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Learning strategies in university students: A systematic review

Estrategias de aprendizaje en estudiantes universitarios: una revisión sistemática

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Abstract

The transition from school to university represents a significant challenge for students, who must navigate new technical terms and disciplines with specific complexities, making it difficult to adopt effective learning strategies. In this context, this study aims to analyze the learning strategies used by university students through a systematic review. To this end, recognized scientific databases such as Web of Science, Scopus, SciELO, and MEDLINE (PUBMED) were consulted, using the term "learning strategies" as the main descriptor. A total of 39 articles were selected and analyzed: 13 from Web of Science, 9 from Scopus, 9 from PUBMED, and 8 from SciELO. The results indicate that strategies to support information processing are the most commonly used by university students. Furthermore, a wide diversity of countries is observed, including institutions and faculty, that incorporate at least one learning strategy as a fundamental part of their educational processes. This analysis highlights the importance of learning strategies in university students' adaptation and academic success, underscoring the need to promote their effective use to enhance the educational process in different institutional contexts. This systematic review thus contributes to deepening the understanding and application of these strategies in higher education.

Keywords: learning, teaching, university students.

Resumen

La transición de la etapa escolar a la universitaria representa un desafío significativo para los estudiantes, quienes deben enfrentarse a nuevos tecnicismos y disciplinas con complejidades específicas, lo que dificulta la adopción de estrategias de aprendizaje efectivas. En este contexto, el presente estudio tiene como objetivo analizar las estrategias de aprendizaje utilizadas por estudiantes universitarios a través de una revisión sistemática. Para ello, se consultaron bases de datos científicas reconocidas, tales como Web of Science, Scopus, SciELO y MEDLINE (PUBMED), utilizando como descriptor principal el término “estrategias de aprendizaje”. Se seleccionaron y analizaron un total de 39 artículos: 13 de Web of Science, 9 de Scopus, 9 de PUBMED y 8 de SciELO. Los resultados indican que las estrategias de apoyo al procesamiento de la información son las más empleadas por los estudiantes universitarios. Además, se observa una amplia diversidad de países que, en sus respectivas instituciones y sin importar la facultad, incorporan al menos una estrategia de aprendizaje como parte fundamental de sus procesos formativos. Este análisis resalta la relevancia de las estrategias de aprendizaje en la adaptación y éxito académico de los estudiantes universitarios, subrayando la necesidad de promover su uso efectivo para favorecer el proceso educativo en diferentes contextos institucionales. La revisión sistemática contribuye así a profundizar el conocimiento y la aplicación de estas estrategias en la educación superior.

Palabras clave: aprendizaje, enseñanza, universitarios.

Introduction

The acquisition of knowledge is grounded in two essential cognitive theories: on one hand, Vygotsky's emphasis on social interaction as a driving force of learning, alongside individual assimilation (Maidansky & Kravtsov, 2023); and on the other, Piaget's approach regarding the progressive construction of increasingly complex logical structures (Cerovac & Keane, 2024; Rochat, 2023; Ülger, 2023). From these perspectives, learning strategies are designed with a focus on clear objectives (Campos et al., 2021), based on cognitive psychology (Ait Moussa et al., 2024). According to Weinstein & Mayer (1986), these strategies are actions that facilitate the manifestation of specific skills according to context and purpose (Barbeau et al., 2021). However, in

practice, many current strategies prove to be ineffective. Therefore, integrating the teaching of these strategies into higher education is fundamental (McDaniel & Einstein, 2020), as they represent key tools for the active construction of knowledge (De los Santos & González, 2022).

Furthermore, university students must not only process information but also understand and apply effective strategies to enhance their academic performance (Palacios et al., 2022). Studies support that the frequent and appropriate use of these strategies is associated with better academic outcomes (Díaz-García et al., 2023; Williams et al., 2022), which aligns with educational models that value active student participation in their learning. In the face of increasing professional demands, the ability to adapt quickly is indispensable, implying efficient learning enhanced by current scientific and technological advancements (Moreno, 2022). Thus, learning activities should promote higher-order thinking, as deep understanding is reflected in effective knowledge transfer (Liu et al., 2023).

