

**ANALYSIS OF INFLUENTIAL FACTORS OF ACADEMIC PERFORMANCE IN
COMPUTER ENGINEERING STUDENTS AT THE ISPB
ANÁLISIS DE FACTORES INFLUYENTES DEL RENDIMIENTO ACADÉMICO EN LOS
ESTUDIANTES DE INGENIERÍA INFORMÁTICA EN EL ISPB**

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ABSTRACT

Keywords:

academic performance,
socioeconomic, family
environment, motivation, learning
styles, health and well-being.

This research aims to understand the factors that affect the academic performance of computer engineering students at ISPB. Using a mixed-methods approach that combines quantitative and qualitative techniques, key variables related to academic performance were explored. Through surveys, socioeconomic factors, family environment, motivation, learning styles, and health were identified as key elements affecting the academic performance of engineering students at ISPB. These findings highlight the importance of considering and addressing these factors to promote academic achievement among engineering students at ISPB. The results support the hypothesis by demonstrating a positive correlation between the independent variable of academic performance and the dependent variables of socioeconomic status, family environment, motivation, learning styles, health, and well-being. The study has demonstrated the relevance of considering and addressing these factors to promote optimal academic performance in students, helping them overcome barriers and maximize their academic potential. This study can serve as a basis for further research to delve deeper into the topic and make significant contributions.

RESUMEN

Palabras clave:

rendimiento académico,
socioeconómico, entorno familiar,
motivación, estilos de aprendizaje,
salud y Bienestar.

La presente investigación tiene como objetivo comprender los factores que afectan el rendimiento académico de los estudiantes de ingeniería informática en el ISPB. Mediante un enfoque mixto que combina técnicas cuantitativas y cualitativas, explorándose variables claves relacionadas con el desempeño académico. A través de las encuestas realizadas, se identificaron factores socioeconómicos, el entorno familiar, la motivación, los estilos de aprendizaje y la salud como elementos clave que afectan el rendimiento académico de los estudiantes de ingeniería en el ISPB.

Estos hallazgos resaltan la importancia de considerar y abordar estos factores para promover un rendimiento académico en los estudiantes de ingeniería en el ISPB. Los resultados respaldan la hipótesis planteada al demostrar una correlación positiva entre la variable independiente de rendimiento académico y las variables dependientes socioeconómico, entorno familiar, motivación, estilos de aprendizaje, salud y bienestar. El estudio ha demostrado la relevancia de considerar y abordar estos factores para promover un rendimiento académico óptimo en los estudiantes a superar las barreras y maximizar su rendimiento académico. A partir de este estudio, se pueden plantear diversas investigaciones adicionales para profundizar en el tema y realizar aportes significativos.

Introduction

Assessing the academic performance of college students is of vital importance to educational institutions, as it provides valuable information about the effectiveness of academic programs and the quality of instruction. Understanding the factors that influence academic performance is essential for identifying areas for improvement and designing educational strategies that promote student success.

Assessing the academic performance of college students and identifying the factors that influence it are essential for improving the quality of education (Aranda et al., 2023). By gaining a deeper understanding of these factors, educational institutions can implement more effective strategies, provide personalized support, and promote their students' academic success. Ongoing research in this field is essential to continue improving educational practices and ensure an enriching learning environment for all students (Silva Castillo, 2021).

In the academic setting, it is essential to understand the factors that influence college students' performance. Specifically, at the Benguela Higher Polytechnic Institute (ISPB) in Angola, the goal is to conduct a comprehensive analysis of the factors that affect the academic performance of engineering students. This study focuses on identifying the multidimensional factors that have a significant influence on the academic performance of college students (Segura, 2022).

Research conducted by the Department of Engineering at the Benguela Higher Polytechnic Institute (ISPB) has revealed that there are several factors contributing to the poor academic performance of engineering students. Difficulties have been identified in the understanding of fundamental concepts in mathematics, programming logic, and algorithms among computer engineering students in the Engineering Department at ISPB. In addition, teachers' approach to curriculum management, the lack of adequate teaching resources, and the lack of a systematic approach to teaching and learning also contribute to poor performance.

Students face difficulties applying these concepts to solve practical problems, which is reflected in their performance on exams and projects related to these subjects (Gutiérrez-Monsalve, et al., 2021). These difficulties have a negative impact on their overall academic performance.

In addition, it has been observed that factors such as the family's economic situation, family structure, and parents' educational level can influence the academic performance of engineering students (Rodríguez, 2021). Intrinsic or extrinsic motivation, attitudes toward learning, and perceptions of the value of education also play an important role. Similarly, preferences for visual, auditory, or kinesthetic learning styles, as well as physical and mental health and the balance between work and rest, can be determining factors in students' academic performance (Verdugo-Guamán et al., 2023).

