



## Enhancing Learning in Class Using Retrieval Practice in Maritime Education

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### ABSTRACT

Student active-learning techniques in enhancing the learning for students in the classrooms is recognized as an effective way to improve not only students' participation but also their understanding. 'Retrieval Practice' is one of the simple and effective tools in active learning strategies that can be utilized without significant additional efforts, resources, and time. This paper brings out the use of retrieval practice in maritime education, firstly reviewing the pedagogical literature on the subject and then proposing some techniques for use.

### 1. Introduction.

The significance of the participation of the students in the class during teaching is recognized in improving learning. The benefits of moving beyond traditional lecture-driven approaches in favor of 'active learning' to put students more in the driver's seat through discussions, in-class questions, and feedback; interactive technologies; and other strategies to engage learners and deepen understanding have been demonstrated through various studies (Wible, 2021). Thus, use of active learning methods has been explored by teachers in the classrooms to ensure optimum results.

During the teaching of the first-year students of Bachelor's course in Nautical Science, a number of active learning techniques were utilized and mixed results were achieved. However, despite greatly improving the interest of the students in the course over time, their active participation still could not improve significantly. After learning about pedagogical concepts and theories, the challenges in this field were preliminarily identified to work out solutions.

#### 1.1. Challenges in Active Learning.

One of the challenges which was faced in the class was that many students displayed lack of understanding and knowledge despite regular revision and work exercises in class. This was observed even when their interest in the course and the class participation was greatly enhanced. Therefore, use of active learning through the increase in student participation in class activities does not always deliver tangible results for students in learning. It led to the identification of the challenge of selection of appropriate active learning strategy to address this problem.

Specific problems of teaching and learning, and desired results expected from students will differ based on the course content, expected learning outcomes and type of assessment method used for evaluation of knowledge gained. Thus, relevant active learning techniques need to be utilized which are most suitable to a specific situation in class surroundings.

### 2. Selecting Active Learning Techniques for Improved Learning.

Initially, the active learning techniques were selected randomly by the teacher based on personal convenience and familiarity, with a focus on improving the participation of the students in the class. The aim for designing teaching-learning activities to address non-active participation of students, was to

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make the class experience more interesting and content more relevant to real-life scenarios. It would ensure that the students could relate to the course in general and the topic of lecture in particular, in a much better way.

The response to these activities from the students was mixed. These activities drastically improved attendance in the class, however, the performance of students during first term assessment was lacking.

As there was limited knowledge available with the teacher about active learning techniques in the beginning, the response could not be improved further. However, after a comprehensive effort to learn about 'Teaching for student-active learning', it was found that a number of other activities can also be used in the class. It was also learnt how informal assessment during teaching can be included in student-active learning.

After careful examination, it was considered that the techniques of 'Retrieval Practice' were the most suited for use in the scenarios which were being faced in the class. Thus, the succeeding paragraphs bring out how it could be used for enabling students to improve their understanding and learning.

### 3. Review of Higher Education Literature – Retrieval Practice.

Retrieval practice is a learning strategy focusing on getting the information out and through the act of retrieval, or calling information to mind, and therefore, our memory for that information is strengthened and forgetting is less likely to occur (Agarwal, Roediger, McDaniel, & McDermott, 2020). Therefore, it is a powerful strategy for improving academic performance of students without any additional efforts towards using new technology tools or increase in class time. Deliberately recalling information forces us to pull our knowledge 'out' and examine what we know.

However, it is important to remember that it is to be primarily used as a learning strategy and not as an assessment tool. So, instead of asking students to retrieve information only during assessments, retrieval during learning to improve students' understanding and retention of classroom material needs to be encouraged (Roediger, Agarwal, McDaniel, & McDermott, 2011). Further, retrieval practice does not lead to memorization but increasing the understanding as it helps in metacognition - awareness of what students know and don't know.

Retrieval is not merely a read out of the knowledge stored in one's mind – the act of reconstructing knowledge itself enhances learning and it is a powerful way to promote meaningful learning of complex concepts commonly found in science education and (Karpicke & Blunt, 2011). It is also found to be effective in learning languages (Kang, Gollan, & Pashler, 2013).

McDermott (2021) while discussing the conceptual framework for retrieval practice, provides analogy of learning to play a musical instrument through 'practice' to ensure long-term memory of various chords. She suggests similar learning for acquiring new knowledge from a textbook. Further, for a learner to benefit from retrieval practice, the goal is to make the retrieval effort difficult, but not so difficult that the retrieval attempt fails.

Interestingly, though tests are commonly used in educational settings as a means of assessing the state of a student's knowledge, research has shown that tests do much more than to measure learning and they also enhance learning (Storm, Bjork, & Storm, 2010). Rowland and Delosh (2015) use testing effects - retention benefit conferred by prior retrieval of information from memory, to demonstrate its effectiveness not only for longer but even for shorter retention intervals. The finding that retrieval of information from memory produces better retention than restudying the same information for an equivalent amount of time has been termed the testing effect (Roediger & Butler, 2011).

