

## THE INFLUENCE OF THE FLIPPED CLASSROOM MODEL ON TABLE TENNIS LEARNING OUTCOMES

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### ABSTRAK

Membalik kelas adalah strategi dalam model pembelajaran campuran yang menggabungkan pembelajaran langsung atau tatap muka (secara bersamaan) secara offline dengan pembelajaran tidak langsung atau independen (asynchronous) daring. Membalik kelas adalah model pembelajaran di mana siswa menelaah materi secara mandiri melalui e-learning sebelum kelas dan kemudian bertemu di kelas secara offline untuk membahas materi yang telah dipelajari. Tujuan penelitian ini adalah untuk menentukan efek dari model belajar kelas terbalik pada prestasi belajar tenis meja. Metode penelitian ini adalah percobaan dengan pra-test pasca-test desain grup. Populasi dalam penelitian tersebut adalah siswa semester keempat dari pendidikan fisik, Program studi kesehatan dan rekreasi yang memprogram pembelajaran tenis meja, sementara sampel penelitian acak menggunakan teknik sampling acak berkelompok. Metode pengumpulan data menggunakan banyak pilihan tes tertulis dan tes kinerja. Hasilnya menunjukkan bahwa ada perbedaan signifikan antara penggunaan kelas terbalik dan model konvensional (dengan sig 0.04 < 0.05). Model kelas terbalik memberikan hasil yang lebih baik dalam meningkatkan hasil belajar rata-rata dari tenis meja.

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**Abstract.** Flipped classroom is a strategy in the blended learning model that combines direct or face-to-face learning (synchronous) offline with indirect or independent learning (asynchronous) online. Flipped classroom is a learning model where students study the material independently through e-learning before class and then meet in class offline to discuss the material that has been studied. The purpose of this study was to determine the effect of the flipped classroom learning model on table tennis learning achievement. This research method is an experiment with a pre-test post-test control group design. The population in the study were fourth semester students of the Physical Education, Health and Recreation Study Program who programmed the course table tennis learning, while the research sample was randomized using the cluster random sampling technique. The data collection method used multiple choice written tests and performance tests. The results showed that there was a significant difference between the use of flipped classroom and conventional models (with sig 0.04 < 0.05). The flipped classroom model provides better results in increasing the average learning outcomes of table tennis.

## INTRODUCTION

Table tennis, commonly known as ping pong, is a popular game widely played among the public. The game of table tennis is played using a paddle (bat) to strike the ball over a table. There are numerous benefits gained through this game, such as physical growth, as well as cognitive, mental, and social development (D. N. Sari & Antoni, 2020), helps children become diligent, disciplined, persistent, and responsible (Saripin et al., 2018). As a popular sport, table tennis is a mandatory course in the Bachelor's program in Physical Education, Health, and Recreation called Table Tennis Theory and Practice (TP). The aim of this course is for students to gain knowledge about table tennis (history, equipment, and rules), develop various fundamental techniques, and be able to design, implement, and evaluate table tennis instruction. Although table tennis is relatively easy to play, mastering basic techniques is essential for playing effectively, including grip techniques, body positioning, stroke techniques, and footwork (Yulianto, 2015).

To ensure that students gain knowledge and master skills in table tennis, specific strategies tailored to students' characteristics, the material, and the learning environment are required. One effective approach to improving table tennis skills (learning outcomes) is by using appropriate teaching models. The rapid advancement in information and technology has led to a paradigm shift in education, transitioning from a teacher-centered approach to a student-centered approach. The use of technology in education has become essential, given the numerous digital platforms available as learning media, such as e-learning. E-learning offers several benefits, including cost savings, greater flexibility in terms of time and location, and the promotion of independence (Ajiatmojo, 2021). However, several drawbacks of e-learning, such as the lack of interaction between educators and students, a tendency to neglect social aspects, limited internet facilities leading to difficulties in accessing learning, and minimal supervision during the learning process (Muhammad Rusli et al., 2020).

Reflections on table tennis learning during the COVID-19 pandemic, conducted online, reveal suboptimal learning outcomes due to the instructor's limited ability to supervise students' activities. As table tennis is a practical course, students require substantial practice to master their skills, necessitating supervision to provide feedback on each movement. Reflections on face-to-face learning also indicate less-than-optimal results, as limited practice time is often consumed by theoretical explanations at the beginning. Therefore, a teaching strategy that bridges online and face-to-face sessions is needed, such as the blended learning model. Blended learning combines face-to-face instruction with online learning (Sari, 2021), integrating technology into the educational process. The chosen form of blended learning is the flipped classroom model. In a flipped classroom, the traditional learning environment is inverted by providing instructional content online before classroom sessions (Pratiwi, 2022). This approach allows students to complete assignments at their own pace. Jang and Kim

(2020) explain that the flipped classroom model can enhance cognitive aspects of students, such as critical thinking skills, content comprehension, and overall performance and learning outcomes. Based on this, a study will be conducted with the title "The Impact of the Flipped Classroom Model on Table Tennis Learning Outcomes".

