

ORIGINAL

## Analyzing the Impact of Self-Regulated Learning on Academic Performance and Student Engagement

### Análisis del Impacto del Aprendizaje Autorregulado en el Rendimiento Académico y la Participación Estudiantil

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#### ABSTRACT

**Introduction:** self-regulated Learning is a central process that allows students to plan, monitor, and evaluate their own learning activities. This process holds a strong influence on academic performance and student engagement. Although many studies discuss Self-Regulated Learning, a review of Scopus publications shows that research that examines its direct connection with academic achievement and engagement remains limited. This situation reduces the opportunity to build learning strategies that support stronger learning outcomes.

**Objective:** this study aims to identify research trends on Self-Regulated Learning from 2020 to 2024 and to determine how the topic relates to academic performance and student engagement.

**Method:** the study uses data from the Scopus database. The keywords self, regulated, learning, achievement, and student produce 226 documents for the years 2020-2024. The analysis uses the VOSviewer application through a co-occurrence approach with a minimum threshold of four keyword occurrences. The process produces 86 relevant keywords after the removal of irrelevant terms, such as human and medical student.

**Results:** the analysis shows limited research that directly links Self-Regulated Learning with academic performance and student engagement. Cluster 5 contains less-developed themes, such as achievement goals, learning strategies, metacognition, and motivation. The visual analysis shows a research peak in 2021 and 2022, followed by a decline in 2023 and 2024.

**Conclusion:** Self-Regulated Learning research continues to grow, yet its link with key outcome variables remains limited. Future studies need stronger attention to metacognition, motivation, achievement goals, and learning strategies to improve educational practices and student outcomes.

**Keywords:** Self-Regulated Learning; Learning; Students; Achievement.

#### RESUMEN

**Introducción:** el aprendizaje autorregulado es un proceso fundamental que permite a los estudiantes planificar, supervisar y evaluar sus propias actividades de aprendizaje. Este proceso tiene una gran influencia en el rendimiento académico y la implicación de los estudiantes. Aunque muchos estudios tratan el aprendizaje autorregulado, una revisión de las publicaciones de Scopus muestra que las investigaciones que examinan su conexión directa con el rendimiento académico y la implicación siguen siendo limitadas. Esta situación reduce la oportunidad de crear estrategias de aprendizaje que favorezcan unos resultados académicos más sólidos.

**Objetivo:** el objetivo de este estudio es identificar las tendencias de investigación sobre el aprendizaje autorregulado entre 2020 y 2024 y determinar cómo se relaciona este tema con el rendimiento académico y

la implicación de los estudiantes.

**Método:** el estudio utiliza datos de la base de datos Scopus. Las palabras clave «auto», «regulado», «aprendizaje», «rendimiento» y «estudiante» producen 226 documentos para los años 2020-2024. El análisis utiliza la aplicación VOSviewer mediante un enfoque de coocurrencia con un umbral mínimo de cuatro apariciones de palabras clave. El proceso produce 86 palabras clave relevantes tras la eliminación de términos irrelevantes, como «estudiante de medicina» y «estudiante de ciencias humanas».

**Resultados:** el análisis muestra que hay pocas investigaciones que relacionen directamente el aprendizaje autorregulado con el rendimiento académico y la participación de los estudiantes. El grupo 5 contiene temas menos desarrollados, como los objetivos de rendimiento, las estrategias de aprendizaje, la metacognición y la motivación. El análisis visual muestra un pico de investigación en 2021 y 2022, seguido de un descenso en 2023 y 2024.

**Conclusión:** la investigación sobre el aprendizaje autorregulado sigue creciendo, pero su relación con las variables clave de los resultados sigue siendo limitada. Los estudios futuros deben prestar más atención a la metacognición, la motivación, los objetivos de rendimiento y las estrategias de aprendizaje para mejorar las prácticas educativas y los resultados de los estudiantes.