In this context, the PISA 2022 report highlighted a significant decline in learning levels in Latin America and the Caribbean. In particular, the Ministry of Education of Peru reported that a large percentage of students did not achieve minimum competencies in mathematics, science, and language (Minedu, 2022). Similarly, the National Household Survey (ENAHO) from the National Institute of Statistics and Informatics (INEI) indicated that only 30.9% of young Peruvians successfully completed higher education in 2022, a figure lower than the 36.6% recorded in 2019 (SENAJU, 2024).

Finally, the present study aims to analyze the learning strategies employed by university students, focusing on the knowledge and use of strategies for the acquisition, encoding, retrieval, and support of information processing. In this regard, the study seeks to answer the question: Are the learning strategies utilized by university students effective? This inquiry is approached from an epistemological perspective, based on Ausubel's meaningful learning theory, and from a cognitive approach that considers the learning process as the foundation for the meaningful construction of knowledge (Shaidullina et al., 2023; Bryce & Blown, 2023).

Methodology

The present study employs a descriptive design with a qualitative focus, based on a literature review conducted according to the PRISMA guidelines (Page et al., 2021). The process was developed in four main phases:

1. Search

The bibliographic search was conducted in accredited and indexed scientific journal databases, such as Web of Science, Scopus, SciELO, and Medline. The key terms used included "learning strategies," "information acquisition learning strategies," "information encoding learning strategies," "information retrieval learning strategies," and "information processing support learning strategies." To encompass publications in both English and Spanish, language filters were applied. Articles published between 2020 and 2024 were considered.

2. Evaluation

Each retrieved article's abstract was reviewed in detail to assess its relevance. Inclusion criteria were established, prioritizing original publications, and exclusion criteria eliminated reviews, theses, and other non-original document types.

3. Analysis

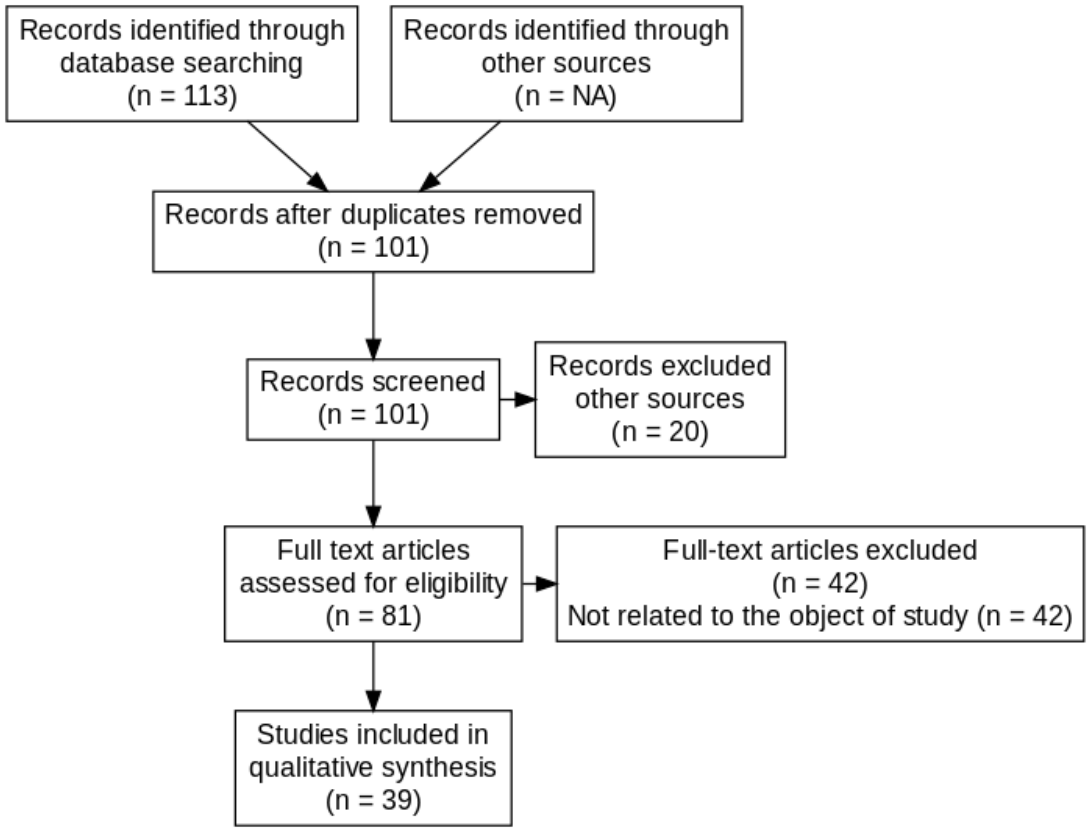
The selected articles were meticulously studied to extract relevant data related to learning strategies. Key information was recorded, such as study design, sample characteristics, methodology employed, and main conclusions.

