
Retrieval-Based Learning: A Strategy to Improve the Retention Rate in Science of Grade 7 Learners

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ABSTRACT

This study investigated the effectiveness of the Retrieval-Based Learning (RBL) strategy in improving learning retention among Grade 7 students at DNHS in science. Employing a mixed-method design, the research involves both quantitative and qualitative components. Forty-seven students undergo a one-shot pretest, post-test, and retention test, with statistical analysis examining the impact of RBL on retention rates. Concurrently, qualitative interviews with ten randomly selected participants offer insights into student experiences with RBL. Participants are chosen purposely based on observed learning retention. Data collection methods include questionnaires and consent letters approved by school authorities, ensuring alignment with learning objectives and content validation.

Results of the study revealed the efficacy of Retrieval-Based Learning (RBL) in improving student learning as evidenced by a substantial increase in mean post-test scores compared to pre-test scores, indicating a significant improvement in student learning following RBL. The retention test results demonstrated that the knowledge gained through RBL was effectively retained by students over the course of a week. Statistical analysis confirmed a significant difference between pre-test and post-test scores, as well as between post-test and retention test scores, rejecting the null hypothesis posited. Qualitative interviews provided additional insights into student experiences with RBL. These interviews corroborated the quantitative findings, affirming the beneficial impact of Retrieval-based learning. The study findings show the effectiveness of RBL as a strategy in improving retention rate among Grade 7 students in science.

KEYWORDS: *learning retention, retrieval-based learning, science education, grade 7 learners*

INTRODUCTION

The retention of learning is a crucial factor in students' academic success. However, with the challenges posed by the COVID-19 pandemic, low learning retention rates among students, particularly in science, was one of the identified effects. The researchers, who are also

science pre-service teachers at Dologon National High School, identified this problem among Grade 7 students who struggled to remember and apply concepts learned, which may be caused by a variety of factors, including lack of face-to-face interaction from the previous year levels, limited monitoring, evaluation, and educational resources, or learners' lack of motivation and support.

These challenges contribute to the broader educational landscape, ultimately affecting the country's standing in international assessments such as PISA, where the Philippines ranks among the lowest-performing countries in mathematics, reading, and science. The PISA 2022 results for the Philippines indicate that the country scored 355 in math, 347 in reading, and 373 in science. These scores position the Philippines at 77th out of 81 countries globally in the student assessment conducted by the OECD for 15-year-old learners. For the second time, the Philippines landed in the bottom 10 out of 81 countries in reading comprehension, mathematics and science (PISA, 2022).

The pandemic has significantly altered the Philippines' education system, shifting from in-person to remote learning. This change poses challenges, especially for students with limited technology access. Numerous studies show a decline in learning retention rates during the pandemic, attributed to difficulties adjusting to new learning methods and communication issues between students and teachers (Baticulon et al., 2021).

Previous research has demonstrated that retrieval-based learning improves long-term retention, understanding, and knowledge transfer across fields and settings (Roediger & Karpicke, 2006; Karpicke & Grimaldi, 2012; Agarwal et al., 2014). According to cognitive science research, retrieval practice strengthens memory trace and resistance to forgetting. This technique involves recalling knowledge from memory without referring to the source material. Quizzes, flashcards, self-testing, and summarizing are some examples. Additionally, Ortega-Tudela et al. (2019) propose that incorporating retrieval-focused activities, alongside other methods, in school settings may enhance conceptual learning in children. The results offer preliminary evidence supporting the effectiveness of retrieval practice, emphasizing the crucial role of teachers in implementing these strategies in their daily teaching duties.

This study aims to explore the effectiveness of retrieval-based learning as a strategy to improve the retention rate in Science of Grade 7 learners at Dologon National High School. To support the urgency of solving the problem, researchers reviewed relevant literature revealing the learning retention rate in science as a common issue among students in different contexts and levels. According to a study by Almazan et al. (2020), science teachers needed help to ensure that learners can retain and transfer their learning to real-life situations during online learning. Furthermore, Bautista et al. (2020) claim that modular learning positively affects academic performance only for those with high prior knowledge and self-efficacy. These studies suggest a need to explore and implement effective learning strategies that can enhance a student's retention rate.