It is essential to identify and address these specific challenges in order to improve the academic performance of engineering students at ISPB. Understanding the factors that affect student performance will enable the institution to identify areas for improvement and design more effective educational strategies. Based on this premise, the following scientific research question arises: What factors at the Benguela Higher Polytechnic Institute (ISPB) influence the academic performance of engineering students and could be related to their academic performance? To address the scientific question, this study sets the following objective: to examine and understand the factors that influence academic performance among engineering students at the ISPB. Using a multidimensional approach, the study aims to analyze key variables that may be related to academic performance.

Academic Performance

Academic performance among college students refers to students' performance and success in their academic activities, such as exams, assignments, and class participation. This performance is generally measured through grades, grade point averages, and rankings. The academic performance of college students is a multifaceted issue that encompasses various aspects (Cala and Castrillón, 2023). In addition to grades and test scores, academic performance may also include participation in extracurricular activities, conducting research projects, presenting papers at conferences, and receiving scholarships, internships, or academic awards, among other things.

In this study, academic performance is defined as students' performance and success in their academic activities, which include exams, homework, and class participation. This perspective highlights the holistic nature of academic performance, which encompasses various aspects of learning. On the other hand, when determining the study variables, academic performance is considered to be measured primarily through grades, scores, or rankings—specifically, the grade point average.

This duality does not imply a contradiction; rather, it reflects a complementary approach. Grades are quantitative indicators that objectively reflect students' performance in their academic activities. Thus, the grade point average serves as a numerical summary of that overall performance, allowing for a clearer assessment and comparison of academic success.

Academic performance is a multidimensional concept that, while defined in terms of overall performance, is effectively measured through grades, providing a more comprehensive view of students' educational success.

Therefore, academic performance should be viewed as a comprehensive concept that combines both quantitative assessment (grade point averages) and qualitative assessment (performance in academic activities) to provide a more complete picture of a student's progress and success.

College students' academic performance is the result of a complex interplay of multidimensional factors that encompass socioeconomic aspects, family environment, motivation and action, learning style, health, and well-being. Socioeconomic factors include access to educational resources, family income level, and the availability of educational opportunities (Medina, 2022). The family environment plays a crucial role, influencing the quality of family relationships, the level of emotional and educational support provided by the family, and the stability of the family environment.

Student motivation and behavior are also key factors, as levels of intrinsic and extrinsic motivation, study habits, and participation in extracurricular activities influence academic performance (Luna Cevallos, 2022). Learning style—which encompasses learning preferences and adaptation to the teaching methods used at the university—also plays a significant role (Curriñir, 2023). Finally, physical and mental health, a balance between work, study, and rest, as well as access to health services and emotional support, are essential factors that influence academic performance (Cala and Castrillón, 2023).

The study conducted by Parra-Aguirre and Padilla Contreras (2022), titled "Socioeconomic Factors and Academic Performance Among Nursing Students." "Integrative Literature Review" addresses the challenges faced by students from disadvantaged socioeconomic backgrounds and how these factors may influence their academic performance. It highlights that limited access to educational resources, family support, the balance between work and school, living conditions, and social stigma are key factors that affect academic performance when students face socioeconomic

challenges. These findings underscore the importance of addressing these barriers and providing the necessary support to ensure equal opportunities in education.

The study conducted by Tamayo-Cabeza et al. (2022), titled "Family Functioning, Support from Friends, and Academic Performance in Dental Students," examines the relationship between family functioning, support from friends, and academic performance in dental students. It is important to consider the individual circumstances of each student and family, as these can influence the impact of the family environment on academic performance. The study highlights that a lack of support from family can lead to feelings of discouragement and a lack of motivation among students. Family conflicts can cause additional stress and distract students from their studies. Financial difficulties can limit access to educational resources, causing concern and anxiety among students. Emotional difficulties within the family environment, such as a lack of emotional stability or the presence of challenging situations, can also negatively affect students' emotional well-being and their ability to concentrate on their studies.

The study conducted by Luna Cevallos (2022) focuses on the relationship between motivation and academic performance among students at a private university. This study was conducted in response to the need to understand the basic aspects of motivation and its influence on learning. The research conducted by Luna Cevallos (2022) highlights the importance of motivation in students' academic performance. Socioeconomic issues play a significant role in this relationship, as they can affect students' motivation and learning strategies. It is crucial to provide specialized supervision and training to help these students overcome barriers and reach their full academic potential.

The study titled "The Relationship Between Learning Style Preferences and Academic Performance Among College Engineering Students," conducted by Sánchez et al. (2022) examines the relationship between learning style preferences and the academic performance of engineering students. The study provides insight into the relationship between learning style preferences and the academic performance of engineering students. It is important to keep in mind that learning style can have an impact on students' academic performance. Various theories suggest that understanding one's individual learning style can help students reach their full academic potential. By adapting teaching methods to each student's preferred learning style, it is possible to improve their academic performance.

