

# Monitoring and Academic Accompaniment of University Students Using Emerging Technologies

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## Abstract

*In the current context, where academic competitiveness is high, it is essential to provide academic support to improve the experience and achievements of students before they opt to drop out due to economic, social, and institutional factors. The main objective of the research is to understand how academic support and monitoring programs are implemented, identify different support styles, and the factors influencing their effectiveness. The methodology used was a systematic review of indexed articles in databases such as Scopus, DOAJ, Scielo, Semantic Scholar, and ProQuest, following PRISMA guidelines. The most important results highlight that the implementation of technologies such as artificial intelligence, smart monitors, and machine learning algorithms in academic monitoring programs improves student retention and success. However, challenges are identified, such as the adaptation of students and teachers to new technologies and the need for quality design and implementation to ensure the effectiveness of support. Additionally, the importance of predictive factors such as initial academic performance and motivation is emphasized to identify at-risk students and provide effective interventions.*

**Keywords:** Support; Monitoring; Emerging Technologies; Students and University.

## INTRODUCTION

Students are the main protagonists of educational institutions, where these institutions strive to maintain their quality and prestige in the educational community through the support and monitoring of students' learning. This approach allows for timely identification of those who require additional support, thereby ensuring a high level of education that contributes to the comprehensive development of graduates.

Most higher education students require some academic assistance throughout their learning experiences. As the academic landscape becomes more competitive, the importance of students seeking and utilizing academic support to improve their learning experience and achievements is widely recognized (Li et al., 2023). The benefits of the monitoring and support process through tutoring for students are well established and have demonstrated effectiveness. However, there are strong factors influencing student dropout that affect economic, social, institutional, and personal levels concerning public investment, impacting productivity and societal development (Schmidt et al., 2023).

To achieve the success of academic monitoring and support programs for students in their professional training journey, multiple variables determine success or failure. As Bornschlegl mentions, during the design of support services, variables such as gender, age, cultural background, and personality must be considered (Bornschlegl, 2022). Studies by Gonzalez-Nucamendi et al. (2023) show that the main variables associated with student success were academic performance during the first weeks of the first semester, average grades in previous academic levels, previous math scores, and entrance exam scores. Other important variables included the number of class hours taken, the student's age, the status of scholarship funding, the level of English proficiency, and the number of subjects dropped in the first weeks. However, Fonseca-Grandón et al. (2022) went further by characterizing students who stay and those who leave the educational institution throughout the academic trajectory, categorizing them into groups. Sheldon et al. (2021) also managed to distinguish students according to typologies, such as those who adapted to the context, adapted to performance, retained, and dropouts.

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After the digital transformation event in the academic field between 2020 and 2021, educational institutions saw the need to separate some academic support services for students intending to improve educational quality. However, before 2020, there was strong pressure regarding the use of technology in support of education (Morris et al., 2020). In response to this pressure, companies providing educational services emerged, offering services to improve educational quality integrated with learning management modules, libraries, academic support, and more to enhance student retention and success (Swinnerton et al., 2018). In this situation, the role of monitoring, academic support, and student development services is now taken for granted as part of effective student support.

The literature review on the role of academic support primarily focuses on its ability to enhance retention and the persistence of students affiliated with professional training institutions through the use of emerging technologies (Broadbent & Lodge, 2021). Many studies emphasize increased academic support for undergraduate students, often targeting first-year students under the assumption that they are underprepared for university and may enter the institution with limited academic capital, to the extent that they might have little specific knowledge about how "university works" (Bornschlegl & Caltabiano, 2022). Therefore, the role in this process is to level the playing field to address structural inequalities and support successful completion.

Academic support can be formal, accessed within or through the institution, or informal, accessed outside the institution through social contacts. The effectiveness of support is variably related to its responsiveness (Walsh et al., 2020), timeliness (Dollinger et al., 2020), flexibility (Kelly et al., 2020), quality (Fong et al., 2023), and perhaps most importantly, acceptance (Marineo & Shi, 2018).

