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Effectiveness of the flipped classroom model in minimizing students' learning performance gaps in higher education

Gamar Assagaf [1, a] *, Patma Sopamena [1, b], Dinar Riaddin [1, c], Julham Hukom [2, d], Abdulnassir Yassin [3, e]

[1] Institut Agama Islam Negeri Ambon. Jl. Dr. H. Tarmizi Taher, Ambon, Maluku, 97128, Indonesia
[2] Universitas Negeri Makassar. Jl. A P Pettarani Gunungsari, Makassar, 90222, Indonesia
[3] Islamic University in Uganda. Kumi Road, P.O.BOX 2555 Mbale, Uganda
[a] gamar_assagaf@iainambon.ac.id; [b] patma.sopamena@iainambon.ac.id;
[c] dinar.riaddin@iainambon.ac.id; [d] julhamhukom.2020@student.uny.ac.id; [e] nasiryasin681@gmail.com
* Corresponding Author.

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Abstract: The flipped classroom (MFC) model has been widely studied as an innovative learning approach that can improve student learning performance. However, the extent to which FCM can have a positive impact on students with different academic abilities remains an unanswered question. Several studies have shown that certain learning models tend to benefit students with high academic ability (UA) more than students with low academic ability (LA), thus potentially widening the achievement gap. This study aims to evaluate the effectiveness of FCM in reducing the learning performance gap between LA and UA students. The research method used the ANCOVA test with a 3 x 2 factorial design, which compared three learning models, namely FCM, Problem-Based Learning (PBL), and Expository. The research subjects consisted of 25 students divided into LA and UA groups. The results showed that FCM was significantly more effective in reducing the learning performance gap compared to PBL and expository models. This finding emphasizes the importance of adopting FCM as a learning strategy that can minimize the academic achievement gap in higher education.
Keywords: learning performance gaps, flipped classroom model, problem-based learning

INTRODUCTION

Higher education is an important foundation in preparing future educators to face the demands and complexities of the modern world. However, one significant challenge that has emerged is the gap in academic achievement between students with the high academic ability (UA) and low academic ability (LA). One of the factors causing this gap is the use of learning models that tend to be one-way and less flexible, thus failing to meet diverse learning needs. UA students often feel less challenged by learning that is too slow, while LA students feel left behind or less involved in the learning process. Therefore, a more inclusive and adaptive learning model is needed to bridge this learning performance gap, so that all students can reach their learning potential optimally.

Each student has a unique speed in understanding information. Prayitno et al.'s (2022) research show that UA students tend to take less time to understand the material than LA students. This emphasizes the importance of allocating the right study time to help LA students improve their academic performance. Other studies, such as those conducted by Adeyemo and Babajide (2014) and Siddaiah-Subramanya et al. (2017), show that when LA students are given sufficient study time that suits their needs, they can achieve mastery of the material comparable to UA students. In addition, Badawi et al. (2023) revealed that inadequate learning strategies and limited study time hinder students from developing their abilities effectively. Thus, Setiawan et al. (2022) recommend that educators adopt learning strategies that can meet the individual learning needs of students, one of which is the Flipped Classroom Model (FCM).

FCM offers a different approach to learning by reversing the traditional learning sequence. In FCM, students study material independently before class meetings through learning resources such as videos, readings, or other digital resources (Bergmann & Sams, 2012; Flipped Learning Network, 2014; Shih & Huang, 2020). Class time is used for discussion, collaboration, and in-depth application of concepts (Al-Samarraie et al., 2020; Clark et al., 2022). This model allows students to learn at their own pace and learning style (Al-Samarraie et al., 2020; Bergmann & Sams, 2012), reduces time pressure that often occurs in conventional learning models (Sargent & Casey, 2020), and provides individualized guidance and more in-depth discussions (Bawaneh & Moumene, 2020). With its flexible, interactive, and responsive approach to student needs, FCM has the potential to not only improve academic performance but also minimize the achievement gap between LA and UA students.