The research conducted by Sinchigalo-Martínez et al. (2022) titled "Emotional Well-Being and Academic Performance Among College Students: A Two-Dimensional Relationship and Its Impact on Support Strategies." It focuses on the relationship between emotional well-being and academic performance among college students. Although there are conflicting findings in the scientific literature, this specific study suggests that there is no strong relationship between emotional well-being and academic performance among college students. However, it is important to emphasize the importance of promoting healthy habits to improve college students' emotional well-being, as this can have a positive impact on other aspects of their lives.

College students' academic performance is intrinsically linked to a healthy emotional balance. Family support plays a vital role in emotional and socioeconomic development, which in turn influences academic performance. However, this support alone may not be enough if the student lacks the motivation to achieve his or her goals.

To achieve optimal academic performance, it is essential for college students to maintain a healthy emotional balance. Emotional well-being is essential for focusing on your studies and effectively tackling academic challenges. A student who feels emotionally stable and at peace with himself or herself is more likely to achieve good

academic results. Family support plays a vital role in the emotional development of college students.

In this scenario, students must develop their own learning styles. Every student has their own way of absorbing the material and retaining information. By identifying and using the learning styles that best suit their individual needs, students will be able to optimize their learning process and improve their academic performance. These interrelated factors can have a significant impact on students' ability to concentrate, absorb new information, and remain engaged in their studies.

Method

Design

The methodology used in this project is based on a mixed-methods approach, which combines data collection techniques drawn from both quantitative and qualitative methodologies. Data were collected through a review of the literature and documents, as well as through the use of questionnaires to measure the variables under study and determine research output and related activities.

Instruments

1. Quantitative Survey:
 - Description: A structured questionnaire with closed-ended questions that assess various factors, such as the family environment, motivation, study habits, and use of educational resources.
 - Validation: Before it is implemented, the questionnaire can be validated through a pilot test with a small group of students.
2. Qualitative Interviews:
 - Description: Semi-structured interviews with students and teachers to gain deeper insight into their perceptions and experiences related to academic performance.
 - Recording and Transcription: The interviews are recorded (with consent) and then transcribed to facilitate analysis.
3. Analysis of Academic Records:
 - Description: Review of academic records to obtain data on grades, attendance, and academic progress, which will serve as indicators of academic performance.

Procedure

1. Definition of the Population and Sample:
 - Description: A representative group of computer engineering students from the ISPB will be selected. This may include different academic levels (first, second, third year, etc.).
2. Data Collection:
 - Surveys: The survey will be administered to all selected students. It can be done online or on paper, ensuring a high response rate.
 - Interviews: Interviews will be scheduled with a smaller sample of students and teachers, selected either at random or purposefully to enrich the analysis.
3. Data Analysis:

- Quantitative: The data obtained from the survey will be analyzed using statistical tools (such as SPSS or Excel) to identify significant correlations between variables.
- Qualitative: A thematic analysis of the interview transcripts will be conducted to identify patterns and recurring themes.
- 4. Interpretation of Results:
 - Quantitative and qualitative findings will be integrated to provide a more comprehensive understanding of the factors that influence academic performance.
- 5. Drafting of the Final Report:
 - The findings will be presented in a structured format, discussing the implications of the results and proposing recommendations based on the research.

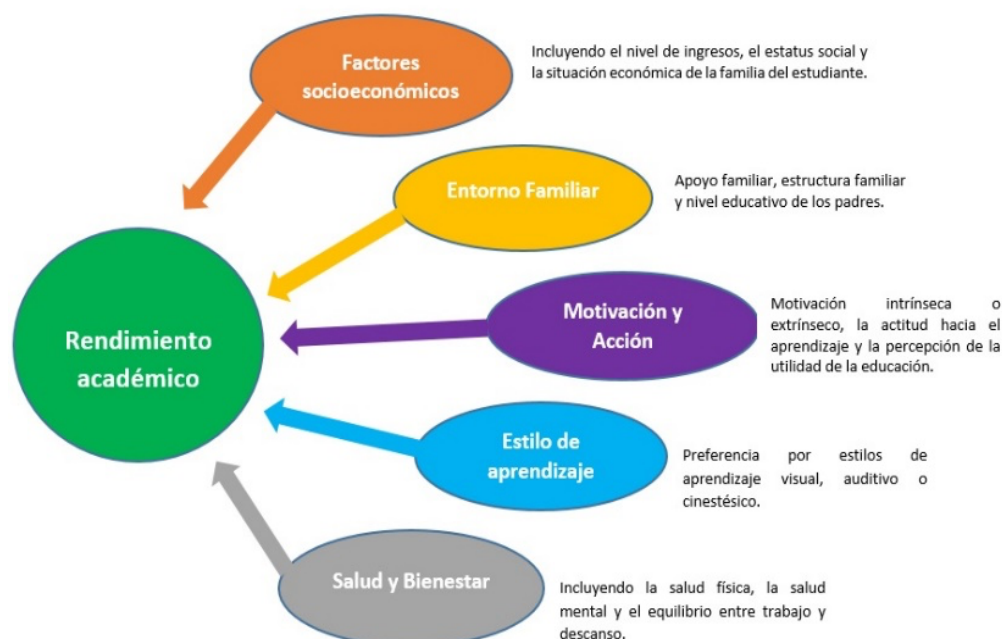
With regard to the study population, there are a total of 227 participants, of whom 88.11% are students and 11.89% are professors in the computer engineering program. Purposive sampling, a type of non-probability sampling, was used to gather the opinions of a large number of ISPB faculty and students through an attitude questionnaire.

