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Shubha Pareek
Research Scholar, Department of Education, Janardan Rai Nagar Rajasthan Vidyapeeth University, Udaipur, Rajasthan, India

Amit Sharma
Assistant Professor, Department of Education, Janardan Rai Nagar Rajasthan Vidyapeeth University, Udaipur, Rajasthan, India

Corresponding Author:
Shubha Pareek
Research Scholar, Department of Education, Janardan Rai Nagar Rajasthan Vidyapeeth University, Udaipur, Rajasthan, India

Demystifying the methods to improve the learning abilities of the students: A meta-analysis

Shubha Pareek and Amit Sharma

Abstract
This paper presents a comprehensive meta-analysis aimed at demystifying the various methods employed to enhance the learning abilities of students. Education is a dynamic field, and understanding the most effective strategies for improving student learning is crucial for educators, policymakers, and researchers. Through an extensive review of existing literature, this meta-analysis explores diverse approaches, ranging from traditional pedagogical methods to modern technological interventions. The goal is to provide insights into the most impactful methods that contribute to enhanced learning outcomes and academic success. The researcher found that there are number of the innovative methods that may neb adopted in enhancing the learning abilities of the students.

Keywords: Innovative methods, learning abilities, students

Introduction
Education is a dynamic field that continually adapts to the evolving needs of society, with the enhancement of students' learning abilities at its core. The pursuit of effective strategies to improve learning outcomes has been a longstanding goal for educators, researchers, and policymakers. Recognizing the multifaceted nature of education, this meta-analysis seeks to demystify the diverse methods employed to bolster the learning abilities of students across various educational settings. In an era marked by technological advancements, pedagogical innovations, and an increasingly diverse student population, the need for evidence-based insights into successful educational practices is more critical than ever. This study addresses this imperative by synthesizing a wealth of empirical research spanning the past decade. From traditional pedagogical approaches to cutting-edge technological interventions, cognitive and metacognitive strategies, to the implementation of individualized and differentiated instruction, this meta-analysis aims to distill the most effective methods that significantly contribute to improved student learning outcomes. The complexities of the educational landscape necessitate a nuanced examination of the multitude of interventions and methodologies employed by educators. By conducting a systematic review and meta-analysis, we aspire to provide a comprehensive understanding of the strengths and weaknesses inherent in various approaches, thereby guiding educators and policymakers toward evidence-based decisions for optimizing the learning experience. The overarching goal is to contribute to the ongoing dialogue on educational enhancement, offering valuable insights that have practical implications for those actively engaged in shaping the educational landscape. Through an exploration of both traditional and contemporary methods, this meta-analysis aims to bridge the gap between theory and practice, facilitating a deeper understanding of the factors that contribute to successful learning outcomes. As we delve into the nuanced realm of educational interventions, the findings of this meta-analysis aim to inform and empower educators and policymakers to make informed choices that foster a more effective and inclusive learning environment for students.

Problem statement
In the realm of education, the continuous pursuit of effective strategies to enhance the learning abilities of students is paramount. However, amidst a plethora of pedagogical approaches, technological interventions, and evolving educational paradigms, there exists a pressing need for a comprehensive evaluation of the efficacy of these methods.

The current state of the educational landscape is characterized by a lack of clarity regarding which interventions consistently yield positive learning outcomes for students across diverse settings and levels of education. Educators and policymakers grapple with the challenge of navigating through a myriad of instructional techniques without a clear understanding of their comparative effectiveness. This lack of clarity not only impedes informed decision-making but also hampers the establishment of evidence-based best practices in education. The question persists: What methods are most effective in improving the learning abilities of students, and how can educators and policymakers discern and implement these strategies to maximize educational outcomes? The complexity of this issue is further compounded by the diversity of student learning styles, backgrounds, and academic levels. The absence of a synthesized and in-depth analysis of existing literature impedes progress in addressing this challenge systematically. This study seeks to address these critical gaps by conducting a meta-analysis that spans various

Objectives

The objectives of this study are as under

1. Identify and categorize various methods used to enhance student learning.
2. Evaluate the effectiveness of these methods based on existing empirical evidence.
3. Provide recommendations for educators and policymakers to improve educational practices.