Previous studies have widely discussed the effectiveness of FCM on academic performance in general (Bredow et al., 2021; Divjak et al., 2022; Jang & Kim, 2020; Shi et al., 2020; Stöhr et al., 2020; Zheng et al., 2020). However, these studies tend to ignore differences in students' academic abilities. In other words, there are still few studies exploring whether FCM is effective in reducing the learning performance gap between LA and UA students. This is important to be further investigated because there is a concern that certain learning models are only significant for UA students without providing the same benefits for LA students. Educators need accurate and convincing information about the effectiveness of FCM in this context.

Research on reducing the learning performance gap between LA and UA students has been conducted by Prayitno and Suciati (2017), Prayitno et al. (2022), and Titikusumawati et al. (2020). However, the strategies tested in these studies, such as INSTAD, constructivist collaborative strategies, and integration of open and collaborative strategies (OE-C), have limitations in the allocation of learning time that are less than optimal and do not support students' learning styles. In contrast, FCM provides flexibility in learning time that is more in line with students' needs, allowing them to learn in the environment and time they prefer. Thus, the performance gap between LA and UA students can be minimized if LA students get the allocation of learning time according to their needs. On the other hand, the global urgency of implementing FCM in the last decade has not been studied further regarding its ability to overcome this learning performance gap.

This study aims to evaluate the effectiveness of the Flipped Classroom Model (FCM) in minimizing the learning performance gap between LA and UA students in higher education. The urgency of this study lies in the need to provide more inclusive learning strategies to create equal academic achievement among students with different abilities. The findings of this study are expected to provide significant contributions to the development of learning policies that are more adaptive and responsive to the needs of diverse students.

METHOD

Participant

The population for this study consisted of third-semester students enrolled in an educational program at a college in Indonesia. From the four available classes, we randomly selected three to participate in the research. The sample comprised 150 students, divided into three groups, each with 25 low academic ability (LA) students and 25 high academic ability (UA) students. Prior to the commencement of the study, the students were informed about the research objectives and agreed to participate voluntarily.

Research Design and Procedures

This type of research is an experiment with a 3 x 2 factorial design that aims to investigate whether the use of FCM is more effective in minimizing learning performance gaps between LA and UA students compared to the PBL and expository models. The research design allows researchers to gain a deep understanding of the relative impact of the three learning models on learning achievement gaps among LA and AU students. Table 1 provides a clear visualization of the research design.

Table 1. Research Design

Academic Abilities	Learning Model		
	FCM (A_1)	PBL (A_2)	Expository (A_3)
Lower Academic (B_1)	A_1B_1	A_2B_1	A_3B_1
Upper Accademic(B_2)	A_1B_2	A_2B_2	A_3B_2

Note:
A1B1: Using FCM by LA students
A1B2: Using FCM by UA students
A2B1: Using PBL by LA students
A2B2: Using PBL by UA students
A3B1: Using Expository by LA students
A3B2: Using Expository by UA students

In the treatment classes, three different learning models were implemented: the flipped classroom model (FCM), problem-based learning (PBL), and expository teaching. The steps for the FCM followed the concept outlined by Bergmann and Sams (2012), emphasizing the use of video learning prior to class meetings. Students were expected to prepare by studying the material through video lessons before attending class, allowing class time to be devoted to discussions, problem-solving, and the deeper application of concepts.

The PBL model steps were based on the ideas developed by Ersoy (2014). In this approach, students were presented with a complex problem or scenario that required resolution. They worked in groups to research the problem, gather information, and develop solutions. Classroom discussions were facilitated by the lecturer, guiding students in problem-solving and applying relevant concepts. The expository teaching model followed traditional campus learning activities, where the lecturer predominantly explained the material to the students. For further clarification, the details are illustrated in Figure 1 below.

Research Hypothesis

H_0 : The implementation of FCM is not effective in minimizing the learning performance gap between students with high academic ability (UA) and low academic ability (LA) in higher education.

Ha : The implementation of FCM is effective in minimizing the learning performance gap between students with the high academic ability (UA) and low academic ability (LA) in higher education.

