Journal of Academic Biology and Biology Education
Vol. 1, No. 1, June 2024, pp. 10~18
ISSN: 3062-9705, DOI: 10.37251/jouabe.v1i1.1013

Comparative of Student Learning Outcomes: Practice Rehearsal Pairs Learning Strategy with Index Card Match

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Article Info

Article history:

Received Mar 5, 2024
Revised Apr 8, 2024
Accepted May 10, 2024
OnlineFirst Jun 25, 2024

Keywords:

Comparative
Digestive System
Index Card Match
Learning Strategy
Practice Rehearsal Pairs

ABSTRACT

Purpose of the study: This study aims to compare the student learning outcomes between two different learning strategies: Practice Rehearsal Pairs (PRP) with Index Card Match (ICM) in the context of Digestive System material.

Methodology: This study uses a quasi-experimental approach with a Nonequivalent Control Group design. The population in this study were all students of grade XI of Public High School 1 Muara Enim totaling 5 classes. Sampling was done using simple random sampling technique in two experimental classes. Data collection was done using multiple-choice tests and analyzed using descriptive and inferential statistical techniques.

Main Findings: The results of the study obtained for both groups through descriptive statistical analysis are that the average biology learning outcomes using the Practice Rehearsal Pairs learning strategy are better than using the Index Card Match learning strategy. The results of the inferential data analysis show that there is a significant difference between the use of the Practice Rehearsal Pairs learning strategy and the Index Card Match learning strategy on the biology learning outcomes of class XI students.

Novelty/Originality of this study: This type of research has the potential to provide insight into the relative effectiveness of two different learning approaches in facilitating student understanding and learning outcomes on a particular topic. with the Practice Rehearsal Pairs and Index Card Match approaches likely focusing on learning methods in which students pair up to practice and repeat material together.

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1. INTRODUCTION

Education can be interpreted as a process of changing the behavior of students so that they become mature humans, in the sense of being able to live independently and being able to live in the society where the individual is located [1]–[3]. Education does not only include intellectual development, but also emphasizes the process of developing students' personalities as a whole so that they become more mature. Therefore, education is one of the determining factors for the progress of the nation and state, because education seeks to form people who are faithful, knowledgeable, skilled and have noble character [4], [5]. To realize national education goals, it is necessary to provide education that is able to increase the mastery and development of science and technology and is accompanied by the readiness of human resources who have high intellectual abilities and morality.

One of the problems facing our world of education is the problem of weak learning processes. In the learning process, children are less encouraged to develop thinking abilities. The learning process in the classroom is directed at children's ability to memorize information, children's brains are forced to remember and store various information without being required to understand the information they remember to relate it to everyday life. As a result, when our students graduate from school, they are smart theoretically, but they are poor in application. The world of education requires educators who manage their learning seriously through careful planning, utilizing all available resources and paying attention to the level of intellectual development and psychological development of children's learning and educators who can truly develop existing potentials. on students [6]–[8]. The use of conventional methods has not provided good results in creating active students in learning. Active learning is by applying appropriate learning strategies [9], [10]. The choice of strategy must be in accordance with the material to be taught. One active learning strategy is index card match with practice rehearsal pairs.

The practice rehearsal pairs strategy is one of the strategies that comes from active learning. [11], [12]. Active learning is learning that invites students to learn actively. When students learn actively, it means they dominate the learning activities. With this, they actively use their brains, either to find the main idea of the learning material, solve problems or apply what they have just learned to a problem that exists in real life. Students are invited to participate in all learning processes, not only mentally but also physically [13], [14]. So it is hoped that students will feel a more pleasant atmosphere and that learning outcomes can be maximized.