4. Synthesis

To highlight the learning strategies, the results of the selected studies were summarized, identifying recurring themes as well as discrepancies among them. Finally, conclusions were drawn that emphasize the educational implications derived from the analysis.

A total of 113 articles were analyzed, from which a representative sample of 39 studies was selected for detailed review.

Figure 1
Flow diagram of article selection



Results and discussion

Table 1
Scientific publications incorporating information acquisition as a learning strategy

Author	Year	Contribution
Cui & Kaur	2023	In China, medical English students primarily employed repetition and memorization strategies.
Arones et al.	2022	In Peru, the least utilized strategies by education and humanities students were exploration, chunking, and repetition.
Zubenko et al.	2022	In Ukraine, students applied repetition strategies for learning other languages in less time.
Çan & Toraman	2022	In Turkey, medical students prioritized scenario-based repetition strategies for learning anatomy.
Guerra et al.	2022	In Mexico, psychology students utilized underlining (a chunking strategy), repetition, and annotations as learning methods.
Ladino & Rincón	2022	In Colombia, special education students varied their use of information acquisition strategies according to their different options.

Source. Article analysis matrix

Table 2
Scientific publications considering information encoding as a learning strategy

Author	Year	Contribution
Shu et al.	2024	In China, students predominantly used elaboration, seeking help, interaction and cooperation, effort management, and information selection strategies.
Hey et al.	2024	In New Zealand, participants mainly employed organization and elaboration strategies.
Choo et al.	2023	In Malaysia, pharmacy students applied trial, elaboration, and organization approaches.
Kruse et al.	2023	In Germany, dental students showed a preference for digital strategies in courses and concepts.
Aksoy & Pasli Gurdogan	2022	In Turkey, the flipped classroom method proved effective in enhancing knowledge, skills, and motivation in nursing students.
Bernabé et al.	2022	In Ecuador, a weak positive linear relationship was found between learning strategies and academic averages according to the ACRA scale among university students.
Romero et al.	2022	In Peru, a proportional and positive relationship was documented between the use of mentifacts as a metacognitive strategy and academic performance in education students.
Phun et al.	2021	In Peru, a direct relationship was reported between acquisition strategies and academic performance in medical sciences students, highlighting the influence of personal motivation and social environment.
Cabana et al.	2021	In Peru, a higher use of information encoding strategies was evidenced among engineering students.

Source. Article analysis matrix

Table 3
Scientific publications considering information retrieval as a learning strategy

Author	Year	Contribution
Zeballos & Pumacahua	2023	In Peru, social sciences students applied strategies for searching and exploring digital information and texts on institutional portals.
Urdaneta et al.	2023	In Ecuador, it was confirmed that information retrieval is the most utilized strategy among administration and engineering students.
Röling-Salazar et al.	2022	In Chile, health sciences students recognize information literacy as a key competency for searching and using information resources.
Nedjat-Haiem & Cooke	2021	In the United States, biology students employed unconventional strategies to answer open-ended questions, the most frequent being "include only important information" (20.3%).
Chen	2020	In Taiwan, university students of English predominantly used online information searching.
Atoy et al.	2020	In the Philippines, a direct link was evidenced between digital literacy and information searching strategies.

Arbee	2020	In South Africa, marketing students reported that the non-use of the writing center was primarily due to time-related factors.