**Palabras clave:** Aprendizaje Autorregulado; Aprendizaje; Estudiantes; Rendimiento.

## INTRODUCTION

Effective learning management supports the achievement of learning objectives,<sup>(1)</sup> and learning becomes more meaningful when students actively plan, organize, and evaluate their own learning processes.<sup>(2)</sup> This idea is central to the concept of Self-Regulated Learning (SRL), a multidimensional construct encompassing cognitive, metacognitive, motivational, behavioral, and emotional processes that enable students to direct their learning autonomously.<sup>(3,4)</sup> SRL has consistently been regarded as a key determinant of academic achievement and student engagement two essential indicators of educational success in contemporary learning environments.<sup>(5)</sup>

Historically, the study of SRL has evolved alongside the development of educational psychology. Early research emphasized metacognitive monitoring and strategy use, while subsequent studies expanded the construct to include motivation, emotion, and behavioral regulation, reflecting the increasing complexity of modern, learner-centered classrooms.<sup>(6,7)</sup> As a result, SRL is now positioned as a foundational competence that underpins lifelong learning and academic resilience across educational levels.

Despite the theoretical and practical significance of SRL, an examination of the Scopus database reveals substantial gaps in empirical research. Much of the existing literature focuses on online learning contexts, the role of motivation, or isolated learning strategies.<sup>(6)</sup> Studies that directly investigate the impact of SRL on academic achievement—particularly within primary and secondary education where self-regulation skills are still developing—remain limited. This lack of comprehensive evidence restricts the ability of educators to design interventions that strengthen academic outcomes supported by SRL.

A similar gap exists in studies examining the relationship between SRL and student engagement. Engagement encompasses emotional, behavioral, and cognitive components that capture students' involvement in learning.<sup>(8)</sup> Although conceptually SRL is expected to enhance engagement, empirical investigations are fragmented, often addressing only one dimension of engagement without considering its broader implications for active learning. This limits the understanding of how SRL functions as a holistic mechanism for improving students' participation and persistence.

While SRL is seen as one of the factors that can improve student engagement, the literature in Scopus shows that research in this area tends to be fragmented, with many studies only focusing on one aspect of engagement without looking at its impact comprehensively.

This is evidenced by the interlinking research findings. These research findings<sup>(9,10,11)</sup> indicate that currently research on SRL that relates to learner competence is very lacking, even though learner competence in the realm of learning currently needs to be improved. Of course, this is a problem that must be solved, by presenting a variety of studies on SRL that are linked to learner competence.<sup>(12)</sup>

Based on what has been said, it can be said that the gaps in this research have significant implications.<sup>(13)</sup> When teachers and students do not understand what the relationship of SRL is in the context of learning which of course will affect student competence, student achievement, therefore this research is very important to do. Research that underscores especially in exploring the direct relationship of SRL with academic achievement and student engagement is very important to be presented. Some relevant studies that relate to the topic are<sup>(12,14,15,16,17,18)</sup>. These studies have contributed to providing references in the form of a review of SFL analysis so that it is said to be relevant to the research. Matters related to SRL will be processed and become the basis for reviewing research data. Overall, it can be seen that by utilizing broader data and methodologies, such as those available in Scopus, future research can provide richer and more relevant insights to improve the quality of education at various

levels.<sup>(19)</sup> SRL will be the thing that can improve students' competence and achievement through learning.

Several studies further indicate that research linking SRL with broader learner competencies is still scarce,<sup>(9,10,11)</sup> despite the growing emphasis on competence-based education. Other works that explore SRL in relation to learning outcomes,<sup>(12,14,15,16,17,18)</sup> provide useful insights but remain insufficient to establish a comprehensive and integrated understanding due to the wide scope of the field. Given the extensive nature of Scopus as a global research database, relying on a small number of prior studies does not provide adequate justification unless their methodological rigor and scope are explicitly demonstrated.

These gaps collectively underscore the need for a systematic analysis of SRL research trends. Without a clear mapping of how SRL relates to academic achievement and student engagement, the design of effective learning strategies may remain misaligned with students' developmental needs. Broad-scale databases such as Scopus offer the opportunity to review patterns, identify thematic clusters, and highlight areas requiring further investigation.<sup>(19)</sup>

Therefore, this study is justified by the absence of integrated research examining the relationship between SRL, academic achievement, and student engagement. The general objective of this study is to analyze Scopus-indexed research on Self-Regulated Learning published from 2020 to 2024 to identify research trends, thematic orientations, and gaps that require deeper exploration.