Within the institution, academic support is typically offered on campus and in person. The advantages of this Socratic style (face-to-face) are documented by Leenknecht, where students develop transferable skills such as problem posing, problem-solving, and critical thinking (Leenknecht et al., 2019). However, there are issues with this type of support; it is often restricted to office hours and therefore does not meet the needs of many students (Wilson et al., 2020). Although it can be presented more formally, as students schedule appointments and wait to be attended to, it can be discouraging for many interested parties. Due to this issue, novice students are more likely to seek help from their peers rather than from professors (Payne et al., 2023) on topics related to academic learning and understanding course content (Martín-Arbós et al., 2021). While peer support is considered valuable, there are inherent dangers; peer support can be inaccurate or incorrect (Payne et al., 2023). Therefore, it may be better not to rely on peers for concrete information.

In the face of the challenge students encounter in finding timely academic support, other variables influence student retention in institutions. If not detected in time, these can lead to dropout. These variables include career choice, institutional processes, demographic background, health issues, teacher opinions, student behavior, financial problems, teacher pacing, time management and social factors (Hegde & Prageeth, 2018; Govender, 2020).

Considering the mentioned variables, technology plays a crucial role in providing monitoring and academic support to higher education students (Rotar, 2022). Online support can be provided by institutional staff or implemented using emerging technologies such as chatbots, augmented reality, virtual reality, and artificial intelligence (Haron et al., 2025; Khan et al., 2021; Balderas et al., 2023).

For this reason, the work of Contreras et al. (2020) helps predict academic performance as one of the key indicators of student success or failure by using machine learning algorithms. Similarly, Shields (2023) and Ho & Nguyen (2021) evaluated variables such as pre-university academic motivation, self-efficacy for learning, student autonomy, and social support as factors to identify students at academic risk, concluding that these variables can be used to predict student performance, with social support being the most significant variable. Additionally, Ariningpraja & Wisnasari (2023) and Fong et al. (2023) also correlated variables of seeking academic help with performance (grade point averages, grades, exam scores) among students, highlighting small but significant associations.

In this context, it is essential to address the following questions: How are academic support and monitoring programs implemented for university students? What are the styles of academic support for university

students? What factors influence the initiation of academic support for university students? Consequently, the research aims to understand how academic support programs for university students are implemented, identify the different styles of support, and the factors that influence their effectiveness. The goal is to improve the design of academic support programs, make curricula more flexible, reduce dropout rates, and increase opportunities for higher education students. The results can influence institutional culture and policies to support at-risk students and ensure that institutions fulfill their ethical obligations to help students develop the necessary skills for success both in and out of the classroom.

**METHODOLOGY**

This study analyzes a subset of articles indexed in various databases systematically following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Page et al., 2021). In this way, the evidence search was conducted carefully, focused on the study's purpose, and avoiding unnecessary explorations. The following describes the steps taken.

**Search Phase**

The search strategies were carried out by breaking down the study topic across four databases: Scopus, DOAJ, Scielo, Semantic Scholar, and ProQuest. Descriptors related to the study were used for the search, with "academic support," "student monitoring," and "university students" being the central themes. Additional descriptors such as "university education," "academic support styles," and "academic support and monitoring" were then added. Specifically for the search in Scopus, the main algorithm was TITLE-ABS-KEY("acompañamiento académico") AND (LIMIT TO (OA, "all")) AND (LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2024) OR LIMIT-TO (PUBYEAR, 2019)), using the boolean operators AND and OR to include the search criteria.

**Selection Phase of the Research**

The selection of research in the chosen databases was based on inclusion and exclusion criteria. The following criteria were applied according to Table 1: Once filtered with the mentioned criteria, the records were examined based on the title and abstract. Finally, studies unrelated to the research questions and objectives, less relevant research, and those out of context were excluded.

