STUDENTS' AND TEACHERS' PERCEPTIONS OF A COMPUTER SCIENCE AND ENTREPRENEURSHIP PROGRAM IN SAQUAREMA

PERCEPÇÕES DE ALUNOS E PROFESSORES SOBRE UM PROGRAMA DE COMPUTAÇÃO E EMPREENDEDORISMO EM SAQUAREMA

PERCEPCIONES DE ESTUDIANTES Y PROFESORES SOBRE UN PROGRAMA DE COMPUTACIÓN Y EMPRENDIMIENTO EN SAQUAREMA

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ABSTRACT: This study aimed to understand the perceptions of students and teachers regarding aspects of the School of Programming and Entrepreneurship of Saquarema (EPES). A quantitative approach was adopted, using structured questionnaires administered to students and teachers participating in the program. Data were analyzed using descriptive statistics. The results indicated high levels of satisfaction with the online platform (M = 4.6), the curriculum (M = 4.25), and the infrastructure (M = 4.0 for students; M = 5.0 for teachers). The availability of practical activities received the lowest mean among students (M = 3.5), highlighting an area that requires attention. The program demonstrates quality and effectiveness, with convergence between student and teacher perceptions across several dimensions. The improvement opportunities identified provide guidance for future investments, particularly regarding the expansion of practical activities and the updating of instructional materials.

KEYWORDS: Computational thinking. Entrepreneurial education. Educational program evaluation. Student perception. Teacher education.

***RESUMO**: Este estudo teve como objetivo conhecer as percepções de alunos e professores sobre aspectos da Escola de Programação e Empreendedorismo de Saquarema (EPES). Foi adotada uma abordagem quantitativa, utilizando questionários estruturados aplicados a alunos e professores participantes do programa. Os dados foram analisados por meio de estatísticas descritivas. Os resultados indicaram níveis elevados de satisfação em relação à plataforma* online *(M = 4,6), ao currículo (M = 4,25) e à infraestrutura (M = 4,0 para alunos; M = 5,0 para professores). A disponibilidade de atividades práticas obteve a menor média entre os alunos (M = 3,5), sinalizando uma área que requer atenção. O programa demonstra qualidade e efetividade, com convergência entre as percepções de alunos e professores em várias dimensões. As oportunidades de melhoria identificadas oferecem direções para investimentos futuros no que tange à ampliação de atividades práticas e à atualização de materiais didáticos.*

***PALAVRAS-CHAVE**: Pensamento computacional. Educação empreendedora. Avaliação de programas educacionais. Percepção discente. Formação de professores.*

***RESUMEN**: Este estudio tuvo como objetivo conocer las percepciones de estudiantes y profesores sobre aspectos de la Escuela de Programación y Emprendimiento de Saquarema (EPES). Se adoptó un enfoque cuantitativo, utilizando cuestionarios estructurados aplicados a los estudiantes y profesores participantes del programa. Los datos fueron analizados mediante estadísticas descriptivas. Los resultados indicaron altos niveles de satisfacción con la plataforma en línea (M = 4,6), el plan de estudios (M = 4,25) y la infraestructura (M = 4,0 para los estudiantes; M = 5,0 para los profesores). La disponibilidad de actividades prácticas obtuvo la media más baja entre los estudiantes (M = 3,5), lo que señala un aspecto que requiere atención. El programa demuestra calidad y efectividad, con convergencia entre las percepciones de estudiantes y profesores en varias dimensiones. Las oportunidades de mejora identificadas ofrecen orientaciones para futuras inversiones, especialmente en la ampliación de actividades prácticas y en la actualización de los materiales didácticos.*
***Palabras clave:** Pensamiento Computacional; Educación Emprendedora; Evaluación de Programas Educativos; Percepción Estudiantil; Formación de Profesores.*

***PALABRAS CLAVE**: Pensamiento computacional. Educación empreendedora. Evaluación de programas educativos. Percepción estudiantil. Formación de profesores.*

Introduction

The integration of digital and entrepreneurial competencies has been widely discussed in the contemporary educational landscape, particularly in light of the rapid transformations driven by the digitalization of society. International studies show that combining technical programming knowledge with innovation and problem-solving skills is essential to preparing students for work environments characterized by constant change (Ferrari, 2012; Wijnen; Van der Molen; Voogt, 2023).

The development of computational thinking has been identified as a central axis for advancing digital competencies, enabling students to structure problems, devise solutions, and apply algorithms in diverse contexts (Wing, 2006; Grover; Pea, 2013). In the Brazilian context, Valente (2016) emphasizes that integrating computational thinking into the basic education curriculum requires multiple strategies and raises important questions regarding teacher training and student assessment. Beyond technical proficiency, studies indicate that the ability to transform ideas into concrete projects—an essential feature of the entrepreneurial mindset—enhances autonomy, creativity, and innovation among young learners (Alkaabi; Senghore, 2024; Murphy; Liao; Welsch, 2006; Li *et al.*, 2020), as well as the acquisition of technical content and the development of transversal competencies such as collaboration, adaptability, and creative problem-solving (Arranz; Arroyabe; Arroyabe, 2017).

Such initiatives gain strategic relevance in local and regional contexts, as they can foster socioeconomic development, reduce inequalities in access to technology, and expand opportunities for social innovation (Bhimani; Mention; Barlatier, 2019; Forgeard; Kaufman, 2016; Phillips *et al.*, 2014).

Another important aspect concerns the evaluation of educational programs. The literature underscores that the systematic analysis of student and teacher perceptions helps identify strengths and weaknesses of each initiative, while also providing useful evidence for decision-making and continuous improvement (Luckesi, 2011; Nouraey *et al.*, 2020). Evaluation studies further highlight that listening to the different actors involved in the educational process contributes to legitimizing pedagogical practices and strengthening the sustainability of innovative educational policies (Alkin; King, 2016).