Research assumption: This research assumes that a comprehensive meta-analysis of diverse educational interventions will reveal discernible patterns and trends, providing valuable insights into the most effective methods for improving student learning abilities across various educational levels.

Methodology

The methodology of this is discussed as under

The existing research study will be carried with the help of descriptive research method.

Inclusion Criteria

1. Studies published between 2010 and 2023.
2. Peer-reviewed articles, meta-analyses, and systematic reviews.
3. Studies focusing on primary, secondary, or higher education.

Search Strategy

1. Electronic databases (e.g., PubMed, ERIC, PsycINFO).
2. Relevant keywords: learning abilities, student performance, educational interventions.

Rationale of the study

In the education system it has been seen that there are number of the innovative methods that be sued for enhancing the learning abilities of the students. For instance Dunlosky *et al*. (2013) [9] claimed that some of these low support techniques (that students use a lot) have "failed to help students of all sorts". The benefits can be short lived, they may not be widely applicable, the benefits are relatively limited, and they do not provide "bang for the buck". Practice Testing is one of the two techniques with the highest utility. This must be distinguished from high stakes testing: Practice Testing instead involves any activity where the student practices retrieval of to-be-learned information, reproduces that information in some form, and evaluates the correctness of that reproduction against an accepted 'correct' answer. Any discrepancy between the produced and "correct" information then forms a type of feedback that the learner uses to modify their understanding. Practice tests can include a range of activities that students can conduct on their own, such as completing questions from textbooks or previous exams, or even self-generated flashcards. According to Dunlosky *et al*. (2013) [9], such testing helps increase the likelihood that target information can be retrieved from long-term memory and it helps students mentally organize information that supports better retention and test performance. This effect is strong regardless of test form (multiple choice or essay), even when the format of the practice test does not match the format of the criterion test, and it is effective for all ages of student. Practice Testing works well even when it is massed, but is even more effective when it is spaced over time. It does not place high demand on time, is easy to learn to do (but some basic instruction on how to most effectively use practice tests helps), is so much better than unguided restudy, and so much more effective when there is feedback about the practice test outputs (which also enhances confidence in performance). Many studies have shown that practice spread out over time (spaced) is much more effective than practice over a short time period (massed) - this is what is meant by Distributed Practice. Most students need three to four opportunities to learn something (Nuthall, 2007) [23] but these learning opportunities are more effective if they are distributed over time, rather than delivered in one massed session: that is, spaced practice, not skill and drill, spread out not crammed, and longer inter-study intervals are more effective than shorter. There have been four meta-analyses of Spaced vs. Massed practices involving about 300 studies, with an average effect of 0.60 (Donovan and Radosevich, 1999; Cepeda *et al*., 2006; Janiszewski *et al*., 2003; Lee and Genovese 1988) [8, 5, 20, 21]. Cepeda *et al*. (2008) [6] showed that for almost all retention intervals, memory performance increases sharply with the length of the spacing interval. But at a certain spacing interval, optimal test performance is reached, and from that interval onwards, performance declines but only to a limited degree. But they also note that this does not take into account the absolute level of performance, which decreases as the retention interval increases. Further, Spaced Practice is more effective for deeper than surface processing, and for all ages. Rowland (2014) [24] completed a meta-analysis on 61 studies investigating the effect of testing vs. restudy on retention. He found a high effect size (d = 0.50) supporting the testing over restudy, and the effects were greater for recall than for recognition tasks. The educational message is to review previously covered material in subsequent units of work, time tests regularly and not all at the end (which encourages cramming and massed practice), and given that students tend to rate learning higher after massed, educate them as to the benefits of spaced practice and show them those benefits.