**Table 1: criteria for inclusion and exclusion**

Criteria	Inclusion	Exclusion
Year of publication	2020-2024	Prior to 2020
Language	In English, Spanish and Portuguese.	Other languages
Context	Pandemic and post-pandemic stage	Studies conducted before 2020
Access	Open source	Opposed to the criteria
Level of education	Higher education	Other educational levels (basic education, postgraduate)
Methodology	Original review and research papers	Opposed to the criteria
types of publication	Scopus, Scielo, DOAJ, Semantic Scholar and ProQuest	Theses, books and conferences

**Information Extraction Phase**

After completing the selection process, the reading of each study began in order to determine the categories related to the research topic. Therefore, the procedures performed have been documented and the chart has been created according to the PRISMA statement, as shown in Figure 1.

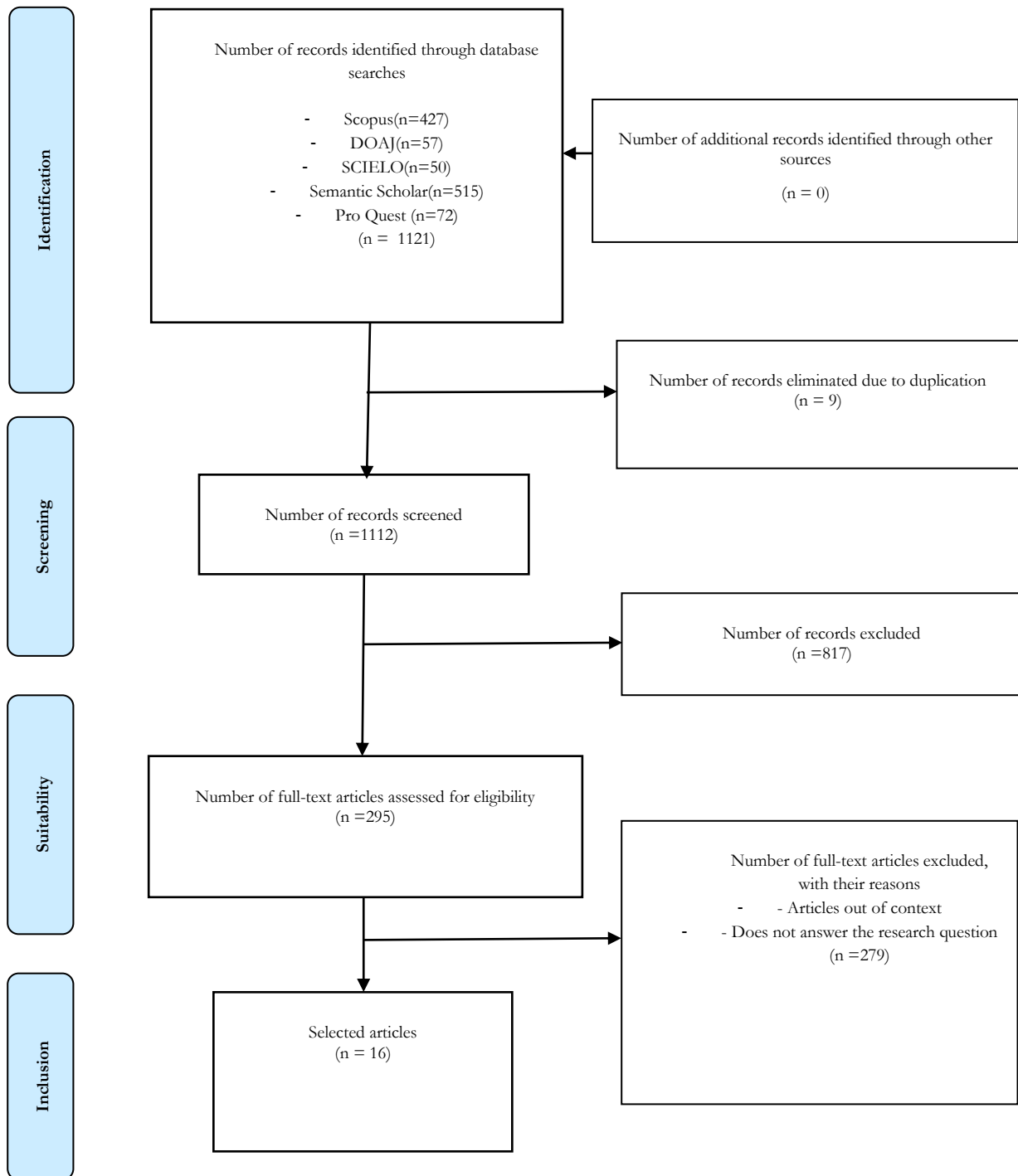


Figure 1: PRISMA flowchart: Systematic search

## RESULTS AND DISCUSSION

Based on the explored research, the topic in question was first categorized, followed by the analysis of results for an in-depth discussion. Each of these responds to the research question.

The categorization process was conducted based on a literature review and document analysis.

**Table 2: Category of Teacher Identity**

Category	Description
Category 1: Implementation of Technologies in Monitoring and Mentoring Programs	This category focuses on how educational institutions use emerging technologies such as augmented reality, virtual reality, artificial intelligence, and online learning platforms to provide and monitor academic mentoring. This category will explore implementation methods, the technological tools employed, and innovative approaches for integrating these resources into academic mentoring. Keywords: Program design, integration of emerging technologies (e.g., machine learning algorithms, artificial intelligence), role of tutors and support staff, and strategies for student retention and success.
Category 2: Styles of Academic Mentoring	This category addresses the different approaches and methodologies of mentoring used in universities. This includes formal and informal mentoring, on-campus and online support, and strategies such as individual tutoring, group advising, and the use of academic and peer mentors. It also considers how these styles are adapted to meet the individual needs of students through emerging technologies. Keywords: In-person vs. online mentoring, use of technologies such as augmented and virtual reality, peer interaction, formal and informal tutoring, and the impact of these styles on academic performance.