The importance of addressing and teaching the use of technologies, computing, and even programming in basic education is explicitly stated in Brazil's national curriculum guidelines—the National Common Curricular Base (BNCC). The document outlines ten general competencies that define students' learning rights and processes. These competencies permeate

curricular components and skills, guiding student development throughout schooling, while allowing for the inclusion of additional competencies according to regional and local specificities across the country.

One of the competencies directly related to technology in the BNCC is Competency 5—Digital Culture, defined as:

> Understanding, using, and creating digital information and communication technologies in a critical, meaningful, reflective, and ethical manner across diverse social practices (including school settings), in order to communicate, access, and disseminate information, produce knowledge, solve problems, and exercise protagonism and authorship in personal and collective life (Brasil, 2018, p. 9, our translation).

Programming falls within this scope, as noted by Gresse von Wangenheim, Nunes, and Santos (2014, p. 116, our translation):

> Programming is an essential part of computing, thus requiring the learning of the competency to create software programs. Through learning programming, students also develop computational thinking—an approach to problem-solving that can be implemented on a computer, involving a set of concepts such as abstraction, recursion, and iteration, among others.

According to these authors, teaching focused solely on the use of Information Technology is no longer sufficient; it is necessary to teach digital proficiency as well as computational thinking to young people. This aligns with what scholars in the field have long argued (Grover; Pea, 2013; Valente, 2019).

Since the beginning of the century, numerous studies have highlighted that computational thinking should be considered an essential competency for the current generation of students. The prevailing understanding is that all children in basic education should learn computational thinking (Grover; Pea, 2013; Wing, 2006; Brackmann, 2017), fostering learning opportunities and strengthening students' interest in STEM fields (STEM)[6] (Kwon *et al.,* 2021; Leonard *et al*., 2016; Chen et *al.*, 2017).

It is important to emphasize that computational thinking not only contributes to mastering computational tools and technologies but also supports the development of cognitive competencies such as abstraction and persistence, which are essential for meaningful problem-solving (Liu *et al*., 2024; Macedo; Alves, 2025).

[6] STEM stands for Science, Technology, Engineering, and Mathematics.

According to Barr and Stephenson (2011, p. 51), through computational thinking, students learn to: (i) deal with complex and open-ended problems; (ii) persist in solving difficult problems; (iii) tolerate ambiguity or handle uncertain and incomplete situations; and (iv) communicate and collaborate with others.

Regarding entrepreneurship—an area that has gained prominence due to new perspectives in the labor market and the emergence of innovative business ideas—emphasis has shifted toward educational initiatives designed to develop entrepreneurial skills, competencies, and attitudes among young people. This focus becomes even more critical when addressing adolescents and youth in socially and economically vulnerable contexts.

Entrepreneurial training should be rooted in education, with schools—whether public or private—providing opportunities that encourage entrepreneurial development. Education becomes the driving force behind strengthening entrepreneurial competencies at all levels of schooling, supporting the emergence of future entrepreneurs (Aveni, 2019; Carvalho; Corrêa, 2022).

However, as observed in Brazil, European studies by Lilleväli and Täks (2017) also reveal a gap in entrepreneurship education, as few countries include practical entrepreneurial experiences as mandatory and regular components of school curricula.

The Global Entrepreneurship Monitor (GEM)[7] reported in 2021 a positive trend between 2023 and 2024, with a significant increase in the total entrepreneurship rate, rising from 30.1% to 33.4% of the adult population. The early-stage entrepreneurship rate—which includes both nascent and new entrepreneurs—also increased from 18.6% to 20.3% of the adult population. These data reflect the reality of adult entrepreneurial activity in Brazil.

Filion and Laferté (2003), as cited by Aveni (2019), highlight the proposal set forth in the Quebec State Teaching Plan, which outlines three key factors: (i) teaching practices that simulate real problems and promote problem-solving through classroom theory and the Competencies, Skills, and Attitudes developed therein; (ii) research activities that enable students to understand dynamic realities such as market or social changes; and (iii) initiatives that bring students and entrepreneurs closer together.

[7] "GEM is a research project dedicated to gaining a deeper understanding of the role of entrepreneurship in global economic and social development." Launched in 1999 by prestigious academic institutions such as London Business School and Babson College, GEM is conducted annually, involving more than 100 countries over the years. Available at: https://sebrae.com.br/sites/PortalSebrae/sebrae50mais50/noticias/pesquisa%E2%80%93mundial%E2%80%93de%E2%80%93empreendedorismo%E2%80%93divulgada%E2%80%93no%E2%80%93projeto%E2%80%93sebrae%E2%80%9350mais50#:~:text=A%20GEM%20%C3%A9%20a%20maior,participaram%20da%20pesquisa%2050%20pa%C3%ADses.

In Brazil, the advancement of entrepreneurship education for younger students is also guided by the BNCC (Brasil, 2018), which emphasizes that education should not be limited to technical knowledge but should broaden students' training through the development of additional competencies and skills such as innovation, creativity, imagination, autonomy, and teamwork. In this sense, entrepreneurship education should begin in basic education and operate as a teaching and learning methodology (Dolabela; Filion, 2013; Ferreira; Miguel, 2020; Filion, 1999; Farias, 2018). while also recognizing the challenges posed by the lack of teacher training for its implementation, as evidenced both internationally (Sommarström; Oikkonen; Pihkala, 2020) and nationally (Guimarães; Lima, 2016).

Aligned with this perspective, the present study follows Dolabela and Fillion (2013, p. 136, our translation), who argue that "from the perspective of entrepreneurship, change must begin at the base rather than at the top," as this shift "may transform existing learning patterns and processes." In this regard, entrepreneurship "reveals the capacity of human beings to become the protagonists of their own destinies, a possibility increasingly accessible to all."