## METHOD

### Type of study

This research is a bibliometric, observational, and descriptive study. The design aims to map and analyse publication patterns, thematic clusters, and keyword co-occurrence in the literature related to self-regulated learning and its links to academic achievement and student engagement. As an observational study using secondary bibliographic data, no primary data collection from human participants was performed.

### Universe and sample

All documents indexed in the Scopus database that match the defined search terms and were published in the period 2020-2024. The final dataset comprises 226 documents retrieved from Scopus for the period 2020-2024 using the specified search strategy.

### Variables

The study uses bibliometric indicators as variables, including:

- a. Bibliographic metadata (title, authors, affiliation, year, document type)
- b. Keyword occurrences (author keywords and index keywords)
- c. Citation counts and average citations per document (where relevant)
- d. Network measures derived from co-occurrence analysis (clusters, links, node strength)

These variables support the identification of thematic clusters, temporal trends, and underexplored topics.

### Data collection and processing

#### Search strategy and data extraction

Publications were located in the Scopus database using the keywords *self, regulated, learning, achievement, and student* for documents published between 2020 and 2024. The search retrieved 226 documents; metadata and RIS files were exported from Scopus for analysis.

#### Data cleaning

Exported metadata were checked for duplicates and incomplete records. Keyword cleaning involved removal of irrelevant or out-of-scope terms to refine the thematic focus; removed terms included: *human, medical student, adult, medical education, controlled study, procedures, major clinical study, young adult, undergraduate medical education, medical school, curriculum, achievement emotions, emotions, systematic review*.

#### Data analysis

Cleaned metadata were imported into VOSviewer for co-occurrence analysis of keywords. Analysis settings: co-occurrence (unit of analysis: keywords), minimum threshold = 4 occurrences, which produced 86 retained keywords. VOSviewer's clustering algorithm (VOS clustering) was used to detect thematic clusters. Visualizations generated included network visualization, overlay visualization (temporal trends), and density visualization to identify dominant and underdeveloped topics. All parameter choices and keyword removals are documented to ensure reproducibility.

#### Ethical standards

This study used publicly available bibliographic records and did not involve human subjects or identifiable

personal data. The work follows ethical norms for secondary data analysis and proper attribution of sources. Any limitations of the data source (Scopus coverage, language and regional biases) are acknowledged.

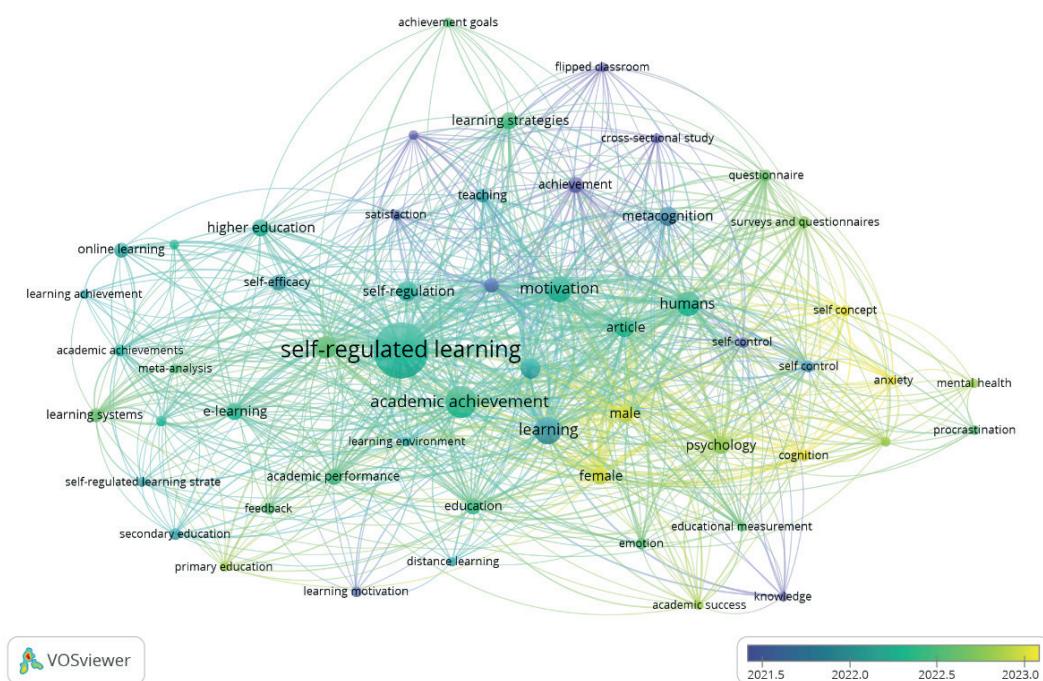
### Limitations (brief)