The Index Card Match strategy is a learning method that stimulates students' active involvement in the learning process, aiming to develop independence in learning and foster creativity [15], [16]. This approach strengthens students' learning skills by providing opportunities for them to actively participate in arranging pairs of information on cards. More than just a tool, these strategies adapt to individual student needs. This is important because each student has different learning preferences, so learning strategies that take these characteristics into account can be more effective in grabbing students' attention. The characteristics of students who enjoy learning while playing are the main focus of this strategy. By embracing an approach that combines learning with elements of play, teachers can create an engaging environment for students. Ensuring that the material presented is interesting and relevant to them is the key to success. Through the joyful aspect of learning, students are more encouraged to be actively involved in the learning process, thereby strengthening understanding and achieving the desired learning goals [17], [18]. This strategy not only offers effective learning, but also creates space for students' creative exploration in understanding and applying the subject matter being taught.

Biology as a science has been around for a long time because it includes human knowledge and exploration of themselves, their environment, as well as efforts to understand the survival of their species. [19], [20]. Biology's focus on the physical structure and function of the human body is a reflection of a deep curiosity about the complexity of these organisms. Each part of the human body has its own role which works in a coordinated manner to support overall body functions. Collaboration between various organ systems in the human body is one of the interesting aspects in the study of biology. For example, the digestive system works together with the circulatory system, nervous system, and others to maintain balance and carry out vital functions in the body. In addition, biology also expands its scope to the study of how the human body interacts with the surrounding environment, from adaptation to environmental changes to interactions with other organisms in the ecosystem. This knowledge provides a deep understanding of the complex relationship between humans and the environment around them.

Based on the results of observations and interviews by researchers with one of the biology subject teachers at Public High School 1 Muara Enim, teacher said that students' biology learning outcomes were still relatively low, and teachers still always taught using conventional methods. This is indicated by the minimum learning completeness criteria not being achieved, student participation in learning is still lacking so that during the learning process, many students are just silent and unable to answer when asked about the material being studied. Research on practice rehearsal pairs learning was carried out.

This study is in line with the study conducted by [21]. Although the study has investigated various learning strategies in the context of higher education, there is in the literature that is in-depth about the direct comparison between Practice Rehearsal Pairs (PRP) and Index Card Match (ICM) specifically in the Digestive System material. Some studies tend to focus on general learning strategies without considering the specific context of the material, while others may be limited in the scope of the sample or the methodology used. Therefore, this study aims to fill this gap by expanding the knowledge about the effectiveness of both strategies in improving students' understanding and retention of information, especially in the context of a complex biology topic such as the Digestive System.

This study has significant urgency because it focuses on a direct comparison between two learning strategies that have the potential to have a significant impact on student learning outcomes in the Digestive System material. With the increasing need for effective and efficient learning approaches in higher education, a deeper understanding of which strategy is more effective can make an important contribution to the development

of better curricula and teaching methods. The results of this study are expected to provide practical guidance that can be used by educators and policy makers to improve the quality of classroom learning and strengthen student learning outcomes in specific academic contexts.

This study aims to compare student learning outcomes between two different learning strategies: Practice Rehearsal Pairs (PRP) and Index Card Match (ICM) in the context of Digestive System material. The PRP method involves repetition of exercises and reinforcement of materials in pairs, while ICM involves the use of index cards to match related concepts in the learning material. By utilizing a randomized controlled experiment approach, this study aims to identify a more effective strategy in improving students' understanding and retention of information in the specific context of the Digestive System. It is hoped that the results of this study can provide practical guidance for educators to choose the most appropriate learning strategy in the context of college-level biology learning.

2. RESEARCH METHOD

2. 1 Research Type

This type of research is an experimental design, namely Quasi Experimental Design. The use of this design is intended to reveal causal relationships by involving a control group in addition to the experimental group [22]–[24]. This type of design is chosen to compare the effectiveness of two different learning strategies, namely Practice Rehearsal Pairs and Index Card Match, in enhancing student understanding and learning outcomes in biology, specifically on the topic of the Digestive System. Quasi-experimental research allows for comparisons between groups without random assignment, yet strives to control variables to ensure the validity of findings regarding the impact of instructional methods on educational outcomes.