Despite growing academic interest and public policies that promote the integration of computing and entrepreneurship, few studies have evaluated the perceptions of students and teachers involved in long-term programs implemented in medium-sized Brazilian cities, such as the Programming and Entrepreneurship School in Saquarema (EPES). This gap in the literature limits understanding of how such initiatives unfold in specific contexts and which factors contribute to or hinder their effectiveness. Therefore, understanding how students and teachers perceive programs that integrate technical training in computing with the development of entrepreneurial competencies is essential for ensuring program effectiveness and guiding curricular and methodological adjustments. Evidence-based evaluation of these educational experiences supports both scientific advancement in the field and the development of public policies that are more responsive to contemporary societal demands.

The EPES program—the focus of this research—represents an innovative educational initiative designed to integrate technical programming knowledge with entrepreneurial competencies, preparing participants to navigate the challenges of today's labor market. In a scenario where digital transformation accelerates change across multiple economic sectors, educational programs that combine technical and entrepreneurial skills are increasingly relevant for regional and national development. Thus, systematic evaluation of educational programs is a fundamental practice for ensuring instructional quality and the effective allocation of educational investments.

Given this context, the study sought to answer the following research question: What are the perceptions of students and teachers regarding the curriculum, methodology, infrastructure, and pedagogical resources of the Saquarema Programming and Entrepreneurship Program, and how can these perceptions support improvements to the initiative?

The study was structured around specific objectives that guided both data collection and analysis. The overall objective was to identify students' and teachers' perceptions of various aspects of the Computing and Entrepreneurship Program, outlining strengths, weaknesses, and opportunities for improvement. The specific objectives included: assessing the adequacy of the curriculum and instructional materials used in the program; analyzing the effectiveness and accessibility of the online learning platform; examining the quality of the physical and technological infrastructure; investigating perceptions of mentoring programs and technical support; verifying the suitability of the assessment and student performance monitoring systems; and identifying aspects related to information security and data protection within the educational environment.

Research Methodology

The methodology adopted in this study is characterized by a quantitative approach designed to provide a comprehensive understanding of participant perceptions. This methodological choice is justified by the need to capture measurable data on participant satisfaction as well as to generate deeper insights into their experiences and suggestions for improvement.

Data Collection Instruments

Data were collected through structured questionnaires administered separately to students and teachers. The questionnaires were developed based on theoretical dimensions relevant to the evaluation of educational programs, including curricular, technological, infrastructural, and pedagogical aspects. Each questionnaire combined closed-ended questions using a 5-point Likert scale (ranging from 1—Very Dissatisfied to 5—Very Satisfied).

The structure of the questionnaires was organized into thematic sections covering: curriculum and instructional materials; online platform and technological resources; physical infrastructure and laboratories; practical activities and projects; mentoring programs and technical support; assessment and monitoring systems; and information security aspects. This organization enabled a systematic analysis of each dimension of the program, facilitating the identification of patterns and trends in participant responses.

Population and Sample

The study population comprised all students and teachers actively involved in the EPES Programming and Entrepreneurship Program during the data collection period. Participation in the research was voluntary, and respondents' anonymity and the confidentiality of the information collected were ensured. This ethical procedure was essential to guarantee the honesty and spontaneity of the responses, thereby strengthening the validity of the results obtained. The study was approved by the Ethics Committee of the Adventist University Center of São Paulo (UNASP), under Opinion No. 7.028.982, CAAE 80618324.6.0000.5377.

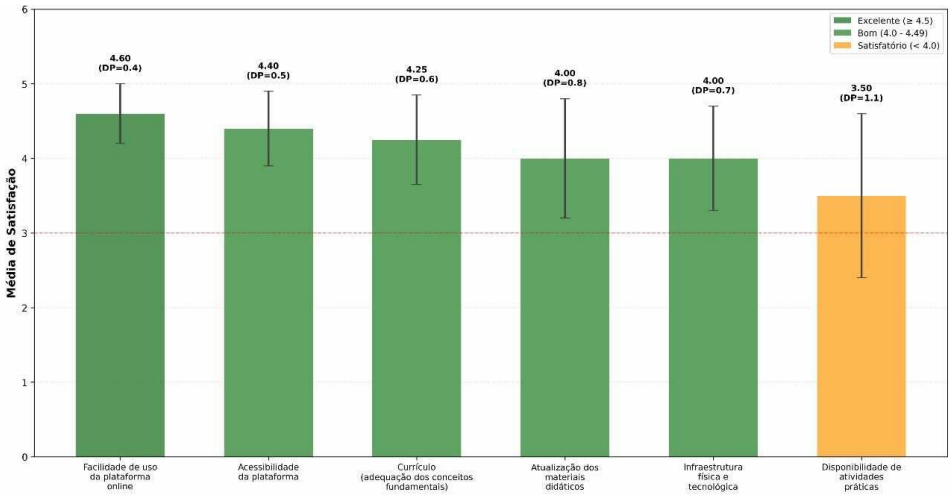
Data Analysis Procedures

The analysis of quantitative data involved the calculation of descriptive statistics, including means, standard deviations, and frequency distributions. For each evaluated dimension, satisfaction averages were calculated based on the responses to the 5-point Likert scale, allowing the identification of strengths and areas requiring improvement from the participants' perspectives. These data were organized into tables and graphically represented through different types of visualizations, including bar charts, comparative charts, and radar charts, facilitating the interpretation and communication of results. The analysis aimed not only to describe the data but also to interpret them in light of the literature on the evaluation of educational programs and training in computing and entrepreneurship.

Results: Overview of Student Satisfaction

The analysis of the data collected from students reveals a predominantly positive outlook across the various evaluated dimensions. As shown in the chart in Image 1, the satisfaction averages range from 3.5 to 4.6 on a scale from 1 to 5, indicating that most students hold a favorable perception of the aspects investigated. This result suggests that the program has met students' expectations across multiple fronts, although significant variations emerge among the different evaluated dimensions.