Relying solely on Scopus may exclude relevant works indexed elsewhere and may introduce language or regional biases. Bibliometric methods show patterns and associations but do not establish causality between constructs.

## DISCUSSION

The findings of this study reveal a fragmented research landscape in which Self-Regulated Learning is frequently discussed, yet its direct relationship with academic performance and student engagement remains insufficiently explored. Although SRL is recognized as an essential skill that influences how students plan, monitor, and evaluate their learning, the bibliometric patterns indicate that empirical investigations connecting SRL with key educational outcomes are still limited. This situation highlights the need to reassess how SRL has been positioned within recent research and to identify which thematic areas require deeper theoretical and methodological attention. By examining these research patterns, a clearer understanding emerges regarding how the field has developed and where substantial gaps persist.

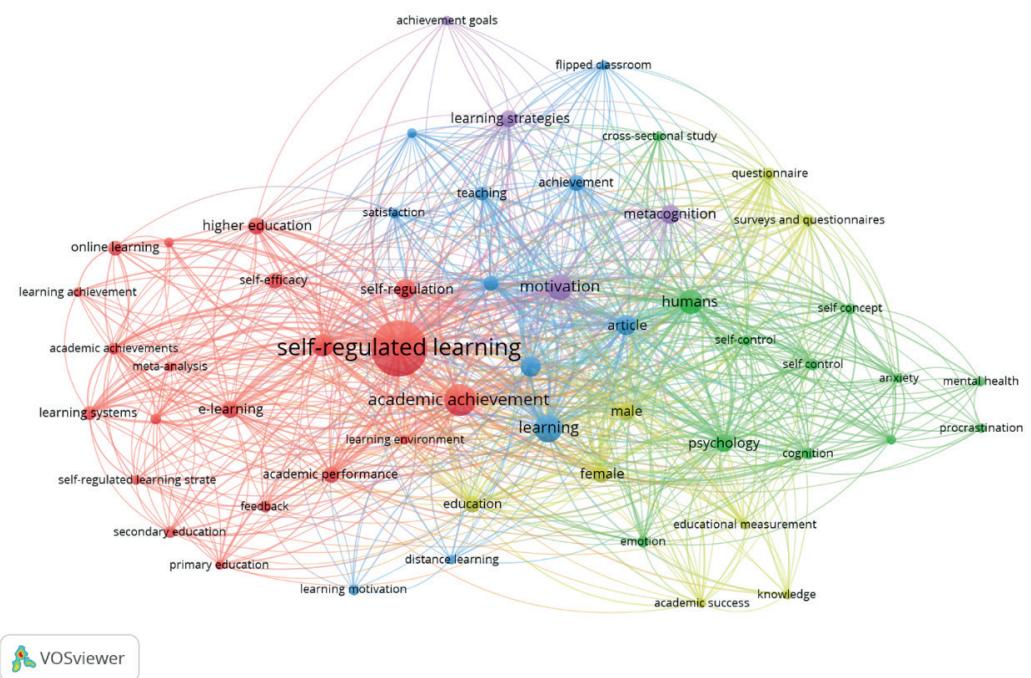
Based figure 1. The overlay visualization illustrates the temporal distribution of research themes related to Self-Regulated Learning. The color gradient indicates the average publication year associated with each keyword, allowing the identification of emerging and declining topics. In 2021, research clusters were dominated by themes such as learning motivation, self-control, satisfaction, achievement, and problem-based learning. By 2022, studies increasingly focused on achievement goals, learning strategies, self-regulation, metacognition, e-learning, online learning, and higher education, reflecting a shift toward more complex and technology-enhanced learning environments. In the mid-2022 period, the keywords expanded further to include questionnaire-based studies, meta-analysis, psychological factors such as mental health and procrastination, and performance-related indicators including academic achievement and educational measurement. By 2023, additional concepts such as self-concept, anxiety, cognition, and gender differences emerged. This progression shows that research directly analyzing the impact of Self-Regulated Learning on academic achievement and student engagement is relatively recent, as indicated by the darker color tones representing newer topics.