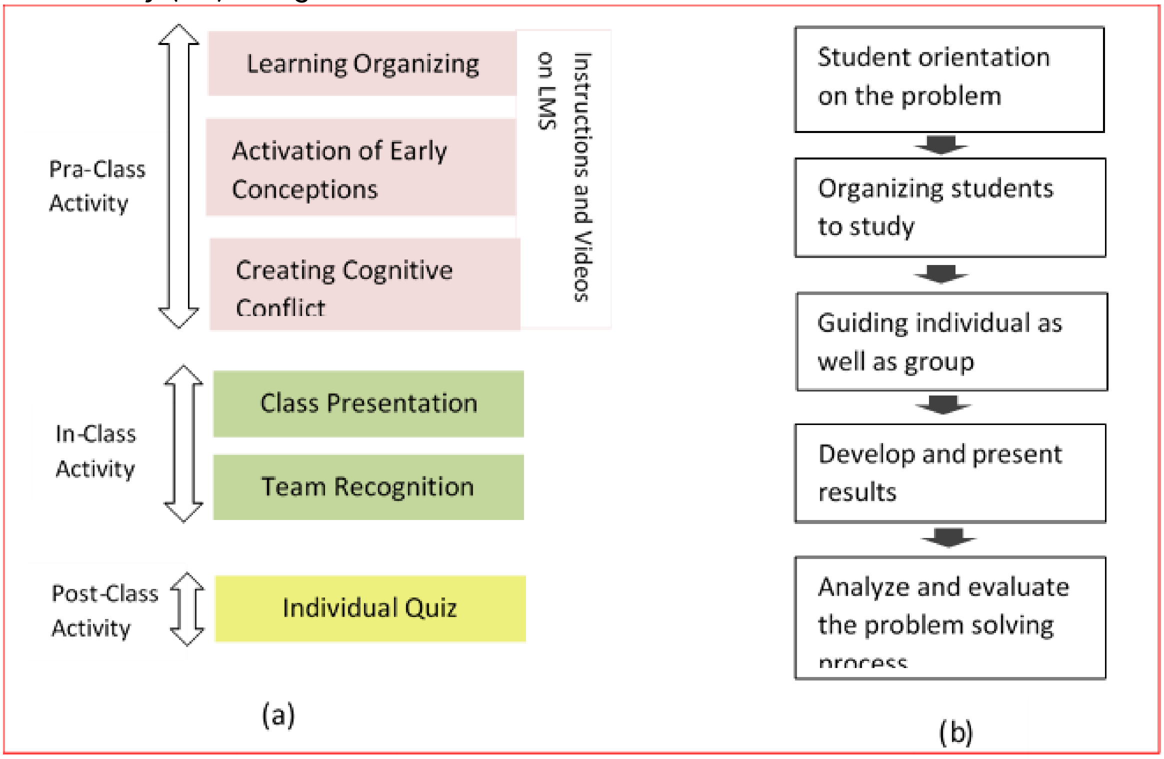

Figure 1. Stages of FCM (a) and PBL (b)

The learning equipment developed by the researchers has passed the qualification test process conducted by three experts with experience in their field. The qualification tests are conducted to evaluate the suitability of the learning device with the established learning measures as well as its ability to achieve the pre-defined learning goals. The evaluation results show that the developed learning devices are considered suitable for the learning process.

Instruments

Student achievement was measured using an essay test consisting of open-ended questions that allowed students to provide multiple correct answers. The test instrument designed by the researcher was first validated by two experts in the field of education to ensure content validity. The validation results showed that the instrument was valid, with an average content validity (CVI) value of 0.88, indicating that the instrument was suitable for measuring academic ability. The reliability of the instrument was tested using Cronbach's Alpha, which produced a value of 0.87, indicating that the instrument had a high level of internal consistency and was reliable in measuring student achievement.

Data Analysis

Pre-test scores were used as covariates in the ANCOVA data analysis process. Before conducting the ANCOVA, we performed normality and homogeneity tests. The Kolmogorov-Smirnov test for data normality yielded results of 0.16 for the pre-test data and 0.23 for the post-test data, both of which are statistically significant values exceeding

0.05, indicating that the data is normally distributed. Additionally, we conducted the homogeneity test using the Levene test, which produced a significance value of 0.07, also greater than 0.05, demonstrating that the variance between data groups is homogeneous. To identify significant differences in the mean values of the variables, we used the Tukey post hoc test. All statistical calculations were performed using IBM SPSS software at a significance level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

Table 2 presents the results of the ANACOVA test on the influence of learning models, academic abilities, and interactions between learning models and academic capacities on student learning achievements.