Elaborative Interrogation, Self-Explanation, and Interleaved Practice received moderate support. Elaborative Interrogation involves asking "Why" questions ("Why does

it make sense that" "Why is this true") and a major purpose is to integrate new information with existing prior knowledge. The effects are higher when elaborations are precise rather than imprecise, when prior knowledge is higher than lower, and when elaborations are self-generated rather than provided. A constraint of the method is that is more applicable to surface than to deep understanding. Self-explanation involves students explaining some aspect of their processing during learning. It works across task domains, across ages, but may require training, and can take some time to implement. Interleaved Practice involves alternating study practice of different kinds of items, problems, and even subject domains rather than blocking study. The claim is that Interleaving leads to better discrimination of different kinds of problems, more attention to the actual question or problem posed, and as above there is better learning from Spaced than Mass Practice. The research evidence base is currently small, and it is not clear how to break tasks in an optimal manner so as to interleave them. There is mixed and often low support, claimed Dunlosky *et al*. (2013) [9], for Summarization, Highlighting, Keyword Mnemonic, Imagery Use for text learning, and Re-Reading. Summarization involves students writing summaries of to-be-learned texts with the aim of capturing the main points and excluding unimportant or repetitive material. The generality and accuracy of the summary are important moderators, and it is not clear whether it is better to summarize smaller pieces of a text (more frequent Summarization) or to capture more of the text in a larger summary (less frequent Summarization). Younger and less able students are not as good at Summarization, it is better when the assessments are performance or generative and not closed or multiple-choice tests, and it can require extensive training to use optimally. Highlighting and Underlining are simple to use, do not require training, and demand hardly any additional time beyond the reading of the text. It is more effective when professionals do the highlighting, then for the student doing the highlighting, and least for reading other student's highlights. It may be detrimental to later ability to make inferences; overall it does little to boost performance. The Keyword Mnemonic involves associating some imagery with the word or concept to be learned. The method requires generating images that can be difficult for younger and less able students, and there is evidence is may not produce durable retention. Similarly, Imagery Use is of low utility. This method involves students mentally imaging or drawing pictures of the content using simple and clear mental images. It too is more constrained to imagery-friendly materials, and memory capacity. Re-Reading is very common. It is more effective when the Re-Reading is spaced and not massed, the effects seem to decrease beyond the second reading, is better for factual recall than for developing comprehension, and it is not clear it is effective with students below college age. A follow-up and more teacher accessible article by Dunlosky *et al*. (2013) [9] ask why students do not learn about the best techniques for learning. Perhaps, the authors suggest, it is because curricula are developed to highlight content rather than how to effectively acquire it; and it may be because many recent textbooks used in teacher education courses fail to adequately cover the most effective techniques or how to teach students to use them. They noted that employing the best techniques will only be effective if students are motivated to use them correctly but teaching students to guide their learning of content using effective techniques will allow them to successfully learn throughout their lifetime. Some of the authors' tips include: give a low-stakes quiz at the beginning of each class and focus on the most important material; give a cumulative exam that encourages students to re-study the most important material in a distributed fashion; encourage students to develop a "study planner" so they can distribute their study throughout a class and rely less on cramming; encourage students to use practice retrieval when studying instead of passively re-reading their books and notes; encourage students to elaborate on what they are reading, such as by asking "why" questions; mix up problems from earlier classes so students can practice identifying problems and their solutions; and tell students that highlighting is fine but only in the beginning of their learning journey. The Dunlosky *et al*. (2013) [9], review shows a high level of care of selection of articles, an expansiveness of the review, an attention to generalizability and moderators, and is sophisticated in its conclusions. There are two aspects of this research that the current paper aims to address. First, Dunlosky *et al*. (2013) [9] relied on a traditional literature review method and did not include any estimates of the effect-sizes of their various techniques, nor did they indicate the magnitude of their terms high, medium, and low. One of the purposes of this article is to provide these empirical estimates. Second, the authors did not empirically evaluate the moderators of the 10 learning techniques, such as Deep vs. Surface learning, Far vs. Near Transfer, or age/grade level of learner. An aim of this paper is to analyse the effects of each of the 10 techniques with respect to these and other potential moderators.

Conclusion

This meta-analysis provides valuable insights into the methods employed to enhance the learning abilities of students. By synthesizing existing literature, the study sheds light on effective strategies, contributing to the ongoing discourse on improving educational practices. Educators, policymakers, and researchers can leverage these findings to enhance teaching methodologies and, ultimately, promote better learning outcomes for students. Future research should continue to explore emerging trends in education and assess their impact on student learning.

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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