Enhancing Students Achievement: The Impact of Hologram Models and Mnemonics

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DOI: https://dx.doi.org/10.47772/IJRISS.2025.90900051

Received: 24 August 2025; Accepted: 30 August 2025; Published: 29 September 2025

ABSTRACT

This study was conducted to determine the effectiveness of teaching aids, hologram models and mnemonic methods for 60 Form 4 Biology students from the Gombak district, Selangor Malaysia. The effectiveness of the use of hologram models and mnemonic methods is seen in the achievement of students in the Form 4 Biology subject. Comparison of conventional teaching methods with the use of hologram models and mnemonic methods was carried out through Wilcoxon Signed Ranks Test Analysis and Mann-Whitney analysis. The instruments used for this study were in the form of pre-tests and post-tests. This study was conducted using a quasi-experimental design that uses quantitative analysis methods. This study used cluster random sampling techniques. Respondents were divided into two groups, 30 students for the control group and 30 students for the treatment group. The control group underwent conventional teaching and learning sessions while the treatment group used hologram models and mnemonic methods. Since the data obtained were not normally distributed, the data were analyzed using the Wilcoxon Signed Rank Test and the Mann-Whitney U Test. The results of the analysis found that there was no significant difference between the post-test achievement of the control group (M=29.45) and the treatment group (M=31.55) with a significant p-value obtained of p=0.633 which shows that the method of using hologram models and mnemonic methods in teaching and learning Biology can provide positive and equivalent results as conventional teaching with teachers. Implications and several suggestions for further research are also discussed in this study. The findings of this study suggest that the use of hologram and mnemonic methods can be used in teaching and learning sessions by teachers to be more creative and innovative towards student learning, especially for Biology subjects.

Keywords: Mnemonics, Academic Achievement, Biology Education, STEM

INTRODUCTION

Education that is suitable for the 21st century generation is seen to have received a lot of attention and comments to produce a competitive generation (Muhammad Zulazizi, 2023). Pupils' performance in the subject of Biology is seen as still unsatisfactory because they label this subject as a burden because it has a lot of information and facts that need to be understood (Nwuba et al., 2022). Appropriate methods combined with the latest technology can be used in education field as a facilitator that can benefit both teachers and students. Nowadays, various interesting combinations use multimedia materials that can produce technological tools such as holograms. Hologram technology is now getting a lot of attention and has been widely used in various fields including the field of education.

Suharto (2022), stated that "3D hologram technology has the potential to be used as a teaching aid for educators on certain subjects to reconstruct and simulate objects in the real world" (p. 43). Along with the rapid development of technology, effective strategies are also becoming a fugitive in the field of education. Among them are mnemonic methods. According to Syadiyah Khairuddin et al. (2023), "a mnemonic is a technique applied by a person to help improve the ability to remember something" (p. 57). This technique is capable of increasing the power of memory to encode and recall important information.

Problem Statement

This study is to address the needs of science at home and abroad, science education high quality must be offered if Malaysia wants to become a developed country and succeed. All science teachers need to actively participate in implement teaching initiatives and strategies to improve the standard of education science. (Elis Wong Siew Ting & Che Nidzam Che Ahmad, 2016, p. 149). According to Dayang Julida Abang Tar & Muhd Izwan Mahmuda (2021), "The teacher plays an important role in making choices related to methods and activities teaching that coincides in ensuring the effectiveness of a session learning" (p. 50). Via Valarie Thomas & Shahlan Surat (2021), "The implementation of 21st century learning by instructors encourages them applying elements of creativity and innovation as a response to internal shifts education" (p. 159). This explains that the learning method is conventional is no longer rational to apply in the classroom. This statement also supported by Farah Adlina (2019): "The ability of conventional methods to produce competitive students sometimes questioned along with progress in educational innovation. In P&P, students taught through traditional teacher-centered methods become passive. In addition to not applying critical thinking techniques, students only focus pay attention to the teacher's lecture and take notes". (pg. 36)

The chalk and talk teaching method is a learning method that centered solely on the teacher and causing less effective communication exists between students and teachers and causes ongoing PdP sessions not succeeded in attracting students' interest (Fazilah Razali et al. 2016). Biology subject has a high challenge to learn where there are many scientific terms and names used. This matter coincides with the statement made by Jamaliah Abd Manaf (2021), most students think that there are several topicsin this subject which is considered difficult because it is loaded with information and facts should be remembered (p. 1).

Not only that, student performance in Biology subjects is also seen remains unsatisfactory because they label this subject as one the burden of having a lot of information and facts that need to be understood. This problem stems from a failure to master learning science and mathematics during junior high school which will next continue until level 4 and affect learning achievement pure science, especially in the field of biology (Farah Aida Sanip & Che Nidzam Che Ahmad, 2014, pp. 3). The main problem faced by students is that they are alone remembering information without making connections between the information and overall topic of the lesson. Because of this, students find that there are too a lot of information and facts in the lesson to remember, which makes it difficult them to relate the process as a whole (Noriantie Ibrahim, 2021, ps.111).