The research takes an exploratory-descriptive approach, which allows for a detailed understanding of the situation under study. In addition, the analysis and evaluation of the training model are highlighted, as they provide accurate data compared to other qualitative methods. The methodology used in this project combines quantitative and qualitative techniques, employing questionnaires and document analysis, with an exploratory-descriptive approach.

Study variables

The study variables and their dimensions were structured based on the theoretical framework. This is illustrated below in Figure 1:

Figure 1
Study variables



Academic performance refers to students' achievements or results in terms of grades, scores, or rankings. It is a quantitative variable used to assess students' academic success. It is measured using various metrics, such as grade point averages, pass rates, and other indicators. Academic performance is an important tool for assessing student progress and the impact of educational interventions.

The "Socioeconomic Factors" variable refers to the student's family's income level, social status, and economic situation. These factors are important for understanding the context in which the student finds themselves and can influence their academic performance (Rodríguez, 2021). Socioeconomic factors are a quantitative variable, since they can be measured and quantified, for example, by assessing income level or classifying social status. These factors can have an impact on access to educational resources, extracurricular opportunities, and family support, which can affect a student's academic performance and achievement.

The "Family Environment" variable is analyzed qualitatively using methods such as in-depth interviews and content analysis to gain a detailed understanding of how the family environment influences students' academic performance. By using these qualitative techniques, we aim to capture participants' experiences and perceptions in a more holistic and contextualized way. This allows us to explore how family support, family structure, and parents' educational attainment affect students' academic performance (Verdugo-Guamán et al. (2023). Through in-depth interviews and content analysis, it is possible to identify patterns, themes, and relationships between the family environment and academic performance. The family environment plays a crucial role in students' academic performance (Nevárez-Espinoza and Barcia-Briones, 2022). Family support—both emotional and academic—can have a positive impact on academic performance. When students receive support and encouragement from their families, they feel motivated and supported in their education. This can lead to greater commitment to studies, improved performance, and greater academic achievement.

The "Motivation and Action" variable is quantitative. In the context of educational research, this variable refers to the measurement of students' motivation and actions (Rea, et al. (2023). Motivation can be measured using scales that assess the level of motivation, such as questionnaires or surveys. In quantitative terms, motivation can be measured using assessment scales such as questionnaires or surveys, in which numerical values are assigned to students' responses (Luna Cevallos, 2022). These numerical values make it possible to quantify and compare levels of motivation across different groups or points in time.

The "Learning Style" variable, which includes a preference for visual, auditory, or kinesthetic learning styles, can be considered qualitative. Methods such as in-depth interviews or content analysis are used to measure it. Learning style can have a significant impact on students' academic performance (Cala and Castrillón, 2023). Those who prefer a visual learning style can benefit from using images, graphs, and diagrams to process and retain information. On the other hand, students with an auditory learning style may learn best through verbal explanations and discussions. Students with a kinesthetic learning style can benefit from hands-on and manipulative activities to grasp new concepts.

The Health and Well-being variable can be considered qualitative. To measure this variable, methods such as in-depth interviews, content analysis, or qualitative questionnaires can be used. A lack of adequate rest can negatively affect students' ability to study and their academic performance (Ramírez Lemus et al., 2023). A lack of physical activity, poor diet, and lack of sleep can affect students' concentration, memory, and ability to learn (Morán Carpio, 2022). It is important for students to have access to support resources and stress management strategies to maintain good mental health and effectively cope with academic challenges. A proper balance between work and rest allows students to recharge, reduce stress, and maintain higher productivity in their studies (López, 2023). Students should strive to find a healthy balance so they can effectively tackle academic challenges without negatively affecting their ability to study and their academic performance.

Results

Through observation tools, classroom visits, questionnaires, interviews, and student assessments, it was possible to gain a deeper understanding of the shortcomings in the academic performance of ISPB engineering students. These instruments yielded results that support the existence of difficulties in understanding fundamental concepts in curriculum management, as well as the individual and contextual factors that influence students' academic performance.