In the study of Karpicke and Roediger (2008), college students who used retrieval practice performed better than those who used reread on short- and long-term tests. Middle school students who used retrieval practice improved their performance in science (Agarwal et al., 2012). Furthermore, McDaniel et al. (2013) revealed that elementary school students who used retrieval practice enhanced their comprehension and transfer of science concepts.

The problem of low learning retention rate in science is not only detrimental to the academic achievement of the students but also to their future career and life prospects. Motivated by the desire to assist fellow Science educators and learners in coping with the challenges of the post-pandemic transition, the researchers believe conducting this action research would contribute to improving Science education. As science literacy is essential for understanding and solving the complex problems of the 21st century, the researchers chose this topic, intending to find out how retrieval-based learning can improve learning retention among the identified learners. With this intervention, researchers aspire to improve the retention rate of grade 7 learners in science and prepare them for higher levels of education and beyond.

METHODOLOGY

a. Research Design

This research employs an explanatory sequential mixed-method design incorporating qualitative and quantitative approaches. The quantitative research is the primary research conducted through a one-shot pretest, post-test, and retention test administered to Grade 7 students at DNHS concerning applying the intervention Retrieval-Based Learning (RBL) strategy. Statistical analysis of the population sample is used to assess the level of learning retention in science subjects. The pretest, post-test, and retention test scores will be compared to evaluate any improvement in the students' learning retention rates in science subjects. Simultaneously, the qualitative research examines the experiences of Grade 7 students regarding the implementation of retrieval-based learning. This phase involves interviews among ten random participants. Moreover, the purpose of this phase is to give insights into the students' experiences with this learning strategy, which will provide a richer understanding of their learning experiences.

b. Participants of the study

The participants of this study will be the Grade 7 students of Dologon National High School. Specifically, researchers will use a purposive sampling technique to determine the sample size of the designated number of research respondents. Only the Grade 7 Science Curriculum section, with forty-seven (47) students who are enrolled during the fourth quarter of the academic year 2023-2024, will undergo a thorough observation. The participants are appropriate for the study because, upon observation during Field Study 1 and research, many of the grade 7 students at Dologon National High School lack learning retention in science subjects due to the shift from online to face-to-face learning. The study will be conducted from January to May 2024 in the second-semester academic year 2023-2024 within the premises of Dologon National High School, P-3 Dologon, Maramag Bukidnon.

c. Data Collection Methods

A written letter request for approval was addressed to the principal and respective advisers of the respondents, along with a note from the research advisor and a letter of consent from the participants to conduct the study. The researcher developed thirty pre- and post-test questionnaires to assess the level of learning in Science among Grade 7 students as exposed to RBL and retention test questionnaires to assess the student's learning retention rate after a week of the implementation. The test was administered as a Pre-test and Post-test— before and after the intervention, and the Retention Test will be taken a week after the post-test. Before creating the Pre-Test, Post-Test, and Retention Test questionnaires, a table of specifications

(TOS) will be developed. Questions for the Pre-Test, Post-Test, and Retention Test will then be created based on the TOS to align with the learning objectives and provided learning materials. These questions were content validated by the subject instructor/teacher. The tests underwent pilot testing with thirty-five (35) students from the Kibawe National High School campus with a Cronbach alpha of 0.863. The test utilized the following procedure according to the provided Template 1-A specified in DepEd Order No. 8, s. 2015, along with qualitative interpretations provided by Cambaya (2021). The learners' ratings in class will be categorized according to the predefined ranges in the template. After the data is quantified, ten (10) random students will be interviewed on one. Before the interview, the questionnaires will be validated by the expert or the adviser of the grade 7 students. A series of questions will be conducted to examine the experiences of Grade 7 students regarding implementing RBL.

d. Data Analysis

The study will utilize paired sample t-tests on the quantitative data acquired from pre-test, post-test, and retention test scores to examine the effectiveness of a retrieval-based learning strategy. It will also begin by calculating descriptive statistics, including the mean and standard deviation. An IBM SPSS statistical v.2022 tool will be used to fully grasp these following treatments. On the other hand, the qualitative data obtained will utilize Colaizzi's (1978) method to dissect and comprehend the subjective nature of their experiences systematically.