Table 2. The Influence of Models, Academic Abilities, and Their Interactions on Learning Achievement

Source	Sum of Squares	Df	Mean Square	F	Sig.
Corrected value of Model	21026.07[a]	6	3259.53	641.25	0.00
Pre-test	1860.27	1	1487.49	410.12	0.00
Average Score	3467.76	1	3869.58	701.27	0.00
Learning Model	1493.62	2	801.97	149.41	0.00
Academic Abilities	5.74	1	5.97	1.21	0.07
Learning Model*Academic Abilities	246.26	2	131.41	31.06	0.00
Error	298.88	143	4.98		
Total	423691.61	150			
Total Average Score	19979.18	149			

After taking into account how well the student learned at the start, the ANCOVA two-way test (see Table 2) revealed that using various learning models led to notable differences in how well the student learned [$F(2,143) = 149.41$, $p = 0.00$]. The analysis also showed the learning model interacted significantly with the academic ability [$F(2, 143) = 31.06$, $p = 0.00$]. Next, Table 3 visualizes the post hoc test results.

Table 3. Post-Hoc Results Students' Learning Performance Difference

Learning Models	Pretest	Post-Test	SD	Difference	Corrected Mean	Notation
Expository	41.29	50.49	18.78	9.20	50.06	a
PBL	39.56	74.92	15.73	35.36	77.04	b
FCM	44.26	89.65	11.19	45.39	86.95	c

Post-hoc test results (see Table 3) show that there are significant differences in learning performance between the expository and PBL models. Learning performance also differs significantly between the use of the PBL and FCM models. FCM's learning performance is superior to that of both PBLs and expository models.

The results of the previous ANCOVA analysis (see Table 2) showed that there was a significant difference in the interaction between learning models and students' academic abilities. Table 4 below presents a brief summary of further post hoc test results.

Based on Table 4 results, post hoc tests revealed the following: (1) There were significant differences in learning achievement between LA students using the expository model and LA students who used the PBL model; (2) There was no significant difference in learning achievement between the UA students who were using the expository and the LA students that were using PBL models; (3) There was a significant learning achievement difference between UA students using expository models and UA students with PBL; (4) There were no significant learning achievement differences between the UA students who are using the PBL model and the LA students using FCM; and (5) There was no significant learning achievement difference between the LA and the UA students using the FCM. These findings show that the use of FCM is more effective than expository and PBL in minimizing learning achievement between the LA students and the UA students.

Table 4. Variations in Learning Achievement of LA and UA Students

Learning Models	Academic Abilities	Pretest	Post-Test	Difference	Corrected Mean	Notation
Expository	LA	29.81	39.44	9.63	42.81	a
PBL	LA	29.92	59.11	29.19	62.83	ab
Expository	UA	60.42	79.10	18.68	67.50	b
PBL	UA	57.99	87.38	29.39	79.26	bc
FCM	LA	33.60	65.69	32.09	85.32	c
FCM	UA	60.57	90.36	29.79	92.14	c

These results indicate that the Null Hypothesis (H_0) is rejected, indicating that the Flipped Classroom Model (FCM) is effective in minimizing the learning achievement gap between LA and UA students in college. This finding is consistent with several previous studies that have confirmed that FCM is more effective than traditional learning models (e.g., Chen et al., 2018; Låg & Saele, 2019; Lozano-Lozano et al., 2020; Purnomo et al., 2022; Sulistyowati et al., 2023). In addition, the results of the study showed that the PBL model outperformed the expository model. Expository teaching was found to have the lowest learning performance because it was heavily dominated by teachers who mainly explained the material, presented problems, and asked students to solve the problems, which was less effective in improving student learning performance (Kurniati et al., 2019).