However, it is to be recognized that the effect of incorporating retrieval practice depended on the complexity of the questions; the net benefit of incorporating retrieval was higher for the low complexity ones (Roelle & Berthold, 2017). Retrieval practice is often effective even without feedback (i.e. giving the correct answer), but feedback enhances the benefits of testing (Roediger & Butler, 2011).

Moreira, Pinto, Starling, and Jaeger (2019) while reviewing the studies that investigated the use of retrieval practice as a learning strategy in actual educational contexts provide another view and limitation of the approach. They cautioned that even though retrieval practice emerges as a promising strategy to improve learning in classroom environments, there is not enough evidence available at this moment to determine whether it is as beneficial as alternative learning activities frequently adopted in classroom settings. This is based on the observation that majority of the reviewed studies compared retrieval practice to repeated study or to 'no-activity' rather than alternative learning strategies like concept mapping.

However, another literature review of about 2000 abstracts and 50 experiments by Agarwal, Nunes, and Blunt (2021) found that retrieval practice improved learning for a variety of education levels, content areas, experimental designs, final test delays, retrieval and final test formats, and timing of retrieval practice and feedback.

To summarize, it is quite obvious that retrieval practice can be used to promote better learning for students in the classroom. The theoretical aspects may reveal different degrees of success in retention - either short term or long term, however, retrieval practice could be used without considerable effort and time. Therefore, it could be one of the efficient ways for encouraging active learning.

### 4. Discussion.

While analyzing the problem encountered during teaching, both in terms of non-active participation and lack of understanding and knowledge of students - despite regular revision and work exercises, it was considered that use of retrieval practice could be tried as a good solution.

The various activities which were initially designed to address non-active participation of students did promote active engagement of students. However, on detailed examination, it revealed that most of these activities did not encourage students to

actively think or remember what they have learned previously, except some quizzes designed in IT-platform Kahoot. These activities were usually undertaken or prepared by the teacher, though aiming to make students also contribute to discussions.

Displaying videos of real-life incidents to generate interest and demonstrate importance of course for seafarers, recounting interesting anecdotes from personal professional experience to relate lecture content to practical application, covering brief background of difficult topics requiring prior knowledge, even if not in syllabus, to ensure better understanding and learning of lecture content, short revision of few minutes after each group activity to encourage correlation and remembrance through reinforcement, etc., greatly facilitated active participation of students. However, as students were usually not required to retrieve any information or lecture content in any of these activities, it did not improve their understanding and knowledge significantly.

Though IT-platform Kahoot was used for designing quizzes for students in some lectures, they were mostly focused on the lecture content of the day. It is obvious that it does have its own benefits, however, it is more beneficial for better learning when the lecture is commenced with a quiz session based on the contents and topics of previous lecture rather than topics covered in current lecture.

In addition, other activities using retrieval practice can be considered such as use of flash cards - students look at the term or concept appears displayed on the front of the card and test whether they know the answer, by flipping the card to check (Senzaki, Hackathorn, Appleby, & Gurung, 2017). Though the limitation of flash cards is that it determines how well the students have learned the current material instead of trying to learn more.

Further, one line explanation of topics liked by the students, asking students to recall one interesting terminology and writing prompts for students, can also be utilized for using retrieval practice in the class. In addition, asking the students to name the concept, whenever it is used in subsequent lectures, will also provide them with regular practice and therefore there are less chances of forgetting by them.

As the final assessment of the subject was through an oral exam, it required greater understanding of concepts and knowledge by the students. Therefore, the use of retrieval practice in class regularly was more appropriate for this particular subject, as it helped in reducing the pressure on students to memorize. It also facilitated them to have long term retention of the knowledge covered in lectures and made it easier for students to prepare for the final oral exam.

Overall, the use of various techniques of retrieval practice, in combination with other tools for active learning, improved the learning in the students in the class.

## Conclusions.

Student active learning techniques in enhancing the leaning for students in the classrooms is recognized as an effective way to improve not only students' participation but also their understanding. However, the selection of a particular technique of

active learning shall be based on the requirements envisaged by the teacher, based on the experience of teaching and interaction in the class.

Retrieval practice is one of the simple and effective tools in active learning strategies that can be utilized without significant additional efforts, resources, and time. The same can be incorporated easily in the existing teaching and does not require any new technological tools, classroom materials and expenditure. It is to be recognized that it should be only used as a tool for learning and not for assessment, for better benefits for students.

The literature demonstrates the benefits of using retrieval practice in enhancing learning for students, especially for science subjects, though it is also found to be encouraging in teaching of languages. It works even without feedback about correct answers being provided by the teachers, though it would be more beneficial with feedback.

Use of retrieval practice will greatly enhance teaching and learning, where more comprehensive retention of knowledge is required by the students. I must also state that the opinions and assertions expressed in this paper are those of the author and do not necessarily reflect the official policy or position of the University.

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