Category 3: Predictive Factors of Academic Success and Dropout	This category refers to the study and analysis of various variables that can significantly influence student performance in the university environment and their decision to continue or abandon their studies. Keywords: Initial academic performance, demographic characteristics, motivation and self-efficacy, student autonomy, social support, and institutional and career factors.
Category 4: Effectiveness and Response to Technological Mentoring	Evaluation of the effectiveness of technology-mediated academic mentoring in improving student retention and performance. The acceptance of these technologies among students and educators, as well as their impact on the educational experience and academic outcomes, will be analyzed. Keywords: Tools and platforms

Based on the criteria established, the following table shows the selection of research for analysis. As shown in Table 3, studies from various countries and databases in the last two years have been selected. This table illustrates the categories and determining factors influencing the learning outcomes of the students considered in these studies conducted by researcher.

**Table 3: Main Research Selected Based on Inclusion and Exclusion Criteria**

N°	Author	Title research	Year	Source	Database	Categories	Findings
1	(Akyuz, 2020)	Effects of Intelligent Tutoring Systems (ITS) on Personalized Learning (PL)	2020	Creative Education	SCOPUS	<ul style="list-style-type: none"> <li>Implementation of Technologies in Monitoring and Mentoring Programs</li> <li>Effectiveness and Response to Technological Mentoring</li> </ul>	The research reveals that Intelligent Tutoring Systems (ITS) have been effective in facilitating personalized learning, significantly improving student engagement and performance. It was found that 90% of students and tutors prefer personalized learning assisted by ITS, and 27% of students showed notable improvements. Despite its advantages, there are disadvantages such as communication difficulties due to the lack of interaction.
2	(Chrysafiadi et al., 2023)	Evaluating the user's experience, adaptivity and learning outcomes of a fuzzy-based intelligent tutoring system for computer programming for academic students in Greece	2023	Education and Information Technologies	SCOPUS	<ul style="list-style-type: none"> <li>Implementation of technologies in monitoring and support programs.</li> <li>Effectiveness and response of technological support</li> </ul>	The research evaluated a fuzzy logic-based intelligent tutoring system for teaching programming, highlighting its effectiveness in improving student performance through personalized adaptations to learning needs. The results showed that the system significantly enhances knowledge acquisition and user satisfaction, while also reducing the time and interactions needed for learning.