In this research, the Flipped Classroom Model (FCM) proved to be more effective due to its ability to expedite the formation of conceptual balance in a student's cognitive structure. When students come to class with a relatively complete general understanding of a concept, it accelerates the processes of assimilation and accommodation, thereby speeding up the establishment of cognitive equilibrium (Busyairi & Verawati, 2022; Lourenço, 2012). For effective learning, students need to align their perceptions and the objects they study with their existing cognitive schemas. If new perceptions and experiences align with the initial schema, the assimilation process enhances and develops the schema further (Bächtold, 2013; Derobertis, 2021). Conversely, if the initial schema does not align with new perceptions and experiences, it creates a cognitive imbalance. Students then must decide whether to replace the initial schema with a new one or modify it. If they choose to replace it, students engage in activities such as recalling information and reinforcing their understanding of the new concepts to gain a deeper comprehension (Bormanaki & Khoshhal, 2017; Stoltz, 2018).

Our research results also showed that the learning performance of high academic ability (UA) and low academic ability (LA) students did not differ significantly when using the Flipped Classroom Model (FCM). However, when applying the Problem-Based Learning (PBL) and expository models, there were significant differences in the learning achievements of UA and LA students. This suggests that FCM effectively minimizes the performance gap between UA and LA students. This effectiveness is attributed to FCM's ability to optimally facilitate student learning time (Sulistyowati et al., 2023), allowing students to learn at their own pace and according to their individual learning styles (Al-Samarraie et al., 2020; Bergmann & Sams, 2012; Clark et al., 2022; Shih & Huang, 2020). Additionally, FCM reduces the time pressures commonly associated with conventional learning models (Sargent & Casey, 2020). By implementing FCM, LA students receive optimal scaffolding from both UA students and educators. This aligns with the findings of Haataja et al. (2019) and Hendarwati et al. (2021), who stated that appropriate scaffolding can help LA students transition from their current level of understanding to their proximal development zone.

The use of the Problem-Based Learning model has been found to improve the overall learning performance of students, but it does not effectively minimize the performance gap between LA and UA students. One of the main factors contributing to this issue is the limited learning time inherent in the application of both PBL and expository models. This restricted time is often insufficient to provide adequate support, or scaffolding, to LA students, preventing them from achieving learning outcomes equivalent to those of UA students.

Unlike PBL and expository models, the FCM grants students more responsibility for their learning. This model makes students more active participants in their education, allowing them to choose the most convenient time and place for study, and to revisit material if they do not understand it fully (Angelone et al., 2020). FCM encourages the development of more effective self-learning skills (Ishartono et al., 2022; Suryawam et al., 2021). When faced with challenges, students are required to find solutions and solve problems independently, fostering a sense of independence that can enhance their confidence in the classroom. This increased confidence can positively impact student engagement in lessons (Lin et al., 2019; Naibert et al., 2021; O'Flaherty & Phillips, 2015). Instructors can also dedicate more class time to engaging and interactive learning activities or practical projects (Vaughan, 2014). FCM provides educators with more opportunities to observe students' understanding of the material and to identify their strengths and weaknesses. This approach contrasts with traditional classroom settings, where educators often focus primarily on the most active students.

CONCLUSION

Our research results concluded that the learning achievement of students applied to FCM differs significantly from the PBL and exponitor learning models. The overall student learning performance is only effective if the FCM and PBL models are applied, but not with the expository models. Based on academic capabilities, it was found that there is a significant difference in learning performance between LA students using the exponator model and LA students who use the PBL model, there is no significant learning performance difference between UA students using exponent models and L.A. students using PBL. Thus, the use of FCM is more effective than that of the exhibitor and the PBL students in minimizing learning performance among UA students who are using the P BL model and the LA students who are using FCM.

The results of this study are expected to provide alternative insights into policy-making for educators and stakeholders. Apart from the reported validity, this research also has limitations, including: (1) The number of respondents is only 150 people, of course, it is still insufficient to describe the real situation. Future research can expand the research sample so that the research results become more accurate; (2) The object of research is only focused on students at the university level. Future research can examine further at the elementary, junior high, and high school levels so that the effectiveness of FC in minimizing the learning achievement gap can be generalized to all levels of education; (3) Learning achievement that is measured is more general in nature, further research can investigate further by examining the dependent variable specifically, for example on aspects of learning independence, thinking ability, and others.