Table 1
Results Table

Instrument	Group	Key Result	Percentage (%)
Attitudes Questionnaire	Students	Positive Attitude Toward Support and Resources	75
	Teachers	An agreement in which commitment is crucial	85
Note	Students	Active participation in class	65
	Teachers	Open interaction with students	80
Evaluations	Students	Average Increase in Grades	10
	Students	Correlation with Family Support and Personal Commitment	-

Interpretation of the Results

Attitudes Questionnaire

Students: About 75% of students have a positive attitude toward attending classes and using additional resources, indicating that they value academic support and recognize its importance in their academic performance.

Teachers: 85% of teachers believe that student engagement and motivation are critical to academic success. This suggests a correlation between teachers' perceptions and students' attitudes toward education.

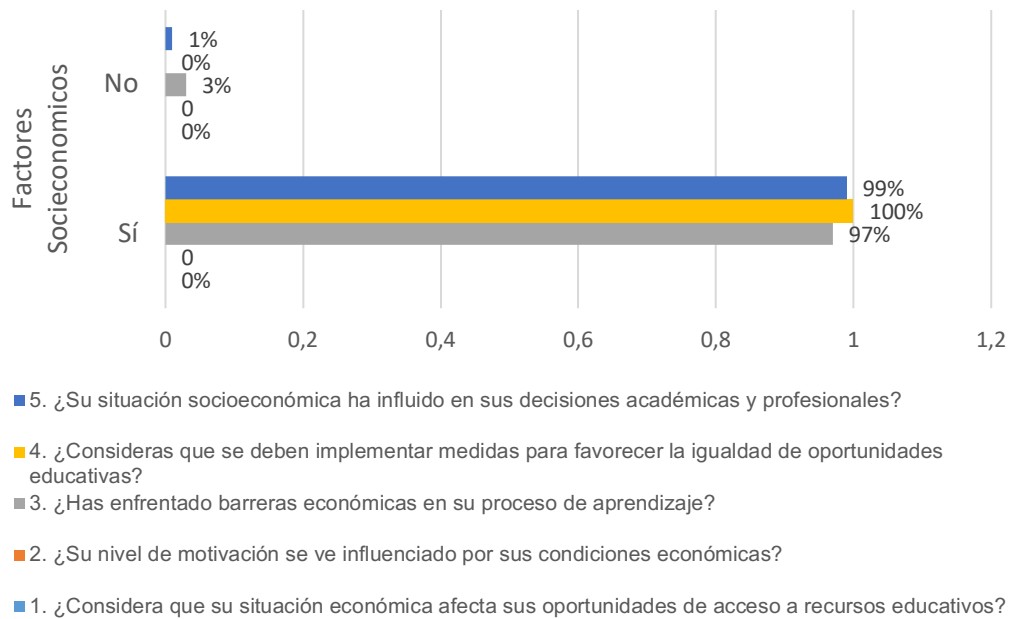
Note: Active Participation: 65% of the students actively participated in class, which is a positive indicator of their engagement. Class participation is linked to better learning and greater retention of information.

Student-Teacher Interaction: About 80% of the teachers were open to students' questions, which fosters a collaborative learning environment where students feel comfortable asking for help.

Assessments: An average 10% increase was observed in the grades of students who demonstrated positive attitudes toward studying and made effective use of academic resources. This finding highlights the positive relationship between attitude and academic performance.

The correlation found between family support, personal commitment, and grade point averages suggests that external factors also influence academic performance, reinforcing the importance of a supportive environment.