3	(Khan et al., 2021)	An artificial intelligence approach to monitor student performance and devise preventive measures	2021	Smart Learning Environments	SCOPUS	Implementation of technologies in monitoring and support programs. Effectiveness and response of technological support	The research demonstrated that decision tree models are effective in predicting student performance, achieving an accuracy of over 86%. The implementation of these technologies allowed for the timely identification of at-risk students, facilitating early interventions and preventive measures that ultimately improved the academic outcomes of the involved students.
4	(Van, 2023)	Teachers' experiences of monitoring their students in online higher education: recommendations for course design and opportunities for learning analytics	2023	Technology, Pedagogy and Education	SCOPUS	Implementation of technologies in monitoring and accompaniment programs. Styles of academic accompaniment	The research reveals that although teachers adapted their monitoring strategies to online education during the pandemic, they faced difficulties due to the lack of non-verbal cues and direct interaction, which affected the personalization of academic support. The findings suggest that effective course design and the use of technology are essential for improving student monitoring and support.
5	(Díaz, 2024)	Tutorías universitarias en períodos de interrupción académica: Un relato desde la experiencia	2024	Psicología Escolar e Educativa	DOAJ	Styles of academic support. Effectiveness and responsiveness of technological support	The research reports on the strategy undertaken during the academic disruption of university students through academic and psychoeducational mentoring programs, which were structured in several phases such as initiation, diagnosis, planning, implementation, evaluation, and closure, constituting a style of mentoring. These phases were supported by virtual platforms, making technology a key factor in the effectiveness of educational support.
6	(Delaney et al., 2023)	Between the Lines: An exploration of online academic help-seeking and outsourced support in higher education: Who seeks help and why? Predictive analytics study to determine undergraduate students at risk of dropout	2023	Education Sciences	DOAJ	Implementation of technologies in monitoring and support programs. Effectiveness and response of technological support	The research demonstrates that the online academic support platform Studiosity is highly valued by undergraduate and postgraduate students at Dublin City University, noted for its accessibility and effectiveness in improving academic performance and student retention.
7	(Gonzalez-Nucamendi et al., 2023)		2023	Frontiers in Education	DOAJ	Implementation of technologies in monitoring and accompaniment programs. Factors predictive of academic success and dropout. Effectiveness and response of technological support	The research demonstrates that the use of machine learning tools to identify students at risk of dropping out is highly effective, highlighting initial academic performance and exam scores as key factors. The technological implementation significantly improves prediction accuracy, facilitating early and effective interventions to increase student retention..
8	(Santana & Barrera, 2021)	Plataforma Asistida por Computadora como alternativa para hacer frente a los retos de la tutoría académica	2021	Programación Matemática y Software	DOAJ	Implementation of technologies in monitoring and support programs. Effectiveness and response of technological support	The research shows that the implementation of a Computer-Assisted Platform significantly improves the administration of academic tutoring. Teachers positively accept this technology, which facilitates the reduction of dropout rates and enhances terminal efficiency, contributing to the personal and academic development of students.
9	(Valenzuela et al., 2021)	Academic support required by university students: evidence for higher education academic support policies	2021	Formacion Universitaria	SCIELO	Styles of academic accompaniment. Factors predictive of academic success and dropout.	The research identifies a high demand for strategic, disciplinary, and socio-emotional academic supports among Chilean university students, emphasizing time management and stress management as the most necessary. These supports are essential for addressing academic demands and improving student success and retention.