REFERENCES

Adeyemo, S. A., & Babajide, V. F. (2014). Effects of mastery learning approach on students' achievement in physics. *International Journal of Scientific & Engineering Research, 5*(2), 910-920.

Al-Samarraie, H., Shamsuddin, A., & Alzahrani, A. I. (2020). A flipped classroom model in higher education: a review of the evidence across disciplines. *Educational Technology Research and Development*, *68*(3), 1017-1051.

Angelone, L., Warner, Z., & Zydney, J.M. (2020). Optimizing the technological design of a blended synchronous learning environment. *Online Learning*, 24(3), 222-240.

Bächtold, M. (2013). What do students "construct" according to constructivism in science education? *Research in science education, 43*(6), 2477-2496.

Badawi., Sumarno., Hukom., J, Prihatmojo, A., Manaf, A, Suciati, I., Ratau, A. (2023). Integration of blended learning and Project-Based Learning (BPjBL) on achievement of students' learning goals: A meta-analysis study. *Pegem Journal of Education and Instruction*, *13*(4), 274–281.

Bawaneh, A. K., & Moumene, A. B. H. (2020). Flipping the classroom for optimizing undergraduate students' motivation and understanding of medical physics concepts. *EURASIA Journal of Mathematics, Science and Technology Education*, *16*(11).

Bergmann, J., & Sams, A. (2012). Flip your classroom: Reach every student in every class every day. *International Society for Technology in Education*.

Bormanaki, H. B., & Khoshhal, Y. (2017). The role of equilibration in Piaget's Theory of Cognitive Development and its implication for receptive skills: A theoretical study. *Journal of Language Teaching & Research, 8*(5), 996-1005.

Bredow, C. A., Roehling, P. V., Knorp, A. J., & Sweet, A. M. (2021). To flip or not to flip? A meta-analysis of the efficacy of flipped learning in higher education. *Review of educational research*, *91*(6), 878-918.

Busyairi, A., & Verawati, N. N. S. P. (2022). Penerapan flipped classroom berbasis pendekatan multirepresentasi untuk meningkatkan pemahaman konsep mahasiswa dimasa pandemi Covid-19 [Implementation of flipped classroom based on multirepresentation approach to improve students' conceptual understanding during the Covid-19 pandemic]. *Karst: Jurnal Pendidikan Fisika Dan Terapannya, 5*(1), 1-7.

Clark, R. M., Kaw, A. K., & Gomes, R.B. (2022). Adaptive learning: Helpful to the flipped classroom in the online environment of COVID? *Computer Applications in Engineering Education*, *30*(2), 517-531.

DeRobertis, E. M. (2021). Piaget and Husserl: Comparisons, contrasts, and challenges for future research. *The Humanistic Psychologist*, 49(4), 1-23.

Divjak, B., Rienties, B., Iniesto, F., Vondra, P., & Žižak, M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: Findings and future research recommendations. *International journal of educational technology in higher education*, *19*(1), 9.

Ersoy, E. (2014). The effects of problem-based learning method in higher education on creative thinking. *Procedia-Social and Behavioral Sciences*, *116*, 3494-3498.

Flipped Learning Network (FLN). (2014). What is flipped learning? The four pillars of F-L-I-P. *In Flipped Learning Network*.

Haataja, E., Moreno-Esteva, E. G., Salonen, V., Laine, A., Toivanen, M., & Hannula, M. S. (2019). Teacher's visual attention when scaffolding collaborative mathematical problem-solving. *Teaching and Teacher Education, 86*, 102877.

Hendarwati, E., Nurlaela, L., Bachri, B., & Sa'ida, N. (2021). Collaborative problem-based learning integrated with online learning. *International Journal of Emerging Technologies in Learning (iJET), 16*(13), 29-39.

Ishartono, N., Nurcahyo, A., Waluyo, M., Prayitno, H. J., & Hanifah, M. (2022). Integrating GeoGebra into the flipped learning approach to improve students' self-regulated learning during the covid-19 pandemic. *Journal on Mathematics Education*, *13*(1), 69-86.