Image 1 – Student Perception Chart (Scale 1 to 5)



Source: Prepared by the authors (2025).

The dimension with the highest rating was the ease of use of the online platform, with an average of 4.6 and a standard deviation (SD) = 0.4. This result is particularly relevant given the growing importance of educational technologies in contemporary contexts. The high satisfaction with the platform suggests that investments in educational technology have yielded tangible outcomes, facilitating the learning process and increasing student engagement. This finding aligns with studies by Valente (2016) and Rege, Salgado, and Viterbo (2023), which emphasize the importance of well-structured digital environments for the development of computational thinking.

Conversely, the dimension with the lowest satisfaction average was the availability of practical activities, scoring 3.5 (SD = 1.1). Although this average is still considered satisfactory, it highlights an area that warrants special attention from program management. The importance of practical activities in computing and entrepreneurship programs is widely recognized in the

educational literature, as these activities allow students to apply theoretical knowledge in real-world contexts, developing essential competencies for the labor market (Dolabela; Filion; Laferté, 2013; Henrique; Cunha, 2008). The lower rating may be associated with limited access to suitable equipment or the need to increase the time allocated to practical projects within the curriculum.

Detailed Analysis by Dimension

Curriculum and Instructional Materials

Students' evaluation of the curriculum indicates a high level of satisfaction, with an average of 4.25 (SD = 0.6) for the adequacy of the fundamental programming concepts addressed. This result suggests that the curricular structure has effectively covered essential content in a clear and relevant manner. This positive perception aligns with the recommendations of Grover and Pea (2013) and Brackmann (2017), who emphasize the importance of a well-designed curriculum for the development of computational thinking.

However, when asked about the updating of instructional materials, the average was slightly lower (Mean = 4.0; SD = 0.8), suggesting room for improvement. In open comments, some students expressed interest in more practical examples and current case studies, particularly those related to the digital entrepreneurship context. This demand is consistent with findings by Carvalho and Corrêa (2022), who highlight the need for constant updates to instructional materials in entrepreneurship education programs.

Online Platform and Technological Resources

As noted earlier, the online platform received the highest satisfaction rating among students (Mean = 4.6; SD = 0.4). Students highlighted navigation ease, clarity of instructions, and availability of support resources as key strengths. Platform accessibility was also well rated (Mean = 4.4; SD = 0.5), indicating that students were able to consistently access content without major technical difficulties.

This is especially significant in the Brazilian context, where disparities in technological access still pose a considerable challenge (Macedo; Alves, 2025). The platform's positive

assessment suggests that the program has succeeded in mitigating some of these barriers, providing a high-quality digital learning experience.

Infrastructure and Laboratories

The physical and technological infrastructure received an average rating of 4.0 (SD = 0.7) from students. While this is a positive result, it is lower than the score assigned by teachers, who rated this dimension at 5.0 (SD = 0.0). This discrepancy suggests that, although the infrastructure may be technically adequate, students may still expect more modern equipment or spaces better aligned with their needs—indicating the need for management to refine its understanding of student expectations.

The literature on learning environments highlights that physical and technological infrastructure play an important role in student motivation and engagement (Luckesi, 2011). Therefore, it is advisable for program management to conduct a deeper analysis of students' specific expectations regarding this dimension to identify opportunities for improvement.

Practical Activities and Knowledge Application

As previously noted, the availability of practical activities received the lowest mean score among students (M = 3.5; SD = 1.1). This finding warrants particular attention, as practical activities are essential for consolidating learning in programming and entrepreneurship. Dolabela and Fillion (2013) emphasize that entrepreneurship education must be grounded in practical experiences that enable students to actively and contextually develop their competencies.

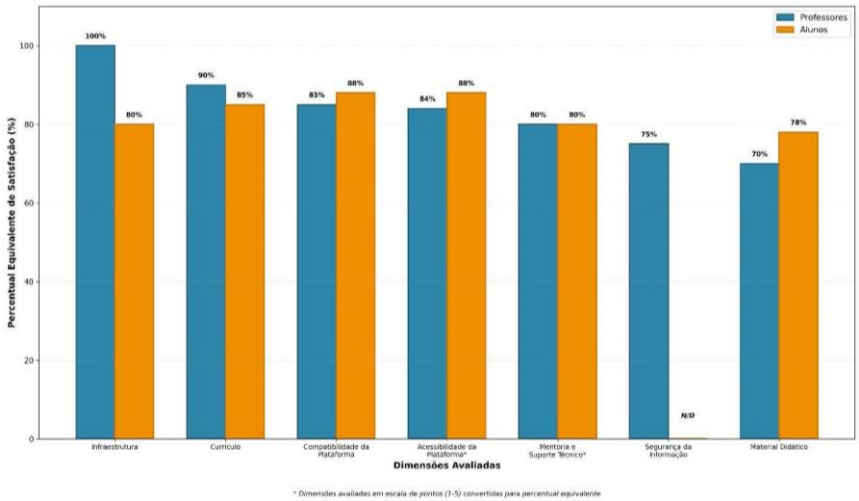
The analysis of open-ended comments revealed that many students would like more opportunities to engage in real-world projects in partnership with companies or community organizations. This demand aligns with international best practices in entrepreneurship education, which recommend the integration of practical projects and the strengthening of ties with the labor market (Filion; Laferté, 2003 *apud* Aveni, 2019).

Results and Analysis of Teachers' Data

Teachers' Perspective on the Program

The analysis of data collected from the program's instructors offers a complementary and equally valuable perspective on the quality and effectiveness of the educational initiative. As illustrated in the chart in Image 2, teachers reported generally positive perceptions across the different dimensions of the program, with satisfaction levels ranging from 70% to 100%. This range indicates that, although some aspects were rated very highly, there are also areas requiring attention and improvement.