e. Research Paradigm

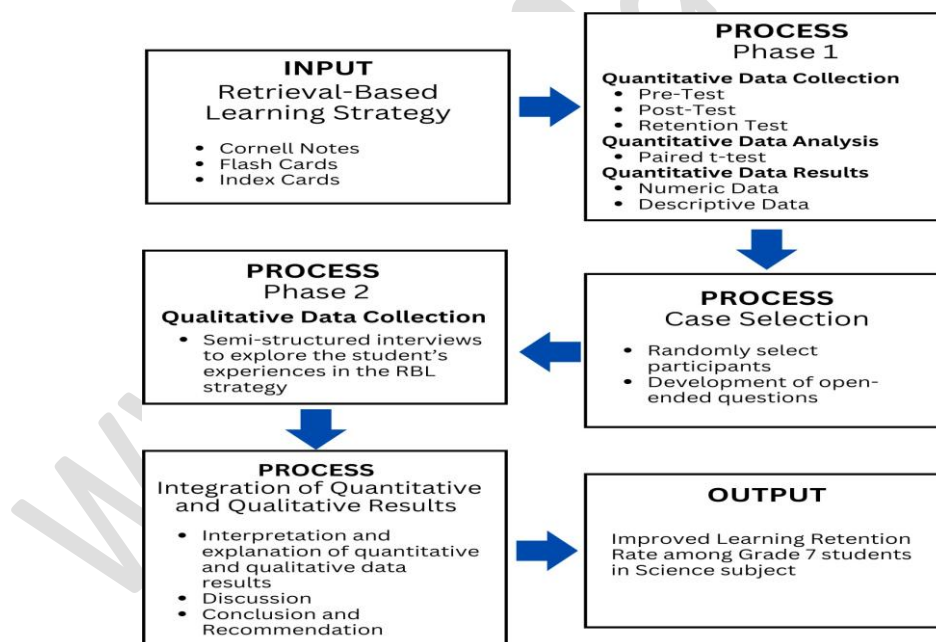


Figure 1. Graphical representation of the study showing the relationship of the variables.

RESULTS AND DISCUSSION

This section presents the analysis and interpretation of data on the effectiveness of retrieval-based learning to improve the retention rate in Science of Grade 7 learners in Dologon National High School.

Descriptive Analysis on the Level of Student’s Learning in RBL

Level of Student’s Learning Before and After as Exposed to RBL

Table 1. Level of students’ learning before and after exposure to RBL

Test	N	Mean	Standard Deviation	Standard Error Mean
Pre-Test	42	13.93	3.20	0.49
Post-Test	42	22.90	3.50	0.54

Table 1 presents the pre-test and post-test results as exposed to RBL. The pre-test scores, which are 13.93, were considerably very low mean scores, which, when interpreted using the scales developed by Cambaya (2021), can only be considered “Did Not Meet Expectations.” This considerably low prior knowledge on the topic, thus, only demonstrates the tremendous and immediate need for intervention. The mean post-test score was observed to have reached 22.90 (Table 2), an increase of 24.36% from the pre-test scores, which is considerably very satisfactory and high performance according to the scales developed by Cambaya (2021). This means that students exposed to RBL have improved their performance in science and enhanced their comprehension and transfer of science concepts, according to Agarwal et al. (2012).

This result is supported with the finding of the interview conducted among some of the participants in which Majority affirms that their learning has enhanced after the implementation of Retrieval based learning.

“I was able to understand our lesson better, Sir.” (Participant 1; Significant Statement 1, Translation Line 3, Page 1)

“There is a difference, sir, because I can understand the lessons better now more than before.” (Participant 7; Significant Statement 8, Translation Line 4, Page 16)

“I became more attentive to ma’am Aly, sir, because she accepts all the answers from us, and she corrects our misconceptions right away.” (Participant 10, Significant Statement 12, Translation Line 8, Page 20)

Participant 1 remarked to have better learning experience. This collaborated with the experience of Participant 7 where he could understand the lessons better. Participant 10 added that she he became more attentive to class participation.

“I was able to grasp the lesson easier, Sir and understand it.” (Participant 2, Significant Statement 2, Translation Line 4, Page 5)

“It was alright, sir. I have learnt a lot from ma’am Aly.” (Participant 9, Significant Statement 11, Translation Line 4, Page 19)

Participant 2 claimed that she was able to grasp the lesson much easier. Participant 9 supports this claim as for her she was able to learn a lot better now than before.