Jang, H. Y., & Kim, H. J. (2020). A meta-analysis of the cognitive, affective, and interpersonal outcomes of flipped classrooms in higher education. *Education Sciences*, *10*(4), 115.

Lourenço, O. (2012). Piaget and Vygotsky: Many resemblances, and a crucial difference. *New ideas in psychology, 30*(3), 281-295.

Lozano-Lozano, M., Fernández-Lao, C., Cantarero-Villanueva, I., Noguerol, I., Álvarez-Salvago, F., Cruz-Fernández, M., ... & Galiano-Castillo, N. (2020). A blended learning system to improve motivation, mood state, and satisfaction in undergraduate students: Randomized controlled trial. *Journal of medical Internet research, 22*(5), 1-13.

Prayitno, B. A., & Suciati. (2017). Narrowing the gap of science students' learning outcomes through INSTAD strategy. *The New Educational Review, 50*, 123-133.

Prayitno, B. A., Sugiharto, B., & Titikusumawati, E. (2022). Effectiveness of collaborative constructivist strategies to minimize gaps in students' understanding of biological concepts. *International Journal of Emerging Technologies in Learning*, 17(11), 114-127.

Prayitno, B., Sugiharto, B., & Titikusumawati, E. (2022). Effectiveness of collaborative constructivist strategies to minimize gaps in students' understanding of biological concepts. *International Journal of Emerging Technologies in Learning (iJET)*, *17*(11), 114-127.

Purnomo, B., Muhtadi, A., Ramadhani, R., Manaf, A., & Hukom, J. (2022). The effect of flipped classroom model on mathematical ability: A meta-analysis study. *Jurnal Pendidikan Progresif*, *12*(3), 1201-1217.

Sargent, J., & Casey, A. (2020). Flipped learning, pedagogy and digital technology: Establishing consistent practice to optimise lesson time. *European Physical Education Review*, *26*(1), 70-84.

Setiawan, A. A., Muhtadi, A., & Hukom, J. (2022). Blended learning and student mathematics ability in Indonesia: A meta-analysis study. *International Journal of Instruction, 15*(2), 905-916.

Shi, Y., Ma, Y., MacLeod, J., & Yang, H. H. (2020). College students' cognitive learning outcomes in flipped classroom instruction: A meta-analysis of the empirical literature. *Journal of Computers in Education*, *7*, 79-103.

Shih, H. C. J., & Huang, S. H. C. (2020). College students' metacognitive strategy use in an EFL flipped classroom. *Computer Assisted Language Learning, 33*(7), 755-784.

Siddaiah-Subramanya, M., Smith, S., & Lonie, J. (2017). Mastery learning: How is it helpful? An analytical review. *Advances in medical education and practice, 8*, 269-275.

Stöhr, C., Demazière, C., & Adawi, T. (2020). The polarizing effect of the online flipped classroom. *Computers & Education*, *147*, 103789.

Stoltz, T. (2018). Consciousness in Piaget: Possibilities of understanding. *Psicologia: Reflexão e Crítica*, 31.

Sulistyowati, E., Rohman, A., & Hukom, J. (2023). Flipped classroom model: Minimizing gaps in understanding mathematical concepts for students with different academic abilities. *European Journal of Mathematics and Science Education, 5*(1), 27-37.

Sulistyowati, E., Hukom, J., & Muhtadi, A. (2023). Meta-analysis of flipped classroom on students' mathematics abilities: Effectiveness and heterogeneity analysis. *JTP-Jurnal Teknologi Pendidikan*, *25*(2), 140-159.

Titikusumawati, E., Sa'dijah, C., As' ari, A. R., & Susanto, H. (2020). The effectiveness of the integration of open-ended and collaborative (OE-C) learning strategies in reducing gaps of elementary school students' creative thinking skills. *Ilkogretim Online*, *19*(1).

Zheng, L., Bhagat, K. K., Zhen, Y., & Zhang, X. (2020). The effectiveness of the flipped classroom on students' learning achievement and learning motivation. *Journal of Educational Technology & Society*, *23*(1), 1-15.