Image 2 – Overall Perception Chart – Teachers vs. Students (All Program Dimensions)



Source: Prepared by the authors (2025).

Analysis of Teachers' Perceptions

Curriculum Assessment and Teaching Materials

The curriculum was rated highly by instructors, with 90% classifying it as Good or Excellent. This percentage surpasses the students' satisfaction regarding the fundamental curriculum concepts (85%), suggesting that teachers hold a broader and more favorable view of the program's curricular structure.

This difference may stem from teachers' more comprehensive understanding of the educational objectives and the articulation between curricular components. Furthermore,

instructors may evaluate the curriculum not only based on their immediate experience but also considering its alignment with professional standards and labor market demands.

Regarding teaching materials, 70% of instructors confirmed that the resources are multimedia and interactive. Although satisfactory, this percentage is lower than that reported by students (78%), indicating a possible divergence in expectations between instructors and learners concerning the desirable characteristics of educational materials.

Teachers' qualitative suggestions for improving teaching materials were particularly rich and specific, including: adoption of current market tools, revision of the didactic approach, and integration of tablets and specialized software. These suggestions reflect instructors' concern with keeping the program aligned with technological trends and contemporary professional demands.

Online Platform and Educational Technology

The accessibility of the online platform was rated by instructors at an average of 4.2 points, slightly lower than the students' evaluation (4.4 points). This discrepancy may reflect distinct expectations between teachers and learners regarding platform functionalities and features.

Device compatibility was confirmed by 85% of instructors, a percentage slightly below that reported by students (88%). This difference may be related to different usage patterns and technological needs across both groups.

Teachers' suggestions for enhancing the platform focused on pedagogical and organizational aspects, such as improved content integration, clearer modular organization, and regular updates. These recommendations underscore instructors' concern with the platform's pedagogical effectiveness, extending beyond technical features to emphasize the overall teaching and learning experience.

Infrastructure, Mentorship, and Technical Support

Infrastructure assessments yielded significant results, with 100% of instructors considering the laboratories adequate for program activities. Student perception, however, was lower, with 80% satisfaction. This divergence suggests that although the laboratories meet the pedagogical needs identified by teachers, students may have higher expectations or specific

demands regarding the facilities offered.

The mentorship and technical support program received an average score of 4.0 points from instructors. This convergence indicates that both students and teachers recognize the quality of the mentorship program, while also identifying opportunities for improvement.

Teachers' suggestions for enhancing mentorship and technical support were particularly detailed and included: implementation of communication training for instructors, the establishment of peer mentoring programs, and the creation of structured semiannual evaluations. These proposals reflect a systemic perspective on professional development and the continuous improvement of educational processes.

Assessment and Information Security

Regarding information security, 75% of instructors reported that the policies implemented are adequate. Although satisfactory, this percentage indicates an area requiring continuous attention, particularly given the growing importance of data protection in digital educational environments.

Suggestions for improvement included enhanced navigation control and real-time monitoring dashboards. These recommendations demonstrate a proactive concern with digital security and reflect instructors' technical knowledge of best practices in information security.

Online quizzes with immediate feedback were positively evaluated by 70% of instructors. Although satisfactory, this represents one of the lowest-rated dimensions among teachers, indicating a specific opportunity for improvement in the program's formative assessment systems.

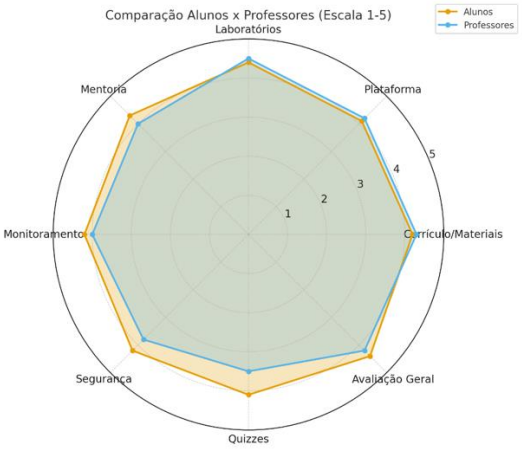
Comparative Analysis: Students' and Teachers' Perspectives

Convergences and Divergences in Perceptions

The comparative analysis between students' and teachers' perceptions, illustrated in the chart in Image 3, reveals meaningful patterns of convergence and divergence that provide valuable insights into the program's dynamics. This comparison is essential for understanding how different stakeholders perceive the same program aspects and for identifying areas where

expectations and experiences diverge.

Image 3 – Comparative Chart Between Students and Teachers



Source: Prepared by the authors (2025).

The radar chart comparing students' and teachers' perceptions (scale 1 to 5) highlights both convergences and relevant differences. Both groups evaluated the curriculum, teaching materials, online platform, laboratories, and mentorship program positively, with closely aligned mean scores. However, instructors showed greater optimism regarding the curriculum and laboratory infrastructure, while students assigned higher scores to information security, performance monitoring, and—most notably—online quizzes.

Overall, mean scores across all dimensions remained above 4.0, indicating a broadly satisfactory perception. Nevertheless, the distinct emphases between the groups suggest that while students place greater value on practical utility and immediate feedback, instructors tend to prioritize pedagogical adequacy and curricular structure as core strengths of the program.

Comparative Dimensional Analysis

Curriculum and Instructional Materials

An interesting dynamic emerges when examining the curriculum dimension across both groups. Faculty members reported slightly higher satisfaction levels (90%) compared with students (85%), particularly regarding the curriculum's coverage of fundamental concepts. This

discrepancy may be attributed to faculty having a broader understanding of educational objectives and curricular articulation, while students tend to evaluate based on their immediate learning experience.