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10	(Gazca et al., 2023)	Estudio de la tutoría académica de un posgrado consolidado y su impacto en la trayectoria y egreso	2023	RIDE Revista Iberoamericana para la Investigación y el Desarrollo Educativo	SCIELO	Styles of academic accompaniment Factors predictive of academic success and dropout.	The research highlights that the academic tutoring system is crucial for monitoring and ensuring student success, although it requires improvements in personalization and responsiveness to individual needs. It concludes that a well-structured academic support system, coupled with effective use of monitoring technologies, can reduce dropout rates and enhance students' academic outcomes.
11	(Sunza-Chan & Sansores-Sabido, 2023)	Tutoría de acompañamiento académico desde la virtualidad en tiempos de COVID-19: experiencias de transformación en el nivel superior	2023	Revista de Estudios y Experiencias en Educación	SCIELO	Implementation of technologies in monitoring and support programs Effectiveness and response of technological support	The research highlights the implementation of technologies in virtual academic tutoring and their effectiveness in providing continuous support during the pandemic, overcoming challenges such as connectivity and time management.
12	(Malik, 2023)	Impact assessment of academic support provided by tertiary learning advisors	2023	Journal of Learning Development in Higher Education	SEMANTIC SCHOLAR	Implementation of monitoring and accompaniment programs. Factors predictive of academic success and dropout Effectiveness and response of technological support	The study demonstrates that discipline-specific academic support enhances students' academic literacy, although the extent of improvement is modest. The results underscore the importance of mixed methodologies for effectively assessing the impact of educational counseling on student retention and academic success.
13	(Bornschlegl & Caltabiano, 2022)	Increasing accessibility to academic support in higher education for diverse student cohorts	2022	Teaching and Learning Inquiry	SEMANTIC SCHOLAR	Styles of academic accompaniment Factors predictive of academic success and dropout.	Academic mentoring styles and predictive factors of success and dropout are important in students' perceptions of academic support services, highlighting the effectiveness of programs such as PASS (Peer Assisted Study Sessions) and personalized mentoring in improving student organization and confidence.
14	(Núñez, 2021)	Tutoría académica en la educación superior: el rol del autor académico, tutor pedagógico y del estudiante en la modalidad a distancia	2021	Revista Científica Retos de la Ciencia	SEMANTIC SCHOLAR	Styles of academic accompaniment Factors predictive of academic success and dropout.	Academic tutoring in distance higher education requires reflection on the roles of the pedagogical tutor and the academic author, emphasizing the importance of self-directed learning and technological interaction to ensure student success and retention.
15	(Ariningpraja & Wisnasari, 2023)	Nursing students' learning support, outcome, and satisfaction towards online learning	2023	Journal of Nursing Science Update (JNSU)	SEMANTIC SCHOLAR	Implementation of technologies in monitoring and accompaniment programs. Styles of academic accompaniment Effectiveness and response of technological support	The study reveals that instructional and peer support are positively correlated with student satisfaction in online learning. However, there is no significant correlation with academic outcomes measured by grade point average. The implementation of technologies and effective support are key factors for student satisfaction.
16	(Haron et al., 2025)	An artificial intelligence approach to monitor and predict student academic performance	2025	Journal of Advanced Research in Applied Sciences and Engineering Technology	ProQUEST	Implementation of technologies in monitoring and accompaniment programs. Factors predictive of academic success and dropout Effectiveness and response of technological support	The study developed a prediction model based on AI using RepTree, k-NN, and Naïve Bayes algorithms, identifying RepTree as the most accurate algorithm for monitoring and predicting academic performance. It highlighted cumulative GPA and semester GPA as key factors, thereby improving the institution's ability to implement preventive interventions effectively.

