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Retrieval method as a learning intervention for long term retention and creative thinking skills

Dr Vishnu Vandana Vemuri, Assoc. Professor, School of Management, Anurag University, Dr Rao A M, Professor, School of Management, Anurag University, Hyderabad

Abstract— **Few key skills among many that are needed in the 21st century are critical thinking, creativity, collaboration, meta cognitive skills, technology literacy and decision making under uncertainty. With the emergence of ChatGPT and other Generative AI tools, there is a dire need for a distinctive way of learning and application of learning to ensure learning effectiveness. Mere content is no longer the most important factor to learn these skills but. what is needed is the ability to retrieve material learnt, in the context of application. For the learner to be able to apply the critical thinking levels and higher learning levels of Blooms taxonomy, the basic first level of remembering forms the basic foundation, particularly when the students are from first generation educated families or with disadvantaged socio-economic backgrounds. However, when students cram for the exams, they generally get an 'illusion of learning', where they think they know, but in reality often they may not be able to recall what they crammed when they need it later. This is a case of inefficient investment of time and effort in learning for the student. For the teacher, it slows down the teaching process and opportunity to engage in higher order thinking level applications. Addressing the frustrations of both teacher and students, the authors applied the concept of Retrieval method for MBA I year for Marketing Management course during a semester and a survey was conducted at the end of the semester to understand the perception of students on effectiveness of Retrieval techniques. The results supported that retrieval techniques were effective in supporting the student learning.**

***Keywords*— Blooms Taxonomy; Learning intervention; Retention technique; Retrieval Technique.**

I. INTRODUCTION

Few key skills among many that are needed in the 21st century are critical thinking, creativity, collaboration, meta cognitive skills, technology literacy and decision making under uncertainty. With the emergence of ChatGPT and other Generative AI tools, there is a dire need for a distinctive way of learning and application of learning to ensure learning effectiveness.

Mere content is no longer the most important factor to learn these skills but. what is needed is the ability to retrieve material learnt, in the context of application. However, when students cram for the exams, they generally get an 'illusion of learning', where they think they know, but in reality often they may not be able to recall what they crammed when they need it later. It is quite common among the students that they think they can answer the questions when they study, but struggle to apply/solve problems when they really need to apply it at home or during an exam. This is a case of inefficient investment of time and effort in learning for the student. For the teacher, it slows down the teaching process and opportunity to engage in higher order thinking level applications.

Addressing the frustrations of both teacher and students, the authors applied the concept of Retrieval method for MBA I year for Marketing Management course in the recent past

II. ABOUT RETRIEVAL METHOD

In the book, Powerful Teaching: Unleash the science of learning, Dr Pooja Agarwal discussed about 4 steps in Retrieval Methods to boost learning instead of cramming and repeating the courses. These are all learning practices utilized with either no-stakes or low-stakes assessments, thus enabling the student to attempt freely without being concerned about assessment or suffer any exam related anxiety.

A. *Retrieval practice*: Retrieval practice is pulling information out of students' heads (e.g., quizzes and flashcards), instead of only giving lectures and giving info through lectures etc., These include brain dump, note taking, two-things etc.

B. *Spaced practice:* To offer retrieval opportunities over time thus providing time for the students to rest and refresh and recall at varied intervals. There is sufficient research on forgetting processes and ways to remedy it.

C. *Interleaving***:** To apply retrieval practices not related to only one topic but to multiple related concepts thus encouraging the linking and ability to discriminate.

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Corresponding author: Vishnu Vandana V. Author, School of Management, Anurag University, Telangana, India.
Address: Anurag University, Hyderabad, 500088 (e-mail: vishnuvandanamba@anurag.edu.in).

D. *Feedback***:** To provide the learner, the opportunity to know what they know and what they do not know, facilitates learning.

III: *APPLICATION OF RETRIEVAL TECHNIQUE AT SCHOOL OF MANAGEMENT*

At School of Management in eastern Hyderabad, we have a blend of students with varied regional, educational backgrounds of B.Sc., B.Com, B .Tech. etc. Some students with rural or regional language background coming from challenging socio-economic settings or first generation learner families have difficulty in learning concepts at the pace required. Hence, to address the concerns of students' learning and recall, Retrieval technique was employed at the School of Management for Marketing Management Course.

Here is a brief descriptions of the methods used.

A. Retrieval Practices employed in a class

1. *Brain Dump or Free Recall***.** Brain dump is an activity where instead of faculty revising the earlier classes, the faculty pause the lesson and ask students to write everything they can remember, and then continue with the lesson. As this is without stakes or low stakes, students have no anxiety to copy or try other methods and helps them to collect and organize their content.

The above interventions when conducted in class, helped the authors understand the topics which were salient in the students' mind and the areas which require attention, additionally it helped other students to catch up with what they missed in earlier classes. The time taken for the activity was a mere 15 minutes.

2. *Two things*: At any point of time during the class, we stopped the lesson and asked students to write 2 things about a specific prompt. Ex: what are two things you learned so far today? What 2 things are take-aways from the unit so far? Can you write any 2 examples that relate to today's topic from your own experiences etc. Students can later share with their peers on which two concepts they have shared and exchanged the context. Time for the activity: 15 minutes

This is a learning strategy and not an assessment strategy. These can act as notes to students and then they can discuss these with their peers to know what common, unique points they noted from the exercise. The faculty could move on with the lesson after this activity.