Although both groups acknowledge the overall quality of the curriculum, their qualitative suggestions reveal distinct priorities. Students emphasize the need for more practical activities and applied projects, reflecting their interest in tangible learning experiences directly connected to the labor market. Conversely, faculty highlight the importance of technological updates and the incorporation of current tools, demonstrating their concern with maintaining the program's relevance and contemporary alignment.

Online Platform and Technological Resources

Evaluation of the online platform shows a notable convergence between students and faculty, with both groups recognizing its quality and effectiveness. Multidevice compatibility was confirmed by 88% of students and 85% of faculty, indicating shared acknowledgment of this key functionality.

However, improvement suggestions reveal complementary perspectives. Students focus on user-experience aspects, such as enhanced visual organization and reduced system bugs. Faculty, on the other hand, emphasize pedagogical enhancements, including better content integration and clearer modular organization. These differences reflect the distinct ways each group interacts with the platform and their respective needs and expectations.

Infrastructure and Laboratories

One of the most significant divergences between students' and faculty perceptions involves the evaluation of infrastructure. While 100% of faculty consider the laboratories adequate, only 80% of students share this view. This notable discrepancy warrants careful interpretation and may stem from multiple factors.

Faculty tend to assess infrastructure based on its alignment with pedagogical objectives and its sufficiency for planned activities. Students, meanwhile, may hold different expectations, influenced by comparisons with other institutions, previous experiences, or aspirations for more advanced technologies. Student suggestions for improvement include increasing the availability of modern equipment and expanding opportunities for collaborative projects. These

recommendations indicate that, although functional, the current infrastructure has potential for enhancements that could significantly improve student satisfaction and program effectiveness.

Mentoring and Technical Support

In the mentoring and technical support dimension, faculty acknowledge the quality and importance of the available programs, reporting average ratings of 4.0 points. This convergence suggests that both students and faculty appropriately value the support systems provided.

Nonetheless, improvement suggestions again reveal complementary viewpoints. Students prioritize accessibility and responsiveness of support services, while faculty highlight broader systemic needs, such as communication training and peer mentoring initiatives. These differing perspectives reflect the distinct roles and responsibilities each group holds within the educational environment.

Implications of Convergences and Divergences

The convergences identified in this comparative analysis highlight aspects of the program that effectively meet the expectations of both groups. These areas represent consolidated strengths that should be maintained and leveraged. High satisfaction with the online platform, for instance, signals that investments in educational technology have produced positive outcomes recognized by all stakeholders.

Divergences, in turn, should not be interpreted strictly as shortcomings. Rather, they offer opportunities to better understand the distinct needs of each group and to develop more targeted strategies. The gap in perceptions regarding infrastructure, for example, may guide future investments that respond both to the pedagogical requirements emphasized by faculty and to the students' desire for more modern and diverse resources.

Overall, the comparative analysis shows that, although differences exist between the perspectives of students and faculty, these distinctions are complementary and provide a more comprehensive understanding of the program. Convergences indicate areas of success, while divergences reveal opportunities for improvement that can enhance the experience of both groups.

Discussion of results

The results presented in this study outline a significant overview of the EPES program, with average ratings above 4.0 in most dimensions evaluated. This is particularly noteworthy given the context of innovative educational programs, which often face challenges related to the implementation of new methodologies and technologies.

High levels of satisfaction with the online platform (mean score of 4.4 among students) represent a particularly relevant finding, especially considering the increasing importance of educational technologies. This result suggests that the program has effectively integrated technological resources into the learning process, providing a high-quality digital learning experience.

The convergence between student and faculty perceptions across several dimensions indicates that the program has been successful in aligning expectations and experiences among different stakeholders. Such alignment is fundamental to the sustainability and effectiveness of educational initiatives, as it demonstrates that pedagogical objectives are being clearly communicated and successfully implemented.

Areas of Excellence Identified

Several dimensions of the program emerged as areas of excellence, warranting recognition and serving as benchmarks for comparable initiatives. The online platform stands out clearly as one such area, with exceptional evaluations in both usability and accessibility. The ease of use reported by 92% of students and the compatibility with multiple devices confirmed by 88% of participants demonstrate that investments in educational technology have yielded tangible results.

The curriculum also emerges as a core strength, with 90% of teachers rating it as Good or Excellent and 85% of students considering it to adequately cover fundamental concepts. This positive perception is critical, as the curriculum constitutes the foundation upon which the entire educational program is structured.

Infrastructure, despite divergent perceptions between students and teachers, is unanimously considered adequate by faculty (100% approval). This outcome indicates that, from a pedagogical standpoint, the facilities meet programmatic needs, although opportunities

may exist to enhance student satisfaction.

Challenges and Opportunities for Improvement

Despite the significant outcomes, the analysis identified several dimensions with targeted opportunities for improvement. The availability of practical activities, with a 70% satisfaction rate among students, represents the primary area of concern identified in the study. This dimension is particularly critical in programming and entrepreneurship programs, where hands-on application of knowledge is essential for the development of professional competencies.

The divergence in perceptions of infrastructure between students (80% satisfaction) and teachers (100% adequacy) suggests the need for a deeper analysis of students' expectations and specific needs. This discrepancy may indicate opportunities for investment in more modern equipment or the creation of spaces better aligned with student expectations.

Teaching materials, although positively evaluated, present room for improvement, particularly from the teachers' perspective, who recommend greater integration of current market tools and revisions to pedagogical approaches. This area represents an opportunity for updates that could further enhance the relevance and effectiveness of the program.

Limitations in Analytical Depth

Although the study combined quantitative and qualitative data, there remains an opportunity to analyze open-ended responses more deeply by expanding content analysis methods or conducting in-depth interviews with selected participants to generate richer insights into their experiences and perceptions.

Furthermore, the absence of academic performance data or objective learning outcomes limits the ability to correlate participant perceptions with more tangible indicators of program effectiveness. Future studies may benefit from the integration of multiple data sources to enable a more comprehensive assessment.