Recent studies on academic monitoring and support for university students address various strategies and effects. Insook et al. (2023) focus on an integrated support system to prevent academic probation, highlighting the need for ongoing management and support for students facing academic challenges. On the

other hand, Trajano et al. (2023) discuss the importance of academic monitoring programs in the comprehensive development of mentors, emphasizing the personal and social development of mentors as a key component. Meanwhile, Voisin et al. (2023) investigated how academic support environments affect students' emotional state, finding significant reductions in anxiety and increased confidence, which positively impact academic performance and retention.

The analysis of academic support in educational institutions reveals a series of arguments and outcomes that enhance understanding of the effectiveness of these programs. In the introduction, authors emphasize the importance of monitoring and support to maintain educational quality and assist students, particularly those needing additional help to ensure academic success and holistic development (Li et al., 2023; Schmidt et al., 2023). In this regard, arguments in favor and against will be evaluated based on the proposed categories and contrasted with research findings.

### **Category 1: Implementation of Technologies in Monitoring and Support Programs**

The implementation of technologies in student monitoring and support has proven to be an effective strategy for personalizing learning and improving academic outcomes. Intelligent Tutoring Systems (ITS) are cited as advanced tools that tailor learning to individual student needs, providing personalized support that can enhance retention and academic success (Haron et al., 2025; Contreras et al., 2020). This category is central to research findings and highlights the use of machine learning algorithms and emerging technological platforms to identify and support at-risk students.

However, challenges are associated with the implementation of these technologies. The adaptation of students and educators to new technological tools may be slow, and the effectiveness of technological support can vary depending on the quality of implementation and user acceptance (Marineo & Shi, 2018; Kelly et al., 2020). Additionally, excessive reliance on technology can lead to the dehumanization of the educational process, where personal contact and emotional support may be inadequate.

### **Category 2: Styles of Academic Mentoring**

Different styles of mentoring, such as individual mentoring and peer support, have proven effective in enhancing students' understanding and academic performance. Face-to-face tutoring sessions allow for the development of critical skills and the resolution of specific problems, while peer support can be more accessible and less intimidating for students (Leenknecht et al., 2019; Payne et al., 2023). These approaches can personalize learning and provide a supportive environment that fosters academic success.

However, academic mentoring styles have their limitations. Peer support, while valuable, can sometimes be inaccurate or incorrect, which may hinder rather than help the student (Payne et al., 2023). Additionally, formal tutoring sessions are often restricted to specific schedules, which may not always accommodate the needs of all students, especially those with conflicting schedules or additional responsibilities (Wilson et al., 2020).

### **Category 3: Predictive Factors of Academic Success and Dropout**

Early identification of predictive factors of academic success and dropout, such as early semester performance, entrance exam scores, and academic motivation, can help institutions implement effective interventions to support at-risk students (Gonzalez-Nucamendi et al., 2023; Shields, 2023). These factors allow for personalized support and directing resources where they are most needed.

However, identifying these factors does not always guarantee student retention. Interventions may be ineffective if underlying causes of poor performance, such as financial, health, or personal issues, are not addressed (Hegde & Prageeth, 2018; Govender, 2020). Additionally, pressure on students to meet certain metrics can increase stress and anxiety, counteracting the potential benefits of academic support.

### **Category 4: Effectiveness and Response of Technological Support**

The effectiveness of technological support has been demonstrated in multiple reviewed studies. Intelligent tutoring systems based on intelligent computational algorithms and other technological tools can significantly



improve accuracy in predicting academic performance and provide consistent, accessible support (Fong et al., 2023; Ariningpraja & Wisnasari, 2023). Students generally exhibit a positive perception towards these technologies, suggesting high acceptance and effectiveness in educational support.

However, the effectiveness of these technologies largely depends on their design and implementation. Technology failures, inadequate user training, and access barriers such as internet connectivity can limit the expected benefits (Sunza-Chan & Sansores-Sabido, 2023). Additionally, the evaluation of technological effectiveness often relies on short-term measures, without considering long-term impacts on retention and academic success.

