TPS) Untuk Meningkatkan Pemahaman Konsep Aljabar. *Kreano, Jurnal Matematika Kreatif-Inovatif*, *11*(1), 64–70.

Kasimuddin, K. (2016). Penggunaan Model Pembelajaran Kooperatif Tipe Think Pair Share (TPS) Untuk Meningkatkan Aktivitas Dan Hasil Belajar Fisika Peserta Didik Kelas XI IPA 2 SMA Negeri 9 Makassar. *Jurnal Pendidikan Fisika*, *4*(1), 54–72.

Kattayat, S., & Josey, S. (2019). Improving students conceptual understanding of calculus based physics using Problem Based Learning approach on an e-learning platform applied to engineering education. *2019 Advances in Science and Engineering Technology International Conferences (ASET)*, 1–6.

Kumar, S., Gankotiya, A. K., & Dutta, K. (2011). A comparative study of moodle with other e-learning systems. *2011 3rd International Conference on Electronics Computer Technology*, *5*, 414–418.

Kurniawan, D., Wahyuningsih, T., & Sari, D. N. (2020). Pengaruh Model Pembelajaran Kooperatif Tipe Think Pair Share dengan Menggunakan Power Point Terhadap Hasil Belajar Matematika. *Jurnal Pendidikan Matematika (Kudus)*, *3*(1), 59–72.

Marlina, M., Hajidin, H., & Ikhsan, M. (2014). Penggunaan model pembelajaran kooperatif tipe think-pair-share (TPS) untuk meningkatkan kemampuan komunikasi dan disposisi

matematis siswa di SMA Negeri 1 Bireuen. *Jurnal Didaktik Matematika*, *1*(1).

Nasution, I. S. (2019). Pengaruh Model Pembelajaran Kooperatif Tipe Think Pair Share Terhadap Hasil Belajar Mahasiswa Pada Mata Kuliah Pengantar Dasar Matematika-FKIP UMSU. *MES: Journal of Mathematics Education and Science*, *4*(2), 160–166.

Putpuek, A., & Kiattikomol, P. (2017). Development of a blended online and offline learning model with think-pair-share collaborative learning and student team's achievement division competition. *International Journal of Innovation and Learning*, *22*(2), 254–269.

Putri, H., Fahriany, F., & Jalil, N. (2020). The Influence of Think-Pair-Share in Enhancing Students' Speaking Ability. *Journal of Education, Teaching and Learning*, *5*(1), 67–72.

Quimson, J.-M. Q. (2021). STEM Students' Engagement in Horizontal Transfer from Calculus to Physics and their Difficulties. *International Journal on Research in STEM Education*, *3*(1), 36–46.

Quraisy, A. (2020). Normalitas Data Menggunakan Uji Kolmogorov-Smirnov dan Saphiro-Wilk: Studi kasus penghasilan orang tua mahasiswa Prodi Pendidikan Matematika Unismuh Makassar. *J-HEST Journal of Health Education Economics Science and Technology*, *3*(1), 7–11.

Sampsel, A. (2013). Finding the effects of think-pair-share on student confidence and participation. *Honor Project*, *28*, 1–19.

Sari, M., Habibi, M., & Putri, R. (2018). Pengaruh model pembelajaran kooperatif tipe think-pairs-share dalam pembelajaran matematika terhadap kemampuan pemahaman konsep matematis dan pengembangan karakter siswa sma kota sungai penuh. *Edumatika: Jurnal Riset Pendidikan Matematika*, *1*(1), 7–21.

Soesatyo, Y., Subroto, W. T., Sakti, N. C., Edwar, M., & Trisnawati, N. (2017). Pelatihan penulisan proposal penelitian tindakan kelas (PTK) bagi guru ekonomi Kabupaten Sidoarjo. *Jurnal Pemberdayaan Masyarakat Madani (JPMM)*, *1*(2), 162–178.

Sugiharti, E. H. (2018). *Efektivitas Think Pair Share Terhadap Hasil Belajar Matematika Ditinjau Dari Kemampuan Awal*.

Sumarni, S. (2016). Think pair share Effect of understanding the concept and achievement. *Proceeding of the International Conference on Teacher Training and Education*, *2*(1), 783–787.

Susilo, B. E., Darhim, D., & Prabawanto, S. (2021). Students' learning difficulties in integral calculus based on critical thinking skills. *Journal of Physics: Conference Series*, *1918*(4), 42058.