Source. Article analysis matrix

Table 4
Scientific publications considering support for information processing as a learning strategy

Author	Year	Contribution
Thamrin et al.	2024	In Indonesia, an improvement in critical thinking skills was observed in students who applied contextual learning strategies.
Gavín et al.	2024	In Spain, it was reported that the strategies used were based on internal factors such as student participation and motivation.
Stambuk-Castellano et al.	2024	In Spain, metacognitive profiles of medical students contributed to improved grades, satisfaction, and engagement with learning.
Greenberg et al.	2023	In the United States, medical students identified key planning tasks for self-regulated learning, including organization, preview, and self-reflection.
Biwer et al.	2023	In the United States, pharmacy students acquired accurate metacognitive knowledge about effective and ineffective strategies in the long and short term.
Do Nascimento et al.	2023	In Brazil, it was evidenced that students applied metacognitive processes during initial teacher training, favoring the development of skills and competencies.
Pérez et al.	2023	In Spain, the use of motivational strategies improved academic performance in education students, although the results were not conclusive.
Martín et al.	2022	In Spain, a negative correlation was reported between procrastination and academic performance, along with low use of metacognitive and socio-affective strategies among education students.
Asencios & Rivas	2022	In Peru, nursing students employed cognitive, metacognitive, and affective strategies to a lesser extent, showing deficiencies in generic and interpersonal competencies.
Bonifaz et al.	2022	In Peru, self-regulated learning control in students is associated with the management of autonomous learning strategies, which enhance cognitive and metacognitive skills.
Medina	2022	In Peru, metacognitive strategies significantly influence the critical thinking of architecture students.
Bordoni et al.	2022	In Argentina, an increase in the use of metacognitive techniques was evidenced, especially among female dental students.
Albar et al.	2022	In Saudi Arabia, personality traits such as conscientiousness and neuroticism predict the selection of learning strategies in medical students.
Hwang & Oh	2021	In South Korea, the relationship between self-learning and problem-solving ability was partially mediated by self-efficacy and self-regulated learning in nursing students.

Chang et al.	2021	In the United States, it was evidenced that performance on progress exams is related to critical thinking and metacognition in medical students.
McCarthy et al.	2021	In Ireland, students expressed benefits of reflection as a strategy for clinical learning, although some showed resistance to written reflections.
Davidson et al.	2021	In New Zealand, students applied three types of processes to self-manage their emotions, using them for internalization, seeking, and confrontation.

Source. Article analysis matrix

In terms of strategies for information acquisition, the initial process consists of paying attention, which facilitates the transfer of data from sensory registers to immediate memory through repetition (Dubinsky & Hamid, 2024). Regarding this, various researchers agree in classifying these strategies as attentional and chunking-based. Among them, linear highlighting is considered particularly effective when learning objectives are clear and the material is well-structured (Guerra et al., 2022; Ladino & Rincón, 2022). On the other hand, repetition strategies are recognized as fundamental for consolidating information into long-term memory, involving verbal or mental reviews (Cui & Kaur, 2023; Zubenko et al., 2022; Çan & Toraman, 2022; Guerra et al., 2022; Román & Gallego, 2008). However, Arones et al. (2022) present a different approach, noting that techniques such as exploration and repetition are less utilized, attributing this to the rise of digital tools. Nevertheless, motivation remains key to achieving meaningful learning, in line with Ausubel's epistemological theory (López & Soler, 2021; Bryce & Blown, 2023; De Farias, 2022; Silva et al., 2020).

Meanwhile, the encoding of information represents a crucial factor for academic success. Elaboration and organization allow for the integration of new knowledge into pre-existing cognitive structures (Alvarado et al., 2021). Cabana et al. (2021) found that these strategies prevail and favor the achievement of objectives in electronics and digital circuits courses. Additionally, several studies (Shu et al., 2024; Hey et al., 2024; Choo et al., 2023; Aksoy & Pasli Gurdogan, 2022) highlight elaboration as the most employed strategy, along with organizational techniques (Hey et al., 2024; Choo et al., 2023; Aksoy & Pasli Gurdogan, 2022; Romero et al., 2022). However, Kruse et al. (2023) reported that the use of diagrams or illustrations is infrequent among dental students. Furthermore, studies by Bernabé et al. (2022) and Phun et al. (2021) indicate that encoding strategies are applied infrequently, suggesting a preference for focusing on key information and review, considering support strategies as more relevant for critical judgment.