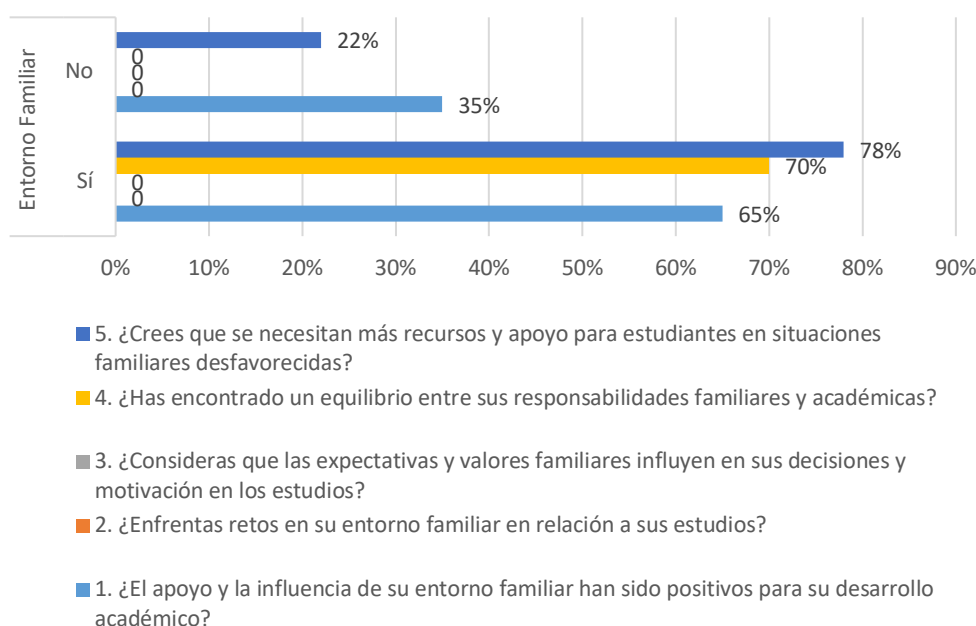
Figure 2
Socioeconomic factors



The results show that 97.5% of students believe that their economic situation affects their access to educational resources. In addition, 97% of students have faced financial barriers in their learning process. On the other hand, 198% of students indicate that their socioeconomic status has influenced their academic and career decisions. Similarly, 83.5% of students say that their level of motivation is influenced by their financial circumstances. Based on the results obtained, it appears that several factors influence the academic performance of computer engineering students at ISPB. A high percentage of respondents indicated that their economic situation affects their access to educational resources, that they have faced financial barriers in their learning process, that their socioeconomic status has influenced their academic and professional decisions, and that their level of motivation is influenced by their economic circumstances (Medina, 2022).

These findings highlight the need for a comprehensive approach to addressing the socioeconomic factors that influence the academic performance of computer engineering students. It is important to consider strategies that provide financial support and educational resources to students, as well as to promote intrinsic motivation and the development of academic skills (Páez and Ramírez, 2022). In addition, policies and programs should be implemented to promote equity and equal opportunities for all students, regardless of their economic status.

Figure 3
Family Environment

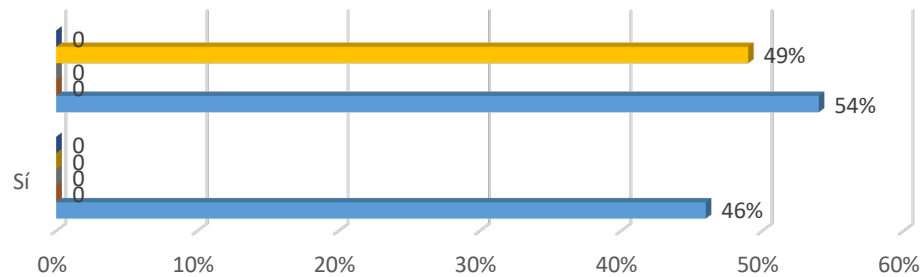


The results show that the support and influence of the family environment have had a positive impact on their academic development, with a percentage of 65%. In addition, 91.5% of students believe that family expectations and values influence their decisions and motivation regarding their studies. On the other hand, 81.5% of students report not facing any challenges in their family environment related to their studies. In addition, 70% of students have managed to strike a balance between their family and academic responsibilities. However, 78% of students believe that more resources and support are needed for those who come from disadvantaged family situations.

These results highlight the importance of the family environment on the academic performance of computer engineering students. Family support and positive influence are key factors in academic development (Nevárez-Espinoza and Barcia-Briones, 2022). Family expectations and values also play a significant role in student motivation. It is encouraging to see that many students do not face obstacles in their family environment when it comes to their studies and have managed to balance their family and academic responsibilities.

However, it is important to note that there is still a need to provide additional resources and support to students from disadvantaged family backgrounds. These results highlight the importance of recognizing differences in students' access to resources and opportunities and working to close those gaps.