## METHODS

This study employs an experimental research method. Experimental research aims to determine whether there is an effect from applying a certain treatment to the research subjects. The research design used is the "Pre-test Post-test Control Group Design," as illustrated in Figure 1.

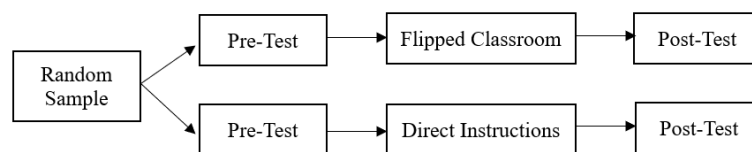


Figure 1. Research Design

The procedures or steps of the research to be carried out according to the research design are as follows.

### 1. Preparation Stage of Research

- a. The first step is to determine the research sample using cluster random sampling, which involves randomly selecting 2 classes (clusters) to be used as research groups.
- b. Next, a lottery will be conducted to determine which class will be assigned to the experimental group (treatment) and which class will be the control group.
- c. Develop a lesson plan according to the media to be provided as the treatment.
- d. Prepare the research instruments, including tests for knowledge and skills in table tennis.

### 2. Implementation Stage of Research

- a. Conduct an initial ability test (pre-test).
- b. Provide the treatment according to each class group for 8 sessions.
- c. Conduct a final ability test (post-test).

### 3. Completion Stage of Research

- a. Analyze the data collected from the pre-test and post-test results.
- b. Prepare the research report and scientific article based on the findings.

The population of this study consists of students from the Sports Education Program (Prodi Penjaskesrek) enrolled in the Theory and Practice (TP) of Table Tennis course,

specifically the fourth-semester students, totaling 111 individuals distributed across 5 classes. The sample for this study was selected using cluster random sampling to determine 2 classes to be used as research samples. The random draw resulted in Semester IVA and IVB being selected as the research samples. Subsequently, another draw determined which class would receive the intervention using the flipped classroom model and which would serve as the control group. Semester IVA was assigned as the treatment group and Semester IVB as the control group.

The data collection technique involves using table tennis performance tests, which will be administered twice: a pre-test to determine students' initial abilities before the intervention, and a post-test to assess their abilities after the intervention. Two types of tests will be utilized: a written multiple-choice test for assessing knowledge and a performance test with an observation checklist for evaluating skills.

To analyze the data on the effect of the flipped classroom model on table tennis learning outcomes, the first step is to tabulate the data to calculate descriptive statistics. To test the hypothesis, prerequisite tests are conducted, including the Kolmogorov-Smirnov test for normality and Levene's Test of Equality of Error Variances for homogeneity. Following these, hypothesis testing is performed using inferential statistics, specifically an independent sample t-test at a 5% significance level, by comparing pre-test and post-test scores. The data analysis is conducted using IBM SPSS Statistics 22.

## RESULTS AND DISCUSSION

### Results

After undergoing a series of structured learning processes by dividing students into two groups—one taught using the flipped classroom model (experimental group) and the other taught using the conventional learning model (control group)—the following data on table tennis learning outcomes scores were obtained.

Table 1. Descriptive Statistics of Table Tennis Learning Outcomes

|                     | N  | Minimum | Maximum | Mean  | Std. Deviation |
|---------------------|----|---------|---------|-------|----------------|
| Pre-Tes Eksperimen  | 19 | 48      | 73      | 59.16 | 7.159          |
| Post-Tes Eksperimen | 19 | 68      | 89      | 77.26 | 6.118          |
| Pre-Test control    | 21 | 45      | 68      | 54.05 | 6.515          |
| Post-Test control   | 21 | 67      | 85      | 73.71 | 3.977          |
| Valid N (listwise)  | 19 |         |         |       |                |

Based on Table 1, it is observed that the average table tennis learning outcomes for the experimental group before the treatment was 59.16, with a minimum value of 48 and a maximum value of 73. After the treatment, the average score increased to 77.26, with a

minimum value of 68 and a maximum value of 89. In contrast, for the control group, the average table tennis learning outcomes before the treatment was 54.05, with a minimum value of 45 and a maximum value of 68. After the treatment, the average score was 73.71, with a minimum value of 67 and a maximum value of 85.

### 1. Normality Test

The normality test for table tennis learning outcomes was conducted using the Shapiro-Wilk test (due to the sample size being less than 50) with the help of SPSS 22 at a significance level of  $\alpha = 0.05$ . A summary of the results of the normality test for table tennis learning outcomes is presented in the following table.