Regarding information retrieval strategies, which involve accessing knowledge stored in long-term memory, these are commonly used (Alvarado et al., 2021; Urdaneta et al., 2023). In this sense, studies on information literacy, such as that by Röling-Salazar et al. (2022), show that this competency facilitates the efficient use of search resources. On the other hand, specific strategies for online information searching, particularly in English, have been explored (Chen, 2020). A positive relationship between digital literacy and information searching strategies has also been demonstrated (Atoy et al., 2020). However, while some authors emphasize that strategies related to generating responses, such as planning and drafting, are predominant (Zeballos & Pumacahua, 2023), others argue that drafting responses is used infrequently (Nedjat-Haiem & Cooke, 2021). Despite the existence of resources such as writing centers designed to support these skills, many students do not utilize them, citing a lack of time as the main reason (Arbee, 2020).

On the other hand, strategies supporting information processing are considered widely applied (Gavín et al., 2024). Various studies highlight the positive role of metacognitive strategies, understood as processes of monitoring and reevaluating one's knowledge, which fosters autonomy (Do Nascimento et al., 2023). This assertion is supported by evidence showing their significant benefit on academic performance (Stambuk-Castellano et al., 2024; Bordoni et al., 2022). Additionally, a moderate use of metacognitive strategies related to awareness, planning, cognition, and control has been identified, positively influencing critical thinking (Medina, 2022). Furthermore, research shows that training in these strategies helps students replace less effective techniques, such as highlighting and rereading, with more efficient methods like interleaving and elaboration (Biwer et al., 2023).

However, the implementation of these strategies is not always consistent. For example, planning, considered a key strategy, is underutilized, while evaluative and self-regulatory strategies are more common

(Bonifaz et al., 2022; Albar et al., 2022; Greenberg et al., 2023; Hwang & Oh, 2021; Chang et al., 2021). Some authors question the importance of metacognitive strategies, arguing that adult students are capable of self-analysis without formal training (Asencios & Rivas, 2022). Instead, they emphasize the relevance of socio-affective strategies for emotional management, a position that aligns with research showing these are the most commonly employed (Albar et al., 2022). Additionally, the social aspect of learning has been addressed, identifying three processes for managing emotions: internalization (avoidance and self-reflection), seeking (requesting help), and confrontation (directly addressing situations or people) (Davidson et al., 2021).

Finally, motivational strategies constitute another critical aspect, prevailing in multiple contexts (Albar et al., 2022). These link intrinsic motivation with support strategies for learning (Pérez et al., 2023) and are positively associated with the development of critical reasoning (Thamrin et al., 2024). Similarly, reflection is highlighted as a significant motivational and self-regulatory behavior (McCarthy et al., 2021). It is also argued that motivation is fundamental for increasing understanding and stimulating intellectual curiosity (Alvarado et al., 2021). Although most studies emphasize the benefits of these strategies, there are perspectives warning that metacognitive and socio-affective strategies do not always positively impact academic performance. In some cases, they are even associated with procrastination, reflecting low use of planning, regulation, and evaluation skills (Martín et al., 2022).

Conclusions

Based on the evidence collected, it is concluded that strategies supporting information processing are the most utilized by university students, with Peru highlighted as one of the South American countries where the highest number of studies on learning strategies in the university context has been concentrated. Regarding information acquisition strategies, the most frequent are repetition strategies, followed to a lesser extent by chunking-based strategies, with highlighting being the most notable technique. In terms of strategies for encoding information, there is a balanced use of organizational and elaboration techniques. On the other hand, within information retrieval strategies, active searching predominates, while response generation strategies—such as planning, ordering, or drafting—are less employed.

Moreover, it was identified that metacognitive strategies, primarily those focused on regulation and evaluation, constitute the most frequent type of support for information processing. In contrast, socio-affective strategies are used to a lesser extent, with motivational, affective, and social strategies being the predominant ones within this group. The wide reliance on basic strategies indicates the need for specific interventions that guide students towards a more effective and advanced use of these techniques.

However, it is important to note certain limitations of the study, as the findings are based on a review of previous literature that is mostly descriptive, which restricts the generalization of results to all university contexts. Therefore, future research is recommended to focus on designing and evaluating interventions that effectively promote the adoption of more sophisticated learning strategies.

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