2.2 Population and Sample

The study was conducted among class XI students at Public High School 1 Muara Enim, comprising a total population of five classes. From this population, a simple random sampling technique was employed to select two experimental groups: class XI science 4 and class XI science 5, each consisting of 32 students. These groups were chosen to represent the broader student body and to ensure that the findings could be generalized to similar educational settings.

2.3 Data Collection Technique

Data collection in the study was primarily achieved through two main instruments: a test comprising 20 multiple-choice questions specifically designed to assess comprehension of the Digestive System material, and observation sheets [25]–[27].. The test provided quantitative data on student performance, while the observation sheets captured qualitative insights into student engagement and interaction during learning activities using either the Practice Rehearsal Pairs or Index Card Match strategies.

2.4 Data Analysis Technique

The collected data underwent thorough analysis, employing both descriptive and inferential statistical techniques. Descriptive statistics were used to summarize the average biology learning outcomes for each group. Inferential statistics, specifically a t-test, were applied to determine the significance of differences between the two groups' outcomes. This analytical approach enabled the researchers to draw conclusions about the relative effectiveness of the two learning strategies in enhancing student learning outcomes.

2.5 Research Procedure

The research procedure involved several key steps to ensure robustness and validity of the findings. First, the researchers identified and selected appropriate classes and students for the study using random sampling. Then, they administered pre-tests to both experimental groups to establish a baseline of understanding before implementing the respective learning strategies. Subsequently, the Practice Rehearsal Pairs and Index Card Match strategies were implemented in their respective groups over a defined period. After completion of the interventions, post-tests were administered to assess the effectiveness of each strategy. Finally, data analysis was conducted to compare and evaluate the outcomes, leading to conclusions regarding the impact of the learning strategies on student learning in the context of the Digestive System topic.

3. RESULTS AND DISCUSSION

Based on the results of descriptive statistical analysis on the biology learning outcomes of experimental class 1 (XI 4) students after carrying out the pretest which can be seen in the following table:

Table 1. Pretest scores of class XI Science 4 students at Public High School 1 Muara Enim

Intervals	f_i	f_k	x_i	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$	Percentage (%)
15 – 25	2	2	20	40	856.73	1713.46	8
26 – 35	2	4	30.5	61	352.31	704.62	8
36 – 45	5	9	40.5	202.5	76.91	384.55	20
46 – 55	5	14	50.5	252.75	1.51	7.55	20
56 – 65	10	24	60.5	605	126.11	1261.1	40
66 - 75	1	25	70.5	70.5	450.71	450.71	4
Amount	25	-	-	1231.75	1864.28	4521.99	100

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i} = 49{,}27 \qquad SD = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{n-1}} = 13{,}72$$

The frequency distribution table and pretest percentage of biology learning results above shows that frequency 10 is the highest frequency with a percentage of 40% in the 56-65 interval, frequency 5 is a medium frequency with a percentage of 20%, and frequency 1 is the lowest frequency with a percentage of 4%.

Based on the results of descriptive statistical analysis on the biology learning outcomes of experimental class 1 (XI 4) students after carrying out the posttest which can be seen in the following table:

Table 2. Posttest scores of Class XI Science 4 students at Public High School 1 Muara Enim

Intervals	f_i	f_k	x_i	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$	Percentage (%)
75 – 78	8	8	76.5	612	31.36	250.88	32
79 – 82	7	15	80.5	563.5	2.56	17.92	28
83 – 86	6	21	84.5	507	5.76	34.56	24
87 – 90	2	23	88.5	177	40.96	81.92	8
91 – 94	1	24	92.5	92.5	108.16	108.16	4
95 – 98	1	25	96.5	193	207.36	414.72	4
Amount	25	-	-	2052.5	396.16	800	100

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i} = 82{,}1 \qquad SD = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{n-1}} = 5{,}77$$

The frequency distribution table and posttest percentage of biology learning results above shows that frequency 8 is the highest frequency with a percentage of 32% in the 85-89 interval. Frequency 6 is the medium frequency with a percentage of 24%, and frequency 1 is the lowest frequency with a percentage of 4%.