The findings from this research are summarized in Figure 1.

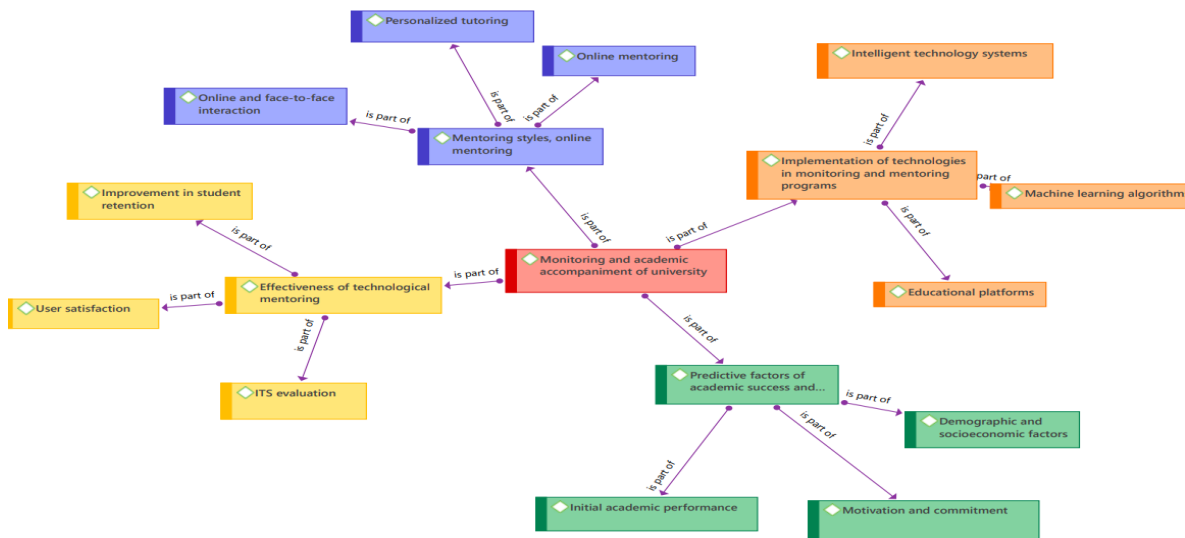


Figure 2: Summary of results according to categories

## CONCLUSIONS

The implementation of technologies in academic monitoring and support programs has proven to be an effective strategy for personalized learning and improving academic outcomes. Tools such as Intelligent Tutoring Systems and machine learning algorithms enable the identification of at-risk students and tailor support to their specific needs. However, the adoption of these technologies requires adaptation from both students and teachers, and the effectiveness of support can vary depending on the quality of implementation and user acceptance.

Different styles of academic mentoring, such as individual tutoring and peer support, have shown to be beneficial for student understanding and performance. Face-to-face tutoring facilitates the development of critical skills, while peer support can be more accessible and less intimidating. However, there are limitations, such as the potential inaccuracies of peer support and the scheduling constraints of formal tutoring sessions. These factors underscore the need for a variety of support methods to meet diverse student needs.

Identifying predictive factors of academic success and dropout, such as initial performance and motivation, allows institutions to implement effective interventions to support at-risk students. Studies have shown that variables like early semester performance and entrance exam scores are important indicators. However, identifying these factors alone does not guarantee retention, as underlying issues such as financial and health problems also need to be addressed to be truly effective.

The effectiveness of technological support has been widely supported by research, with students showing positive perceptions towards these tools. Intelligent tutoring systems and other technologies have significantly

improved accuracy in predicting academic performance and provided consistent, accessible support. However, the effectiveness of these technologies largely depends on their design, implementation, and user training levels. Additionally, access barriers such as internet connectivity can limit expected benefits, requiring ongoing attention to optimize their use.

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