Through the needs analysis that has been carried out on the students Form 4 who choose Biology subjects, got 83.3% of 24 people a sample selected from the population of 4th grade biology students in a boarding school full in the direction of Mersing has agreed to choose the subtopic of the vertebral column as a difficult topic to understand. This is because while following the teaching session and lessons in the classroom, there has been confusion to understand and identify each part of the vertebral column accurately. That string, students need more time to get to know each part of the vertebral column with more detailed.

Research Objectives

To study the problems discussed, the the objective of this study is to; Assess the effectiveness of using hologram models and mnemonic methods on the achievement of form four Biology students.

The hypothesis of this study:

H_{01}- There is no significant difference between pre-test achievement and posttest for the control group after using the hologram model and method mnemonic

H_{02} - There is no significant difference between pre-test achievement and post for the treatment group after using the hologram model and method mnemonic

H_{03} - There is no significant difference between pre-test achievement control and treatment groups after using hologram models and methods mnemonic

H_{04} - There is no significant difference between post-test achievement between control and treatment groups after using hologram models and methods mnemonic

METHODOLOGY

This study is a quasi-experimental study that uses a quantitative analysis approach. This study was carried out to obtain data to assess the level of effectiveness of the use of hologram and mnemonic models on the achievement of biology students 4 in a school in Gombak district for the subtopic of the human vertebral column by using an inferential statistical approach research sample. The target population of this study is 60 of form four students from a secondary school in Gombak district, Selangor who are studying Biology. The study sample was determined by using a cluster random strategy and the sample was divided into two groups, the control group and the treatment group where each group consisted of 30 sample students.

In this study, pre-achievement and post-achievement test instruments were built to test the hypothesis that was stated at the beginning of the study. A set of formal questions is used and the questions in this test will be checked by experts. The face validity and content validity of the study instrument were evaluated by the three experts and analyzed using the percentage of expert agreement. The expert validity value obtained is over 94% and means that all instruments are certified and eligible to be used to make this study a success because it is over 70% (Sidek & Jamaludin, 2005). The reliability of the instrument will be measured based on using the pre-post test method (test-retest reliability). Through this test, the same test question will be given a second time to the same respondent in a certain period of time to determine the reliability of the test. In this study, Pearson's Correlation (Pearson' Correlation) was used to analyze the reliability of the items found in the research instrument. According to Chua (2006), the research instrument is reported to be reliable when the correlation value (r) is equal to 0.65 and above. Through the results of the analysis, the value of the reliability coefficient for the achievement test instrument conducted is 0.732 for the pre-test and 0.767 for the post-test.

The research data was analyzed using the details of The Statistical Packages for the Social Sciences (SPSS) version 29.0. The data obtained through the pre- and post-tests will be evaluated using statistical inferences namely the Mann-Whitney U Test and the Wilcoxon Signed Rank Test to test the research hypothesis and research questions that have been conducted. The significance of a relationship between two variables is determined based on the p value which is usually considered significant if it is less than 0.05. (Darusalam & Hussin, 2016).

Results and Data Analysis

From this study, the effectiveness of using hologram and mnemonic models on the achievement of form four Biology students will discuss. Table 1 shows analysis of Wilcoxon Signed Ranks Test of the pre and post-test for the control group.

Table I WILCOXON SIGNED RANKS TEST ANALYSIS OF PRE AND POST-TEST (CONTROL GROUP)

	Pre Test	Post Test
Mean	77.83	91.30
Std. Deviation	13.55	7.07
Z	-4.153	
Sig. (2 Tailed)	<.001	

Based on the analysis of the Wilcoxon Signed Ranks Test for the pre- and post-test for the control group, it was found that there was a difference between the mean of the two tests (M pretest=77.83, SD=13.55 and M posttest= 91.30, SD=7.07). The p value from this analysis (p<.001) and the null hypothesis will be rejected. This situation shows that there is a significant difference between the pre and posttest for the control group. While Table 2 shows analysis of Wilcoxon Signed Ranks Test of the pre and post-test for the treatment group.

Table II WILCOXON SIGNED RANKS TEST ANALYSIS OF PRE AND POST-TEST (TREATMENT GROUP)

	Pre Test	Post Test
Mean	79.23	91.70
Std. Deviation	13.45	8.36
Z	-4.380	
Sig. (2 Tailed)	<.001	

For the treatment group, the results of the analysis of the Wilcoxon Signed Ranks Test for the pre- and post-test for the treatment group show that there is a difference between the mean of the two tests (Mpre-test=79.23, SD=13.45 and Mpost-test= 91.70, SD=8.36). The value of ($p<.001$) and at the same time can reject the null hypothesis. Therefore, it can be concluded that there is a significant difference between the pre and post-test for the treatment group. Table 3 shows analysis of Mann-Whitney pre-test analysis for the control and treatment groups

Table III Mann-Whitney Pre-Test Analysis (Control and Treatment Groups)

	Control Group	Treatment Group
Mean Rank	29.30	31.70
Mann-Whitney U	414.000	
Z	-.538	
Sig. (2 Tailed)	.590	

Based on the results of the Mann-Whitney test analysis for the pre-test of the control and treatment groups, it was found that there was a mean difference for the two tests. The significant value of the analysis, p that has been obtained for this test is 0.590 ($p>0.05$). Therefore, the null hypothesis fails to be rejected where there is no significant difference between the pre-test for the control and treatment groups. This shows that the initial knowledge level of students for both groups is at the same level. Table 4 shows analysis of Mann-Whitney post-test analysis for the control and treatment groups.