Considerations for Future Studies

Longitudinal studies are recommended to track changes in participant perceptions over time, enabling more comprehensive insights into program dynamics and the effectiveness of implemented improvements.

Incorporating academic performance data and learning outcomes in future evaluations could provide a broader perspective on program effectiveness. Additionally, comparative studies with similar programs in other contexts may help identify best practices and potential opportunities for enhancement.

Final Considerations

This study aimed to understand the perceptions of students and teachers regarding the EPES program, seeking to identify its strengths, weaknesses, and opportunities for improvement. The guiding research question was: What are the perceptions of students and teachers regarding the program's curriculum structure, methodology, infrastructure, and pedagogical resources, and how can these perceptions inform improvements to the initiative?

The results indicate that the program demonstrates a high level of quality and effectiveness, as evidenced by mean scores above 4.0 in most evaluated aspects. The online platform (M = 4.6) and the curriculum (M = 4.25) stand out as the strongest points in students' perceptions, while teachers positively evaluated the infrastructure (M = 5.0) and assessment systems (M = 4.8). These findings indicate that the program has been able to adequately meet participant expectations and fulfill its educational objectives, contributing to the development of technical and entrepreneurial competencies among youth.

However, the analysis also identified areas requiring attention. The availability of practical activities (M = 3.5) received the lowest mean score among students, signaling the need to expand opportunities for the practical application of acquired knowledge. This finding aligns with the literature on entrepreneurship education, which emphasizes the importance of practical experiences for the development of entrepreneurial competencies (Dolabela; Filion; Laferté, 2013; Henrique; Cunha, 2008). Additionally, the divergence between student and teacher perceptions of infrastructure suggests that, although resources may be technically adequate, student expectations regarding more modern equipment or more suitable learning spaces may

not be fully met.

The convergence in perceptions between students and teachers across several dimensions demonstrates alignment between pedagogical objectives and learning experiences, indicating effective program implementation. The divergences identified, in turn, provide valuable insights into the specific needs of each group and can guide more targeted improvement strategies.

This study contributes to the body of knowledge in the field by providing empirical evidence on the implementation of programs that integrate programming and entrepreneurship in local Brazilian contexts, addressing a gap in national literature and informing strategic decision-making and continuous improvement not only for the evaluated program but also for similar initiatives in other regions of the country.

Finally, this study reinforces the importance of systematic program evaluation as a management and continuous improvement tool. The active participation of students and teachers in the evaluation process not only provides valuable data for program management but also contributes to participant engagement and to the development of a culture of quality and educational excellence. The EPES program stands as a promising example of how the integration of technical and entrepreneurial competencies can prepare young people for the challenges of the twenty-first century, and the results of this study offer clear directions for its strengthening and expansion.

REFERENCES

ALKAABI, K.; SENGHORE, S. Student entrepreneurship competency and mindset: examining the influence of education, role models, and gender. **Journal of Innovation and Entrepreneurship**, v. 13, article 36, 2024. DOI: 10.1186/s13731-024-00393-5

ALKIN, Marvin C.; KING, Jean A. The historical development of evaluation use. **American Journal of Evaluation**, v. 37, n. 4, p. 568–579, 2016. DOI: 10.1177/1098214016665164

ARRANZ, Nieves; UBIERNA, Francisco; ARROYABE, Marta. F.; PEREZ, Carlos; FDEZ. DE ARROYABE, J.C. Entrepreneurial intention and obstacles of undergraduate students: the case of the universities of Andalusia. **Studies in Higher Education**, v. 42, n. 11, p. 2011–2027, 2017. DOI: 10.1080/03075079.2018.1486812

AVENI, Alessandro. **Empreendedorismo contemporâneo**: teorias e tipologias. São Paulo: Atlas, 2019.

BARR, Valerie; STEPHENSON, Chris. Bringing computational thinking to K–12: what is involved and what is the role of the computer science education community? **ACM Inroads**, v. 2, n. 1, p. 48–54, 2011. DOI: 10.1145/1929887.1929905

BHIMANI, Hardik; MENTION, Anne Laure; BARLATIER, Pierre Jean. social media and innovation: A systematic literature review and future research directions. **Technological Forecasting and Social Change**, v. 144, p. 251–269, 2019. DOI: 10.1016/j.techfore.2018.10.007

BRACKMANN, Christian Puhlmann. **Desenvolvimento do pensamento computacional através de atividades desplugadas na educação básica**. 2017. 226 f. Tese (Doutorado em Informática na Educação) – Universidade Federal do Rio Grande do Sul, Porto Alegre, 2017. Disponível em: https://lume.ufrgs.br/handle/10183/172208.

BRASIL. Ministério da Educação. **Base Nacional Comum Curricular (BNCC)**. Brasília: MEC, 2018. Available at: https://basenacionalcomum.mec.gov.br/. Accessed in: 02 Dec. 2025.

CARVALHO, Agair Juliete Cavalcante; CORRÊA, Rubia Oliveira; CARVALHO, Gustavo Dambiski Gomes; OLAVE, Maria Elena Leon. Educação empreendedora no ensino básico: identificando desafios a partir de uma análise bibliométrica e da revisão sistemática. **REGEPE – Revista de Empreendedorismo e Gestão de Pequenas Empresas**, v. 11, n. 1, p. 1–25, 2022. DOI: 10.14211/ibjesb.e2032

CHEN, G.; SHEN, J.; BARTH-COHEN, L.; JIANG, S.; HUANG, X.; ELTOUKHY, M. Assessing elementary students' computational thinking in everyday reasoning and robotics programming. **Computers & Education**, v. 109, p. 162–175, 2017. DOI: 10.1016/j.compedu.2017.03.001

DOLABELA, Fernando; FILION, Louis Jacque. Fazendo revolução no Brasil: a introdução da pedagogia empreendedora nos estágios iniciais da educação. **REGEPE – Revista de Empreendedorismo e Gestão de Pequenas Empresas**, v. 3, n. 2, p. 134–181, 2013. DOI: 10.14211/regepe.v2i3.137

FARIAS, Ana Paula Silva. O ensino do empreendedorismo na educação básica representa um novo paradigma? **Revista FOCO**, V.11, n. 3, p. 35-52, jul./out. 2018. DOI: 10.28950/1981-223x_revistafocoadm/2018.v11i3.577.