Table 2. Summary of Normality Test Results for Table Tennis Learning Outcomes in Each Group Tests of Normality

| Class                          |                      | Kolmogorov-Smirnov <sup>a</sup> |    |      | Shapiro-Wilk |    |      |
|--------------------------------|----------------------|---------------------------------|----|------|--------------|----|------|
|                                |                      | Statistic                       | df | Sig. | Statistic    | df | Sig. |
| Table Tennis Learning Outcomes | Pre-Test Eksperimen  | .190                            | 19 | .069 | .927         | 19 | .150 |
|                                | Post-Test Eksperimen | .171                            | 19 | .147 | .936         | 19 | .227 |
|                                | Pre-Test Kontrol     | .157                            | 21 | .195 | .936         | 21 | .178 |
|                                | Post-Test Kontrol    | .190                            | 21 | .046 | .919         | 21 | .084 |

a. Lilliefors Significance Correction

From Table 2, the Shapiro-Wilk test column shows that the significance (Sig) is greater than 0.05, which means that  $H_0$  is accepted. Therefore, it can be concluded that the samples from each group are drawn from normally distributed populations.

### 2. Homogeneity Test

The homogeneity test for table tennis learning outcomes was conducted using Levene's test with the help of SPSS 22 at a significance level of  $\alpha = 0.05$ . The results of the test are as follows.

Table 3. Summary of Homogeneity Test Results for Table Tennis Learning Outcomes  
Test of Homogeneity of Variance

|                                |                                      | Levene Statistic | df1 | df2    | Sig. |
|--------------------------------|--------------------------------------|------------------|-----|--------|------|
| Table Tennis Learning Outcomes | Based on Mean                        | 5.596            | 1   | 38     | .023 |
|                                | Based on Median                      | 3.446            | 1   | 38     | .071 |
|                                | Based on Median and with adjusted df | 3.446            | 1   | 33.919 | .072 |
|                                | Based on trimmed mean                | 5.575            | 1   | 38     | .023 |

Based on Table 3, the significance (Sig.) value in the 'Based on Mean' column is 0.023, which is less than 0.05. Therefore, it can be concluded that the variances of the post-test data for the experimental and control groups are not equal, or not homogeneous.

### 3. Hypothesis Test

Hypothesis testing was conducted using an independent sample t-test to determine the difference in effects between the group taught using the flipped classroom model (experimental group) and the group taught using the conventional model (control group). The results of the hypothesis testing are as follows.

Table 4. Results of the Independent Sample t-Test

|                                |                             | Levene's Test for Equality of Variances |      | t-test for Equality of Means |        |                 |                 |                       |                                           |         |
|--------------------------------|-----------------------------|-----------------------------------------|------|------------------------------|--------|-----------------|-----------------|-----------------------|-------------------------------------------|---------|
|                                |                             | F                                       | Sig. | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |         |
| Table Tennis Learning Outcomes | Equal variances assumed     | 5.596                                   | .023 | 2.196                        | 38     | .034            | 3.54887         | 1.61608               | .27729                                    | 6.82045 |
|                                | Equal variances not assumed |                                         |      | 2.151                        | 30.395 | .040            | 3.54887         | 1.65012               | .18071                                    | 6.91703 |

Based on Table 4, the significance (Sig.) value in the 'Equal Variances Not Assumed' column is 0.04, which is less than 0.05, indicating that H0 is rejected and H1 is accepted. Therefore, it can be concluded that there is a significant difference in table tennis learning outcomes between the flipped classroom model and the conventional model. The flipped classroom model has a more favorable effect compared to the conventional model, as seen from the average table tennis learning outcomes.

### Discussion

The research results indicate that the flipped classroom model has a more favorable impact, with an average score of 77.26, compared to the conventional model, which has an average score of 73.71. This improvement is attributed to the fact that students study the material online before class begins, allowing them to have a preliminary understanding of the content to be taught. Providing modules or instructional materials in advance offers sufficient

knowledge and deeper understanding, making the instructional materials more engaging and interactive compared to traditional classrooms (Joy et al., 2023).

By implementing the flipped classroom model in table tennis instruction, materials can be studied anytime and anywhere, allowing face-to-face sessions to be maximized for practicing related skills. Feedback-required materials are utilized in class, while the conceptual content is studied at home as homework (Khan & Abdou, 2021). In the use of the flipped classroom model, educators are required to prepare creative and innovative teaching materials, which can be supplemented with media such as images, videos, and other interactive elements to ensure that students engage with the content. These teaching materials enable students to access and prepare for the content before the face-to-face classes (Isidori et al., 2018). Students can access the materials anytime and anywhere, and have more time in class to discuss and develop the content (Lo & Hew, 2020). This approach allows students to interact outside the formal (traditional) classroom by engaging in activities outside of class, providing assignments before and after lessons, and using technology to maximize classroom learning by offering feedback or improvements (Alkhatib, 2018). Research shows that watching online videos as a supplementary tool can help students save study time and significantly impact learning outcomes (Meehan & McCallig, 2019).

## CONCLUSION

The results of the study indicate that: there is an influence of the flipped classroom learning model on table tennis learning outcomes. Table tennis learning outcomes are higher using the flipped classroom learning model compared to conventional learning models. The use of flipped classrooms can maximize classroom learning time for the development and deepening of materials because the learning materials can be accessed anywhere and anytime before the face-to-face class begins.

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