“After ma'am Alyssa's teaching, especially with the use of Cornell notes, it was easy for me to remember the ideas being taught, and the learning materials provided by ma'am were really helpful.” (Participant 4, Significant Statement 5, Translation Line 6, Page 10)

“Before, the lessons were discussed directly. Now, ma’am Alyssa made use of Flashcards. She lets us study in advance and conducts an oral quiz the next day. Thus, we studied more on the lessons, and it really stays in our minds.” (Participant 6, Significant Statement 7, Translation Line 6, Page 14)

Participant 4 stated that the difference in the teaching tools such as the Cornell notes and other instructional materials created a positive impact on their learning now compared to before. Participant 6 added that the use of flashcards improved their learning experience.

“It improved even more, sir. Before, ma’am is good at explaining but ma’am Alyssa is friendly, so you can really understand better, sir.” (Participant 5, Significant Statement 6, Translation Line 6, Page 13)

“Before, sir, I find it difficult to understand the lessons because of the fast pacing of the discussions; however, after having ma’am Alyssa, I understood the lessons well because she repeats the review of the lesson before and after, and she also reminds us to study the lesson in advance. She also reviews the lesson first before the quizzes and exams.” (Participant 8, Significant Statement 9, Translation Line 4, Page 17)

“I learned better because of her ways of teaching.” (Participant 8, Significant Statement 10, Translation Line 6, Page 18)

Participant 5 claims that the difference in the teaching approach such as being significantly approachable and ability to explain the content of the lessons, shows mastery which enhances their learning. Participant 8 added that there was better pacing during discussion which influences him to learn better compared to before.

According to Karpicke (2012), it is essential to consider retrieval processes not only because they are central to understanding learning but also because the act of retrieval itself is a powerful tool for enhancing learning. Moreover, active retrieval does not merely produce rote, transient learning; it produces meaningful, long-term learning.

In order to facilitate later access, retrieving items is assumed to include activating associated information and forming or strengthening associations that act as retrieval routes. Research has demonstrated that when students were taught new information about a particular subject, those with comparatively more prior knowledge about the subject matter benefited from retrieval-based learning more than their less knowledgeable peers (Tempel and Sollich, 2023).

Level of Student’s Learning Retention Rate as Exposed to RBL

Table 2. Level of students' learning retention after a week of exposure to RBL

Test	N	Mean	Standard Deviation	Standard Error Mean
Pre-Test	42	22.90	3.50	0.54
Post-Test	42	22.24	5.33	0.82

Table 2 presents the post-test and retention-test scores of students after a week of exposure to RBL. Out of forty-two (42) students who took the post-test after a week as exposed to RBL, a mean of 22.90, a standard deviation of 3.50, and a standard error mean of 0.54 were obtained.

For the retention test, out of forty-two (42) students who took the retention test, a mean of 22.24, a standard deviation of 5.33, and a standard error mean of 0.82 were obtained. The results show that the post-test and retention test were statistically comparable, and this was supported by the research of Roediger & Karpicke, 2006; Karpicke & Grimaldi, 2012; Agarwal et al., 2014, which has demonstrated that retrieval-based learning improves long-term retention, understanding, and knowledge transfer across fields and settings. This result is supported with the finding of the interview conducted among some of the participants in which Retrieval Based Learning (RBL) improved the students' learning retention.

“She always reviews the previous lesson Maam.” (Participant 1, Significant Statement 13, Translation Line 14, Page 2)

“Before she proceeds to another topic, she reviews the previous lesson.” (Participant 3, Significant Statement 15, Translation Line 12, Page 8)

“Through ma’am’s way of teaching, the lessons were taught correctly, sir, and she repeated the lesson as review. Thus, we have already mastered the concepts.” (Participant 4, Significant Statement 16, Translation Line 10, Page 11)

“I can easily remember the lesson, sir, because before she starts the new lessons, she reviews the previous lesson first.” (Participant 5, Significant Statement 18, Translation Line 10, Page 13)

“She keeps on repeating the discussion until we understand the lessons, sir.” (Participant 7, Significant Statement 20, Translation Line 6, Page 16)

“Ofentimes, I forget the lesson however, because she reviews it and encourages us to take it. We could review the lesson.” (Participant 9, Significant Statement 23, Translation Line 8, Page 19)

Participant 1 stated that her learning retention was improved through regular review of the previous lessons. Participant 3 added that it helps that lessons are reviewed before proceeding to a new topic of discussion. Participant 4 supports that review sessions help her master the lesson. Participant 5 also supports the claim as she could easily remember the lesson due to regular review sessions. Mastering the lesson before proceeding to a new lesson improves his understanding, according to Participant 7 and Participant 9 who collaborates to this idea as according to her even if she forgets certain ideas, the review sessions help her remember and retain the concepts learned.