Based on the results of descriptive statistical analysis on the biology learning outcomes of experimental class 2 (X 2) students after the pretest, which can be seen in the following table:

Table 3. Pre-Test Results for Class XI Science 5 Public High School 1 Muara Enim

Intervals	f_i	f_k	x_i	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$	Percentage (%)
25 – 32	3	3	28.5	85.5	235.92	707.76	12
33 – 40	9	12	36.5	328.5	54.16	487.44	36
41 – 48	6	18	44.5	267	0.40	2,4	24
49 – 56	3	21	52.5	257.5	74.64	223.92	12
57 – 64	2	23	60.5	121	276.88	553.76	8
65 – 72	2	25	68.5	137	607.12	1214.24	8
Amount	25	-	-	1096.5	1249.12	3189.52	100

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i} = 43{,}86 \qquad SD = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{n-1}} = 12{,}52$$

The frequency distribution table and pretest percentage of biology learning results above shows that frequency 9 is the highest frequency with a percentage of 36% in the 33-40 interval, frequency 6 is a medium frequency with a percentage of 24%, and frequency 2 is the lowest frequency with a percentage of 8%.

Based on the results of descriptive statistical analysis on the biology learning outcomes of experimental group 2 (X 2) students after carrying out the posttest which can be seen in the following table:

Table 4. Post-Test Results for Class XI IPA5 Public High School 1 Muara Enim

Intervals	f_i	f_k	x_i	$f_i x_i$	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$	Percentage (%)
45 – 51	1	1	48	48	476.98	476.22	4
52 – 58	1	2	55	55	220.22	220.22	4
59 – 65	8	10	496	496	61.46	491.68	32
66 – 72	4	14	276	276	0.70	2.8	16
73 – 79	6	20	456	456	37.94	227.64	24
80 – 86	5	25	415	415	173.18	856.9	20
Amount	25	-	-	1746	2285.22	2285.22	100

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i} = 69{,}84 \qquad SD = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{n-1}} = 9{,}75$$

The frequency distribution table and posttest percentage of biology learning results above shows that frequency 8 is the highest frequency with a percentage of 32% in the interval 59-65 and frequency 4 is a medium frequency with a percentage of 16% and frequency 1 is the lowest frequency with a percentage of 4%.

The normality test aims to state whether the biology learning outcome score data on the subject of the digestive system for each experimental class 1 (X1) and experimental class 2 (X2) from the population is normally distributed. The following is a normality test table 5.

Table 5. Normality Test

Tests of Normality

	Kolmogorov-Smirnov [a]		
	Statistics	Df	Sig.
Practice Rehearsal Pairs learning strategy	8.160	25	.264
Index Card Match learning strategy	9.717	25	.526

So the value obtained is p = 0.264 for α = 0.05, this shows p > α. This means that the biology learning outcome score data for experimental group 1 (X 1) which was taught using the Practice Rehearsal Pairs learning strategy is normally distributed. Meanwhile, the results of data analysis for the experimental group taught using the Index Card Match learning strategy, obtained a p value = 0.526. For α = 0.05, this shows p > α. This means that the biology learning result score data for the experimental group taught using the Index Card Match learning strategy is normally distributed, so that the data for both groups is normally distributed.

The homogeneity test aims to see whether the data in the two groups have the same variance (homogeneous) or not [28]–[30]. The hypothesis for the homogeneity test is as follows:

Table 6. Variable Homogeneity Test

Variable	N	Sig.	Description
Practice Rehearsal Pairs learning strategy	25	0.96	Homogen
Index Card Match learning strategy	25	0.96	Homogen

Homogeneity testing using SPSS was carried out on the posttest results of the two experimental groups. Based on the results of processing with SPSS, the sign obtained for the two experimental groups (practice rehearsal pairs strategy and index card match strategy) obtained sig = 0.096, thus it can be concluded that the posttest data for the two groups is homogeneous because the sign is greater than α or (0.096 > 0.05).