Figure 4
Motivation and Action

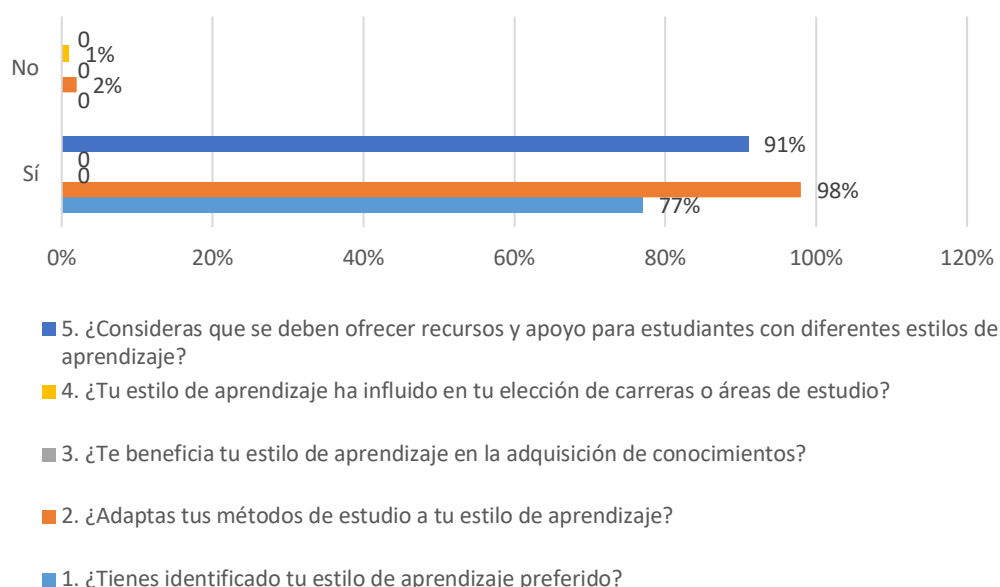


- 5. ¿Consideras que tu nivel de motivación y acción influye en tu éxito académico y personal?
- 4. ¿Utilizas estrategias para mantener un enfoque positivo y perseverar en el logro de tus metas?
- 3. ¿Has tomado acciones concretas para alcanzar tus objetivos académicos?
- 2. ¿Te mantienes motivado/a para superar los desafíos académicos?
- 1. ¿Tienes claras tus metas y motivaciones en tus estudios?

According to the results, several factors have been identified that have a significant impact on these students' academic performance. 189% of students believe that their level of motivation and action influences their academic and personal success. In addition, 193% have taken concrete steps to achieve their academic goals. 102% use strategies to maintain a positive outlook and persevere in achieving their goals, and 92% have a clear understanding of their goals and motivations in their studies. These results highlight the importance of motivation, action, and a positive attitude for the academic performance of computer engineering students.

It is essential to understand and take advantage of these factors to promote students' academic success. Motivation and action are key drivers for achieving academic and personal goals (Inlago Lechón, 2023). The use of strategies and a positive approach also play an important role in achieving goals and overcoming academic challenges.

Figure 5
Learning Style

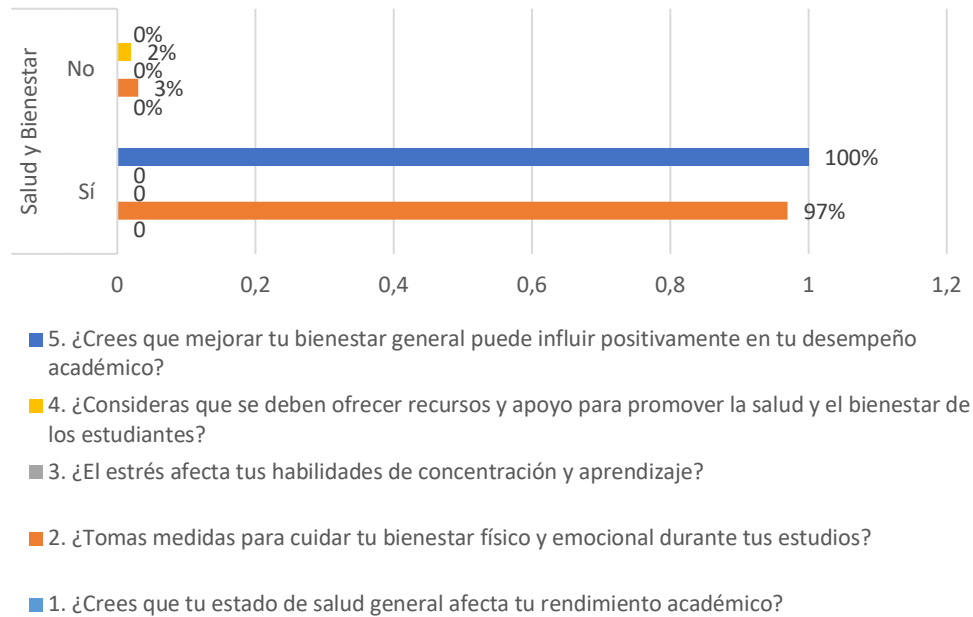


The results show that 154% of the positive responses indicate that students have identified their preferred learning style. In addition, 187% of students benefit from their learning style when acquiring knowledge. 496% of students tailor their study methods to their learning style, and 198% believe that their learning style has influenced their choice of major or field of study. However, 182% of students believe that more resources and support should be provided for those with different learning styles.

These results highlight the importance of understanding and recognizing the learning styles of computer engineering students. Students who have identified their preferred learning style can use it to improve their knowledge acquisition. It is encouraging to see that many students adapt their study methods to their learning style, which can contribute to their academic success (Escobar, et al., 2022). In addition, learning styles can influence students' career choices and fields of study.

However, it is necessary to provide more resources and support for students with different learning styles. This will ensure that all students have equal opportunities and can reach their full academic potential.

Figure 6
Health and Wellness



According to the results, it was found that 100% of the students believe that their overall health affects their academic performance. In addition, they recognize that stress affects their ability to concentrate and learn. Therefore, they believe that improving their overall well-being can have a positive impact on their academic performance. In addition, 196% of students believe that resources and support should be provided to promote student health and well-being.

These results highlight the importance of health and well-being in the academic performance of computer engineering students. Overall health and the ability to cope with stress can have a significant impact on concentration, learning, and academic performance (Morán Carpio, 2022). Therefore, it is essential to provide adequate resources and support to promote students' health and well-being.