“She is good at what she’s doing sir and aside from that she uses fun materials for us to get the lesson quickly.” (Participant 2, Significant Statement 14, Translation Line 8, Page 5)

“The materials from ma’am, sir, are really helpful, especially that we can review the lessons.” (Participant 5, Significant Statement 17, Translation Line 8, Page 13)

“My learning really did improve, sir, because the materials being provided like Cornell notes, we have something to read on while being in our house, and since we write the lessons, most likely we remember the concepts based on how we

interpret the lesson.” (Participant 8, Significant Statement 22, Translation Line 8, Page 13)

“Yes, sir. The Cornell notes really helped us review because we can scribble and read in our houses.” (Participant 10, Significant Statement 24, Translation Line 10, Page 20)

Participant 1 claims that incorporation of learning materials that are fun improves their learning retention. Participant 5 with the same claim states that these learning materials enable them to review their lessons from time to time. Participant 8 added that the Cornell notes enable them to remember the lesson that they take note of and it helps to retain the lesson when you give your own interpretation of the concepts. Participant 10 supported that the freedom of scribbling on the notes and its ability to be reviewed from time to time enables them to retain information they have learned.

“She repeats the lesson discussion, sir, reviews the prior lesson first to assess our understanding, and announces the oral recitation, thus, we study on our own.” (Participant 7, Significant Statement 21, Translation Line 10, Page 16)

“Before she changes the topic, she does a recap of the previous lesson first. She also conducts quiz and oral recitation which could really help us recall the discussions.” (Participant 10, Significant Statement 25, Translation Line 12, Page 21)

Participant 7 remarked that Retrieval Based Learning (RBL) improved his learning retention through regular assessment of prior knowledge through written quiz, and oral recitations as it encourages them to review their lesson. This claim is supported by Participant 10 as the regular conduct of assessments enables her to recall previous lessons discussed.

McDermott (2021) reported that retrieval practice is particularly successful in boosting longer-term recall and typically works better than more conventional techniques. For long-term memory retention, frequent practice of information recall works better than repeated study. This does not imply that studying is unimportant; rather, it indicates that repeated study is not as beneficial as repeated practice of retrieval skills.

According to Jakobsson, Loberg, and Kjörk (2023), when compared to alternative strategies, retrieval-based learning often proves to be more effective in ensuring knowledge retention. Reading a text aloud to a student several times helps them get comfortable with the material and makes them feel as though they own the knowledge. On the other hand, reviewing material by actively remembering and responding to questions frequently necessitates more mental work, which can lead to resistance.

Majority of the participants claimed that they have not experienced significant difficulties during the implementation of RBL. However, there are notable difficulties with their underlying factors that have been identified to be encountered by learners’.

“Yes Sir, I can’t hear clearly because I was sitting at the back.” (Participant 1, Significant Statement 26, Translation Line 18, Page 21)

“During ma’am Aly’s class, sir, my classmates were very noisy.” (Participant 4, Significant Statement 29, Translation Line 12, Page 11)

Auditory clarity and noisy environment pose a challenge to the implementation of RBL. Participant 1 states that due to her sitting arrangement she cannot hear the lesson clearly. Participant 4 added that noisy classmates is a contributing factor to this difficulty. There is strong evidence that background noise impairs memory retention based on research results, which show a statistically significant difference in memory recall between silent and noisy environments. It seems to make sense that those who are more sensitive will perform better when they are not surrounded by external noises (Du, 2023).

“I have, sir, with regards to understanding the lesson; if the lesson is new and I haven’t encountered the lesson yet however, if the discussion on the lesson will start, with the help of ma’am Alyssa’s materials and her way of teaching the lesson, I can then understand.” (Participant 7, Significant Statement 33, Translation Line 12, Page 16)

“Sometimes, sir, if there are concepts that aren’t remembered fully. But, if it is included in the review, I could remember the concept directly.” (Participant 8, Significant Statement 34, Translation Line 10, Page 18)

Having no initial background or new lesson poses a challenge to the learners prior to the implementation of RBL. Participant 7 claims that he has difficulty recalling previous lessons prior to the implementation. Participant 8 added that she tends to not remember concepts prior to the implementation.