Hypothesis testing was carried out to determine whether the learning outcomes of students in experimental group 1 (X1) who were taught using the Practice Rehearsal Pairs learning strategy were significantly different from the learning outcomes of students in experimental group 2 (X 2) who were taught using the Index Card Match learning strategy. .

Table 3. Hypothesis Testing

Variable	N	Df	Sig.
Practice Rehearsal Pairs learning strategy	25	48	0.00
Index Card Match learning strategy	25	40.973	0.00

Based on the SPSS processing results above, a sign value = 0.000 < α = 0.05 is obtained. So H_0 is rejected and H_1 is accepted, meaning that there is a significant difference between biology learning outcomes taught using the Practice Rehearsal Pairs learning strategy and the Index card Match learning strategy for class XI Science students at Public High School 1 Muara Enim

Based on research conducted in class which relates to the subject of biology, the subject of the human digestive system. So the researcher carried out descriptive statistical analysis testing so that the highest score on the post test was 95, the lowest score was 75, the average score was 82.1 and the standard deviation was 5.77. Based on these data, it can be concluded that the biology learning outcomes of students in class XI IPA 4 who studied using the Practice Rehearsal Pairs learning strategy were classified as good and included in the high category. This can be seen from the average post test score (mean), namely 82.1.

Based on research conducted in class with biology subjects on the subject of the human digestive system. Biology learning result data obtained the highest post test learning result score of 85 and the lowest 45. The average (mean) was 69.84 with a standard deviation of 9.75

Based on the results of the One-Sample Kolmogorov-Smirnov Test data analysis for experimental group 1 (X1) which was taught using the Practice Rehearsal Pairs learning strategy, a post test value of p = 0.264 to α= 0.05 was obtained, this shows p > α. This means that the biology learning outcome score data for experimental group 1 (X1) which was taught using the Practice Rehearsal Pairs learning strategy was normally distributed. Meanwhile, the results of data analysis for the experimental group taught using the Index Card Match learning strategy, obtained a p value = 0.526. For α= 0.05, this indicates p > α. This means that the biology learning result score data for the experimental group taught using the Index Card Match learning strategy is normally distributed, so that the data for both groups is normally distributed.

Based on the homogeneity test to test the similarity of the two variances, the post test value $F_{calculated}$ = 1.564 for F_{table} = 3.403. This shows that $F_{count} < F_{table}$ (1.564 < 3.403). This means that the biology learning outcomes data for both treatment groups come from a homogeneous population. Next is the hypothesis test of the difference between the post-test scores for experimental class 1 (X 1) and experiment 2 (X 2), obtained a $_{calculated\ t\ value}$ of 8.173 at an error level of 0.05 (5%) with a value of dk = $n_1 + n_2 - 2 = 25 + 25 – 2 = 48$, the $t_{table\ value}$ is 2.011 based on the provisions of the hypothesis testing criteria, "if $t_{count} < t_{table}$, then it is accepted and rejected and if $t_{count} > t_{table}$ then it is rejected and accepted. From the results of data analysis, the tcount value is greater than ttable, namely (8.173 > 2.011). Thus, H_0 is rejected and H_1 is accepted, meaning that it can be concluded that there is a significant difference between the biology learning outcomes of class shows that the average scores of the two groups are at different category levels.

In experimental group 1 (X 1) which was taught using the Practice Rehearsal Pairs learning strategy the average value of student learning outcomes was at the high category level, while in experimental group 2 (X 2) which was taught using the Index Card Match learning strategy the average value Student learning outcomes are at the medium category level. In conclusion, it can be said that the learning outcomes of students taught using the Practice Rehearsal Pairs learning strategy are higher than the learning outcomes of students taught using the Index Card Match learning strategy. However, the results of the pre-test and post-test show that the application of the Practice Rehearsal Pairs learning strategy and the Index Card Match learning strategy can each improve student learning outcomes in the two classes. However, from the statistical data, the Practice Rehearsal Pairs learning strategy is more effectively used in the biology learning process, especially on the subject of the digestive system.