Table IV Mann-Whitney Post-Test Analysis (Control and Treatment Groups)

	Control Group	Treatment Group
Mean Rank	29.45	31.55
Mann-Whitney U	418.500	
Z	-.478	
Sig. (2 Tailed)	.633	

Based on the results of the Mann-Whitney Test, the post-test for the control and treatment groups showed that there was only a slight difference between the mean of the two tests. The significant value of analysis, p that has been obtained for this test is 0.633 ($p>0.05$). Therefore, the null hypothesis fails to be rejected where there is no significant difference between the post-test for the control and treatment groups. This shows that the use of hologram models and mnemonic methods has a positive effect on student achievement in parallel with learning for the control group.

DISCUSSION AND CONCLUSION

As a result of the research conducted, it proves that learning using hologram models and mnemonic methods has a positive effect in helping students to improve their achievement in learning in the classroom. The findings of the study obtained are in line with the findings of previous studies which state that the integration of holograms and mnemonic methods are effective in teaching and learning sessions and are appropriate and can be used

comprehensively. The use of hologram models and mnemonic methods as teaching aids and methods found to have a positive effect in improving student achievement in Biology lessons. Diversifying methods classroom teaching that can help students and teachers to learn a topic better. The use of holograms and mnemonic methods is effective in helping students to learn optional subtopics more easily. This is because the use holograms can play a secondary role which is important to attract students' interest to participate in teaching and learning sessions in the classroom more actively. Not only that, this student-centered learning method has also increased self-confidence in students when they share and discuss with each other with the help of holograms. Indirectly, this can encourage students to discuss and generate ideas with other friends.

ACKNOWLEDGEMENT

Sincere appreciation to the Faculty of Science and Mathematics of University Pendidikan Sultan Idris for helping in this study.

REFERENCES

1. Chua, Y. P. (2006). Kaedah Penyelidikan. McGraw Hill Education
2. Darusalam, G., & Hussin, S. (2016). Metodologji penyelidikan dalam pendidikan: Amalan dan analysis kajian. Penerbit university Malaya
3. [3] Dayang Julida Abang Tar, & Muhd Izwan Mahmud. (2021). Minat, Tingkah Laku Distruptif Dan Gaya Pembelajaran Murid Bermasalah Pembelajaran Di Sekolah Rendah. Journal Dunia Pendidikan, 3(4), 49-64. https://doi.org/10.55057/jdpd.2021.3.4.5
4. Ellis Wong Siew Ting, & Che Nidzam Che Ahmad. (2016). Interaksi guru dan sikap pelajar Malaysia terhadap biologi: Satu kajian perbandingan etnik. GEOGRAFIA OnlineTM Malaysian Journal of Society and Space, 12(8), 148-160.
5. Farah Adlina Mokter. (2019). Keberkesanan Pembelajaran Berasaskan Masalah Terhadap Pencapaian dan Kemahiran Berfikri Aras Tinggi Pelajar Dalam Penulisan Karangan Bahasa Melayu. Jurnal Pendidikan Bahasa Melayu, 9(1), 33-46.
6. Farah Aida Sanip, & Che Nidzam Che Ahmad. (2014). Kesedaran Strategi Metakognitif dan Kemahiran Berfikir Aras Tinggi dalam Kalangan Pelajar Biologi. Jurnal Penyelidikan Pendidikan (KPM) Jilid 15, 1-18..
7. Fazilah Razali, Othman Talib, & Azraai Othman. (2016). Aplikasi Kemahiran Proses Sains dalam Pembelajaran Berasaskan Masalah Untuk Mata Pelajaran Biologi. Jurnal Kurikulum & Pengajaran Asia Pasifik, 4(3), 38-46.
8. Haleem, A., Javaid, M., Singh, R. P., Suman, R., & Rab, S. (2022). Holography and its applications for industry 4.0: An overview. Internet of Things and Cyber-Physical Systems, 2, 42-48. https://doi.org/10.1016/j.iotcps.2022.05.004
9. Jamaliah Abd Manaf. (2021). Pembangunan Kaedah Mnemonik Dan Teknik 4q In 1c Dalam Meningkatkan Kefahaman Pelajar Dalam Sub Topik Krebs Cycle. Journal on Technical and Vocational Education, 6(2).
10. Sidek, M. N., & Jamaludin, A. (2005). Pembinaan modul: Bagaimana membina modul latihan dan modul akademik. Penerbit UPM.
11. Muhammad Zulazizi Mohd Nawi. (2023). Variasi Media dalam Pendidikan di Malaysia: Satu Paradigma AbadKe-21. Firdaus Journal, 3(1), 77-95.