Based on the study of Smith and Jones (2018) that conducted a comparative study to explore the impact of initial familiarity with a subject on learning and memory outcomes. The research showed that individuals lacking prior exposure to a topic tend to demonstrate reduced comprehension and retention levels. This underscores the importance of retrieval practice in addressing the difficulties associated with limited background knowledge, thereby supporting the assertion that encountering a new lesson or lacking initial background poses challenges to learners before the implementation of retrieval-based learning.

Nevertheless, the participants that claimed to experience the difficulties were able to address the experienced challenges.

“I didn’t listen to those who were making unnecessary noises.” (Participant 1, Significant Statement 37, Translation Line 20, Page 3)

“I just told them to be quiet, sir.” (Participant 5 Significant Statement 40, Translation Line 14, Page 13)

Participants 1 and 5 collaborated on the idea that disregarding distractions and concentrating on the discussion addressed the challenge posed by noisy environments.

The research conducted by Kim, J et al. (2017) demonstrates that engaging in retrieval-based learning (RBL) activities results in notable enhancements in both tolerance to environmental noise and understanding of lesson material. Furthermore, the study identifies the cognitive processes responsible for these improvements, emphasizing the significance of active involvement and memory reinforcement in enabling individuals to ignore distractions and improve learning outcomes, particularly in environments with high levels of auditory interference. These findings corroborate the assertion that focusing on the discussion and disregarding distractions can effectively counteract the challenges posed by noisy surroundings

“If there are times that I forget the lesson, sir, I just ask my classmates or I review my notes instead. I also asked ma’am, sir.” (Participant 4, Significant Statement 93, Translation Line 18, Page 12)

“I just study with my classmates, sir, and also ask ma’am Aly about it.” (Participant 7, Significant Statement 41, Translation Line 14, Page 17)

Participants 4 and 7 share the same claims that Seeking assistance from the teacher and classmates, reviewing the materials in the Cornell notes, addressed the challenge in remembering parts of the lesson.

Agarwal et al. (2014) found that individuals who participated in retrieval practice demonstrated a substantial enhancement in long-term retention compared to those who did not engage in such practice. These results emphasize the efficacy of retrieval-based learning as a valuable method for improving students' ability to remember material over time in educational contexts. This finding aligns with the notion that seeking reviewing materials using Cornell notes, effectively addresses the challenge of remembering key aspects of the lesson. Based on the quantitative data results showing that Retrieval Based Learning has positive impact on the learning of students by improving their learning retention, participants were asked if they agree with future integration of Retrieval Based Learning in the teaching and learning process and all of the participants are in favor.

“For me sir, it is fine so that we could remember the lesson easily.” (Participant 1, Significant Statement 43, Translation Line 24, Page 4)

“Yes, sir.” (Participant 2, Significant Statement 44, Translation Line 20, Page 7)

“I will agree, sir.” (Participant 5, Significant Statement 47, Translation Line 16, Page 15)

“Yes, sir. I will definitely agree.” (Participant 2, Significant Statement 48, Translation Line 12, Page 15)

“Yes, sir.” (Participant 9, Significant Statement 51, Translation Line 14, Page 20)

“I will agree, sir.” (Participant 10, Significant Statement 52, Translation Line 16, Page 21)

“I will agree, sir, for us to really study.” (Participant 3, Significant Statement 45, Translation Line 29, Page 10)

“Yes, sir. We really like it because we were able to remember the lessons that are taught to us and for us to not have a hard time when there is a quiz or a periodical exam.” (Participant 4, Significant Statement 46, Translation Line 20, Page 12)

“Yes, sir, especially that I really understood the topic because of the activities used by ma’am Alyssa.” (Participant 7, Significant Statement 49, Translation Line 16, Page 17)

“Yes, sir. If that will be implemented, I will really agree because the review is effective for us to remember the lesson easily.” (Participant 8, Significant Statement 50, Translation Line 12, Page 18)

Most participants express strong support for the future integration of Retrieval-Based Learning (RBL). Participant 1 advocates for RBL, highlighting its role in enhancing memory retention of lessons. This sentiment is supported by Participants 2, 5, 6, 9, and 10, who are also in agreement with the approach. Participant 3 notes that it can improve study habits. Participant 4 emphasizes the ease of recalling information during assessments, attributing this to the method's effectiveness. Participant 7 also agrees with the continuous integration of activities. Participant 8 remarked that implementation of RBL is an effective way to help students remember the lessons easily and he perceived benefits on RBL towards the learning process.

CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

First, the level of students' learning before and after exposure to retrieval based-learning (RBL), pre-test showed very low mean scores 13.93 on indicating "Did Not Meet Expectations" based on the scales developed by Cambaya (2021). The considerably low pre-test scores clearly indicate that students have limited understanding and familiarity with the topic. This emphasizes the importance of implementing targeted interventions to address the gaps in their knowledge. After a week of the intervention the mean post-test score was observed to have reached 22.90 an increase of 24.36% from the pre-test scores, which is considerably very satisfactory and high performance. The considerable increase in post-test scores indicates that the RBL approach effectively facilitated student learning and engagement. By immersing students in different activities and real-life applications that could let them retrieve the concepts taught, Retrieval-Based Learning enabled the Grade-7 students to actively interact with scientific concepts, leading to a deeper understanding and improved performance.

Second, the level of students' learning retention after a week of exposure to RBL showed that the results show that the post-test and retention test were statistically comparable. Out of forty-two (42) students who took the post-test after a week as exposed to RBL, a mean of 22.90 is obtained and students who took the retention test, got a mean of 22.24. These findings suggested that the knowledge and understanding gained through the RBL approach were effectively retained by the students over the course of a week.

Third, based on the statistical analysis on table one (1) there is a significant difference between the Grade 7 Science students' pre-test and post-test scores when exposed to Retrieval-Based Learning. This rejects the null hypothesis, which states that "There is no significant difference in students' pre-tests and post-tests as exposed to RBL".

Fourth, there is a significant difference between the student's post-tests and retention tests as exposed to RBL. This rejects the null hypothesis, which states that "There is no significant difference in students' post-tests and retention tests as exposed to RBL".

Fifth, the interviews conducted with the ten (10) Grade-7 random students provided further support and validation of insights that could provide additional evidence that the implemented intervention and the use of various teaching tools such as cornell notes, flash cards and index cards had a significant impact on their learning experiences and outcomes. These findings further reinforce that the approaches employed effectively enhanced student performance, comprehension, and engagement in the classroom.

RECOMMENDATION

Based on the conclusions of the study, the following recommendations can be made to enhance learning through retrieval-based learning implementation.

First, it is crucial to implement targeted interventions to address the gaps in students' knowledge and understanding. The considerably low pre-test scores indicate limited familiarity with the topic. By incorporating additional resources like differentiated instruction, and formative assessments, teachers can provide the necessary support to improve student performance and comprehension. The positive results of the post-test and retention test indicate the effectiveness of the Retrieval-Based Learning (RBL) approach in facilitating student learning and engagement. To continue promoting long-term retention, the teachers should incorporate regular review activities, different methods of assessments and opportunities for students to apply their knowledge in different contexts.

Second, since there is a significant difference between the pre-test and post-test scores and post-test and retention test scores. This supports the use of Retrieval-based Learning as a valuable instructional approach in Grade 7- science related subjects. This also highlights the importance of implementing strategies that encourage the retention of knowledge and understanding over time.

Third, the interviews conducted further support the effectiveness of the implemented intervention and the use of various teaching tools such as Cornell notes, flashcards, and index cards. Teachers should continue to utilize these tools and explore additional interactive and engaging instructional materials to enhance student learning experiences, improve comprehension, and foster active engagement in the classroom.

Fourth, it is further recommended that teachers and researchers should consider conducting further studies to evaluate the effectiveness of retrieval-based learning (RBL) in science education using a comparative research-based design involving a control group and an experimental group. By using a comparative research-based design, teachers and researchers can determine the extent to which RBL improves students' engagement, perception, and academic performance in science compared to traditional teaching methods. This will provide more concrete evidence of the effectiveness of RBL and help to guide future efforts to implement RBL into science education.

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