The learning outcomes of students in this study who were taught using the index card match learning strategy with a high percentage level were in the medium category. This is because some students lack enthusiasm to play an active role in the learning process, which indirectly affects their level of knowledge which ultimately has an impact on the learning outcomes achieved. Students' lack of interest in taking an active role in learning activities is influenced by the fear of being wrong about expressing their ideas in front of their peers and teachers [31]–[33]. Only a few students are able to express their ideas when appointed by the teacher to express the main ideas of the learning material they have received. Then this strategy also makes the class noisy because they are looking for partners, but it is noisy in the sense that they are still in the teaching and learning process, but only some are actively looking for partners. Teachers also lack skills in managing the class because this strategy requires adequate skills to create a learning atmosphere that is in line with what is expected by the index card match learning strategy.

Based on the description above, it can be concluded that the Practice Rehearsal Pairs learning strategy is one of the strategies in active learning where the learning is more directed at group work in pairs to master the tasks given with study partners with the aim of ensuring that each pair can carry out and complete the task. correctly. Active learning strategies are intended to optimize all students' potential, so that all students can achieve satisfactory learning outcomes according to their personal characteristics. This learning basically tries to strengthen and facilitate students' stimuli and responses in learning so that the learning process becomes fun, not boring for them. In this strategy, each lesson material must be linked to various previous knowledge and experiences. The aim of the practice-rehearsal pairs strategy is to actively involve students from the start of

learning, namely to convince and ensure that both partners can understand the material and tasks given [34], [35]. Apart from that, practicing in pairs can increase familiarity with students and make it easier to learn psychomotor material.

This study is in line with the study conducted by [36]. The study discusses the effectiveness of learning strategies in the context of the Digestive System material. Previous studies tend to be more general in their focus or limited to small samples, so they have not provided a comprehensive picture of which strategies are more effective in improving students' understanding of this complex biology topic. By filling this, this study not only makes a new contribution to the existing literature, but also provides practical guidance for educators in choosing more effective learning approaches in the context of higher education.

This study explores the novelty in learning approaches by comparing two different strategies, namely Practice Rehearsal Pairs (PRP) and Index Card Match (ICM), in the context of understanding the Digestive System material. PRP combines paired practice and repetition of materials, while ICM uses index cards to match related concepts. By utilizing a quasi-experimental design, this study not only identified significant differences in learning outcomes between the two strategies but also provided valuable insights into how these approaches can be effectively applied in improving students' understanding and retention of information in the context of intermediate biology learning.

The difference in biology learning results using practice rehearsal pairs and index card match learning strategies with higher practice rehearsal pairs results is also due to the teacher using these strategies in different ways and of course also the students' own different learning methods. Even though there are differences in the two learning strategies, it is still stated that both are good learning strategies to apply. Benny A. Pribadi stated that the application of learning system design aims to create successful learning, namely learning that is able to help students achieve the competencies used because each strategy has the aim of producing an effective and efficient instructional system in facilitating the achievement of instructional goals.

4. CONCLUSION

Based on the results of this study, it can be concluded that the use of the Practice Rehearsal Pairs learning strategy is more effective in improving students' biology learning outcomes regarding the human digestive system compared to the use of the Index Card Match strategy. Students who used the Practice Rehearsal Pairs strategy showed a significant increase in their average scores, while students who used the Index Card Match also experienced an increase, although not as large as the first group. These findings highlight the importance of an approach involving paired practice and repetition of material together in deepening students' understanding of complex biological material such as the human digestive system.

ACKNOWLEDGEMENTS

We would like to express our deepest gratitude for the dedication and contribution of this research in providing new insights into effective learning strategies in the context of the human digestive system. This discovery provides a valuable foundation for the development of better education in the future.

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