Source: VOSviewer  
**Figure 1.** Results of visualization overlay analysis

The results of the network visualization analysis in figure 2 show that based on keywords (co-words), the Analysis of the Impact of self-regulated learning on academic achievement and student involvement in 2020-2024 forms into 55 items (5 clusters). Cluster 1 (20 items) in red, consists of topics; academic achievement, academic achievements, academic performance, blended learning, computer aided instruction, e-learning, feedback, higher education, learning achievement, learning environmentlearning systems, meta-analysis,

online learning, primary education, secondary education, self-efficacy, self-regulated learning, self-regulated learning, self-regulation, students. Then in Cluster 2 (12 items) colored green, discussing; Anxiety, cognition, cross-sectional study, emotion, humans, mental health, procrastination, psychology self concept, self control, time management. In cluster 3 (11 items) marked in blue, it discusses; Achievement, article, distance learning, flipped classroom, human experiment, learning, learning motivation, problem-based learning, student satisfaction, teaching. And in cluster 4 (8 items) in yellow, consisting of topics; Academic success, education, self-regulated learning strategy, educational measurement, female, knowledge, male, secondary education, primary education, questionnaire, surveys and questionnai. And finally in cluster 5 (4 items) in purple there are topics; achievement goals learning strategies, metacognition, motivation.



**Source:** VOSviewer  
**Figure 2.** Network visualization analysis results



Source: VOSviewer

Based on figure 3, studies that analyze the impact of self-regulated learning (SRL) on both academic achievement and student engagement are still limited.<sup>(3)</sup> Existing findings show that SRL generally improves academic performance. A meta-analysis reported a positive relationship between SRL strategies and achievement,<sup>(20)</sup> and an experimental study found that students taught SRL performed better academically.<sup>(21)</sup> However, other findings show that SRL does not always have a direct effect, as self-efficacy can play a stronger role.<sup>(22)</sup> These results are consistent with experts such as Zimmerman (2000), who explains that SRL increases metacognition, motivation, and learning behavior, which then support achievement. Also states that SRL often acts as a mediator between learning environments and student outcomes.<sup>(23,24,25)</sup> Although previous studies support the importance of SRL, research that examines its combined effect on academic achievement and student engagement is still scarce, showing that this topic remains relatively new.

## CONCLUSIONS

This study aimed to identify research trends on the impact of self-regulated learning (SRL) on academic achievement and student engagement. Overall, the findings indicate that although SRL is widely explored in educational research, studies that specifically connect SRL with both academic performance and student engagement remain limited. The thematic patterns also show uneven attention across SRL-related concepts, suggesting gaps in theoretical development and empirical focus. Given these conditions, the analysis highlights the need for broader and more integrated research that examines how SRL operates simultaneously across cognitive, motivational, and behavioral dimensions to influence learning outcomes. Future studies should expand methodological approaches and deepen conceptual linkages so that the role of SRL in supporting academic success and engagement can be understood more comprehensively.

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## CONFLICT OF INTEREST

None.

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