

Abstract

In recent years, there has been a discussion in the Israeli education system about what the Israeli Ministry of Education calls "meaningful learning." The Ministry defines the term as a process "in which the student raises questions, locates sources of information, processes information, and creates new knowledge relevant to his personal world and life in the technological age of the 21st century." Meaningful learning produces a deep understanding of what is being learned and promotes creative thinking, a high level in the hierarchy of mental processes.

For meaningful learning to occur, it is important to trigger the learner's motivation and executive functions. It is possible to further applications in classroom practices and examine their impact on memory and comprehension abilities and their implications for creative thinking by using information from neuroscience studies. Spaced teaching is one of the practices found to be applicable and reliable in promoting LTM in the classroom. The findings of the studies suggest that this practice affects neuroplasticity, which contributes to information being stored in LTM (Long term memory) and retrieved more efficiently.

The spaced learning method of classroom teaching is based on study units that integrate repetitively into the learning content and in questions and tasks that require retrieving the information learned. In addition, the spaced learning technique features the scheduling of multiple short teaching periods interspersed with breaks. In the classroom lesson array used in the current study, there was a short break between two study slots). The duration of the spaces between the teaching units in the classroom is unclear, and further research is needed. While the spaced learning method in the classroom provides an environment where students learn only during one lesson in three units of about a quarter of an hour. Recently, an array called "Spaced Learning-Learning for Memory and Retention Teaching - SMART" was introduced, offering a new set of medium-length intervals between lessons in addition to the short intervals in the existing lesson in spaced learning. A pilot study about the retrieval and application abilities of students taught using spaced teaching method was conducted in the UK during the years 2017-2018, with results showing a significant statistical difference in favor of SMART compared to the other group.

There is a need to deepen and expand the understanding of how learning and thinking abilities are influenced and promoted by different teaching practices. The scientific research in this field allows for more precise insights. One example studied the effects and differences between meta-cognitive instruction and a method of working in front of a computer. That study found that students with low achievements were more successful learning in front of a computer than learning with a peer group. One explanation supporting this finding was that in the peer group, the students with the lowest grades are labeled as less competent and therefore take a less active part in learning. Therefore, it will be interesting to check how students with different achievements succeed when they begin using spaced teaching methods.

In the present study, three research questions were examined. The first question was to determine the effect of spaced learning practice compared to SMART, focusing on LTM

abilities such as recall and recognition at concrete and abstract thinking levels. The second question was to determine the effect of different teaching methods on students with high, medium, and low achievements. A third question was qualitative and sought to determine how students experienced being taught by teachers who used different teaching methods. We presented students with instruction methods based on SMART, spaced learning, and concentrated teaching (teaching without breaks). Based on existing literature, the study's research hypothesis was that the practice of SMART, compared to spaced learning, would allow improved retention in LTM and effective retrieval of the new information learned. We hypothesized that SMART teaching would create a more favorable environment for creative thinking and that LTM abilities would be more significantly affected in low and medium-achieving students in relation to students with high achievements.

The findings of the quantitative research related to the first research question showed no uniformity or consistency supporting the superiority of one method over another (SMART vs. spaced learning). It is worth noting that in the recognition complex and recall creativity questions, the scores of both student groups increased from time T1 to time T2. A decrease in the recall conclusion questions was noted, as well, in the scores of both student groups from time T1 to time T2.

The findings of the quantitative research related to the second research question showed uniformity in both methods (SMART vs. spaced learning), finding that students with high achievements displayed the highest rate of success in all categories. Examining the overall scores of the recognition test, the recall test, and the questions that focused on recall creativity and recall conclusions, one can see clear differences: Students with high achievements and those with medium and low achievement levels performed differently. In almost all types of questions, there is no difference in the abilities of students with high and low achievements to recognize simple questions. In both groups, students did better during T1 than during T2. In addition, students who studied in a spaced learning type of teaching were more successful in all types and questions than students who studied according to the SMART practice.

The findings of the qualitative research related to the third research question, which examined the learning experience of the students using the different methods, showed more significant differences. Compared to the students who were taught using the spaced learning method, the students who were taught using the SMART method subjectively experienced a more positive feeling of remembering what was learned. In an additional significant finding, students taught using both methods felt that the breaks during the lessons helped them relax and concentrate on the lesson better.

The findings are important for promoting meaningful learning conditions are suitable for students at different levels of achievement. In addition, they provide a glimpse into the inner world of the students and how they experience various teaching methods. The findings are a basis for further research in which it is possible to develop and observe the students holistically

and differentially and to understand how to advance them by focusing on the cognitive and emotional aspects required for learning.