3. *Note-taking Retrieval* : Here we ask students to listen and not to take notes. After a while, we took a pause and asked students to write down important topics they want to study. And the authors provided quick feedback on important topics i.e. facilitate a discussion where students can share what they wrote down. Faculty continued with the lesson after the exercise. This method can be tried outside the class and will help to remember the concepts better.

4. *HOTs Questions*: Questioning by teacher has a significant impact on student thinking. (Clasen 1990). However, for the students to develop critical thinking skills, it is important that the teachers ask questions beyond factual recall which is also called shrinking questions by Scheiver (1991). It is also observed that while only 10% to 20% of the learning through factual recall is retained by students, around 80% to 85% of retention happens for the learning through higher order questions that elicit higher cognitive processes. (Batson, 1981).

To enable students to apply critical thinking in the class, faculty noted and wrote essential questions at the beginning of each chapter or unit on board. As new facts are learned, we asked students to relate the new information to essential question. We asked the students to turn and talk to their neighboring student followed by class discussion.

These questions were not at Lower order Thinking levels (Remember, Understand, Apply) or Google search questions but those that make them think. For example compare, why do they think so and how did they come to the conclusion etc., to name a few. These helped the students to think beyond the Remember, Understand and Apply levels and to move to Analyze, Evaluate which are Higher Order Thinking (HoTs) level of Bloom's Taxonomy.

B & C. Spaced Retrieval and Interleaving: This is a method to ensure recall after some time-gap. For this session in our class, after the completion of Unit I, to make the session interesting, we prepared a paper ball and asked student to ask a question in Unit I concepts and forward the ball to someone whom he/ she would like to answer. The person who receives the ball shall answer the question, if he or she is not aware of the answer can pass the question and should explain a topic in which one is comfortable and ask another question and forward. At the end of the exercise all concepts were revised and those who could not be answered in class, were explained. It was exciting to see students exchanging questions and trying to help each other. Such activities were repeated few times to ensure spaced retrieval and interleaving of various concepts of the course. This enabled the students to retrieve earlier concepts and also understand the interrelationship between multiple concepts of the course.

4. **Feedback:** As students discuss and explain about various concepts, students were given feedback on their understanding of concepts. This ensured the students know the knowledge gap and to move from remember level to higher levels of Blooms's.

IV: RESEARCH METHODOLOGY

A survey of the class conducted to measure the effectiveness of the retrieval technique application. A structured questionnaire was administered to students of the class. Students were asked to share their opinions on the effectiveness of the retrieval technique, whether it had any impact on their retention and understanding of the concepts and in overall performance. Out of 60 students, 42 students responded to the questionnaire.

V: FINDINGS

The following are the findings of the survey. The agreement and disagreement with the statements regarding effectiveness of retrieval technique is displayed in the table I.

TABLE I
SUMMARY OF RESULTS ON STUDENT PERCEPTION ON RETRIEVAL TECHNIQUE

Statement	Agree %	Disagree %
Retrieval techniques helped me to recall the topics better compared to regular classes	81	19
These techniques helped me to engage better in the class	78	22
The techniques helped me in understanding the concepts better	89	11
I would like retrieval techniques to be applied for future courses too	78	22
I enjoyed the retrieval sessions	74	26
Retrieval techniques helped me to improve my performance better in the examinations	67	33
I do not find retrieval techniques useful	22	78

Source: Primary data

From the above table, it is observed that the students find the retrieval practice helpful in enable them to higher level of retrieval and engagement in the class compared to conventional teaching methods followed regularly. It is also found that the retrieval technique helped them not only to remember and understand the concepts but also in better engagement and performance in the examinations, Overall, 78% of students find retrieval technique useful.

VI: DISCUSSION

Our results address about the concerns of students from first generation educated families and those others who might be facing challenges in following the concepts being taught in the class due to diverse unrelated backgrounds. The study looks at application of retrieval techniques as an approach to address these concerns and helping the students to progress from LOTs to HOTs level of thinking during the course Application of these techniques will also enhance the critical thinking skills of the learners as they will be encouraged to respond to the essential questions that require analyze and evaluation. These techniques when applied over a period of time for multiple courses and concepts through spaced repetition, interleaving and feedback will also help the student in understanding the interrelationships among the concepts. that will augment reasoning, problem solving and decision making skills.

VII: CONCLUSION

It is observed that a majority of students found the retrieval practice useful and would like the techniques to be applied for other courses. One concern expressed was to ensure that the spaced repetition and interleaving be followed so the classes do not drag on, which may reduce the impact of the technique. Overall, the retrieval technique was found useful and impactful. We propose to employ the Retrieval methods for more courses and more cohorts to explore the consistency of the outcomes. Future studies can be more comprehensive to identify the impact of retrieval techniques on theoretical and mathematical or formulae based courses, if there is any difference in perception of retrieval technique based on the prior knowledge of concepts, learner's proficiency in the communication, and other factors . However, the application of retrieval technique is an alternative to the rote and repeat reading for memorizing and understanding and application of the concepts.

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