The proposed hypothesis has been confirmed, as evidenced by the calculation of Pearson's correlation coefficient, which shows a positive correlation between the independent variable and the three dependent variables (since its value lies between 0 and 1), with a calculated value of 0.713. Furthermore, according to the coefficient of determination, the independent variable of academic performance explains 50.50% of the variability in the dependent variables of socioeconomic status, family environment, motivation, learning styles, health, and well-being.

In addition, multivariate analysis of variance (MANOVA) was performed to conduct global significance tests. In this analysis, Pillai's trace reached a value of 0.372. Due to the complexity of the Pillai trace distribution, its value approximates an F-distribution with a specific value of 1.95, which has a significance level of less than 0.0001. This leads to the rejection of the null hypothesis and the conclusion that there are significant differences between the treatments evaluated.

Discussion and Conclusions

This study has found that several factors—socioeconomic, family-related, motivational, and health-related—have a significant influence on the academic performance of computer engineering students at ISPB. Overall, the findings suggest a positive correlation between students' life circumstances and their academic performance, with a Pearson correlation coefficient of 0.713, indicating a moderately strong correlation. However, these results also reveal a number of complexities and nuances that call for critical reflection.

In this context, our research focused on a broader range of variables that may influence the academic performance of computer engineering students. By including socioeconomic, family, and motivational factors, we seek to identify aspects of the students' context that may be beyond the direct control of teachers and the school. While we acknowledge that future research could delve deeper into the analysis of pedagogical and didactic aspects, as well as the interactions between these factors and the variables addressed in our study, we believe that our work offers a valuable contribution to the field of education by emphasizing the importance of adopting a multifactorial approach to the analysis of academic performance.

Among the study's strengths is its ability to reflect students' level of conceptual understanding by showing how attitudes toward attendance and the use of resources are correlated with academic performance. Seventy-five percent of students have a positive attitude toward attending classes and using additional resources, which highlights the potential in the academic context. These results are supported by an average 10% increase in test scores among those who used these strategies.

However, some weaknesses become apparent when we consider that, although 65% of the students actively participated in class, this still leaves 35% who are not fully engaged (Noriega Luna, 2023). This percentage may indicate that, despite a generally positive attitude, not all students are actively engaged in their own learning (Condori Dueñas, 2023). This raises questions about what factors might be limiting this group's participation and their perception of the value of education (Vargas Quispe, 2023).

The choice of statistical techniques—including Pearson's correlation coefficient, multivariate analysis of variance (MANOVA), and Pillai's criterion—is based on their ability to analyze complex relationships among multiple variables and uncover significant patterns in the data obtained. These tools enabled us to quantify the influence of the factors studied on academic performance, as well as to assess both the strength and the direction of these relationships. It is essential to emphasize that our goal was not to attribute low performance exclusively to external factors; rather, we set out to identify a set of variables that, taken together, could explain a substantial portion of the variance in academic performance.

With regard to the hypotheses initially proposed, the results reveal a correlation between teachers' perceptions and students' attitudes toward education. Eighty-five percent of teachers believe that student engagement and motivation are critical to academic success (Curriñir, 2023). However, this perception contrasts with the data on active participation, which shows that only 65% of students actively participate in class (Condori Dueñas, 2023). This suggests a discrepancy that warrants further investigation; it is possible that teachers' expectations are not fully reflected in the behavior of all students.

A comparison of these findings with previous research confirms the importance of motivation and engagement in academic performance. However, there are also some

contradictions (Medina, 2022). Although there is widespread recognition of the importance of a collaborative environment—as evidenced by the fact that 80% of professors are open to consultations—this does not necessarily translate into greater participation by all students (Morán Carpio, 2022). This situation could indicate that, even though students feel they can seek help, there may be a lack of confidence or a negative perception regarding their ability to contribute or participate in class.

The study's limitations include its focus on a single institution, which may limit the generalizability of the results. In addition, reliance on self-reports can lead to bias. It is suggested that future research look beyond attitudes and analyze additional factors such as access to technological resources and students' prior training. This could provide a more holistic understanding of how these factors interact with student engagement and academic performance.

Theoretically, these data provide further evidence for the debate on the importance of active engagement and collaboration in learning. Educational institutions could benefit from implementing workshops or programs that train students in active participation and collaborative learning skills, thereby promoting a pedagogical approach based on inquiry-based learning (Morán Carpio, 2022). This could enhance students' conceptual understanding by allowing them to explore and grasp concepts in depth, thereby promoting meaningful learning.

The study has shown that socioeconomic and family factors, as well as the academic environment, are interrelated and critical to academic performance at the ISPB. Despite the clearly positive attitudes toward education, the reality of active participation and engagement varies among students. The contradictions observed call for a more in-depth analysis of the dynamics of knowledge and teaching methodologies. These findings suggest that better aligning teachers' expectations with students' realities and fostering an inclusive and collaborative educational environment could be key to improving the academic performance of all students.

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