FERRARI, Anusca. **Digital competence in practice**: an analysis of frameworks. Seville: JRC-IPTS, 2012.

FERREIRA, Andreuma Gueges; MIGUEL, Joelson Rodrigues. A Importância da Educação Empreendedora nos Processos de Ensino e Aprendizagem. **ID on line Revista Multidisciplinar e de Psicologia,** v.14, n. 50, p. 331-351, maio/2020. DOI: 10.14295/idonline.v14i50.2440

FILION, Louis Jacques. Empreendedorismo: empreendedores e proprietários-gerentes de pequenos negócios. **Revista de Administração**, v. 34, n. 2, p. 5–28, 1999. Available at: https://rausp.usp.br/wp-content/uploads/files/3402005.pdf. Accessed in: 02 Dec. 2025.

FORGEARD, Marie. J. C.; KAUFMAN, James. C. Who cares about imagination, creativity, and innovation, and why? A review. **Psychology of Aesthetics, Creativity, and the Arts**, v. 10, n. 3, p. 250–269, 2016. DOI: 10.1037/aca0000042

GRESSE VON WANGENHEIM, Christiane; RODRIGUES NUNES, Vinícius; DOS SANTOS, Giovane Daniel. Ensino de computação com SCRATCH no ensino fundamental: um estudo de caso. **Revista Brasileira de Informática na Educação**, v. 22, n. 3, p. 115-125, 2014. DOI: 10.5753/rbie.2014.22.03.115

GROVER, Shuchi; PEA, Roy. Computational thinking in K–12: a review of the state of the field. **Educational Researcher**, v. 42, n. 1, p. 38–43, 2013. DOI: 10.3102/0013189X12463051

GUIMARÃES, Jairo de Carvalho; LIMA, Marcos Antonio Martins. Empreendedorismo educacional: reflexões para um ensino docente diferenciado. **Revista Pensamento Contemporâneo em Administração**, v. 10, n. 2, p. 34–48, 2016. DOI: 10.12712/rpca.v10i2.11263

HENRIQUE, Daniel Christian; CUNHA, Sieglinde Kindl da. Práticas didático-pedagógicas no ensino de empreendedorismo em cursos de graduação e pós-graduação nacionais e internacionais. **RAM – Revista de Administração Mackenzie**, v. 9, n. 5, p. 112–136, 2008. Available at: https://editorarevistas.mackenzie.br/index.php/RAM/article/view/187. Accessed in: 02 Dec. 2025.

KWON, K.; OTTENBREIT-LEFTWICH, A. T.; BRUSH, T. A.; JEON, M.; YAN, G. Integration of problem-based learning in elementary computer science education: effects on computational thinking and attitudes. **Educational Technology Research and Development**, v. 69, p. 2761–2787, 2021. DOI: 10.1007/s11423-021-10034-3

LEONARD, Jacqueline; BUSS, Alan; GAMBOA; Ruben; MITCHELL, Monica; FASHOLA, Olatokunbo S.; HUBERT, Tarcia; ALMUGHYIRAH, Sultan. Using robotics and game design to enhance children's self-efficacy, STEM attitudes, and computational thinking skills. **Journal of Science Education and Technology**, v. 25, n. 6, p. 860–876, 2016. DOI: 10.1007/s10956-016-9628-2

LI, Yeping; SCHOENFELD, Alan H.; diSESSA, Andrea A.; GRAESSER, Arthur C.; BENSON, Lisa C.; ENGLISH, Lyn D.; DUSCHL, Richard A. On Computational Thinking and STEM Education. **Journal for STEM Educ Res**, v. 3, p. 147–166, 2020. 10.1007/s41979-020-00044-w

LILLEVÄLI, Uku; TÄKS, Marge. Competence models as a tool for conceptualizing the systematic process of entrepreneurship competence development. **Education Research International**, v. 2017, article ID 5160863, 2017. DOI: 10.1155/2017/5160863

LIU, Zhichun; GEARTY, Zarina; RICHARD, Eleanor; ORRILL, Chandra Hawley; KAYUMOVA, Shakhnoza; BALASUBRAMANIAN, Ramprasad. Bringing computational thinking into classrooms: a systematic review on supporting teachers in integrating computational thinking into K-12 classrooms. **International Journal of STEM Education**, v. 11, n. 51, 2024. DOI: 10.1186/s40594-024-00510-6

LUCKESI, Cipriano Carlos. **Avaliação da aprendizagem escolar**: estudos e proposições. 22. ed. São Paulo: Cortez, 2011.

MACEDO, Lidiane Caroline Sales; ALVES, Fábio José da Costa. As contribuições do pensamento computacional na educação básica: a tecnologia como ferramenta de aprendizagem. **Debates em Educação**, v. 17, n. 1, p. 45–68, 2025. DOI: https://doi.org/10.28998/2175-6600.2025v17n39pe18396

MURPHY, Patrick J.; LIAO, Jianwen; WELSCH, Harold P. A conceptual history of entrepreneurial thought. **Journal of Management History**, v. 12, n. 1, p. 12–35, 2006. DOI: 10.2139/ssrn.818604

NOURAEY, Peyman; AL-BADI, Ali; RIASATI, Mohammad Javad; MAATA, Rolou Lyn. Educational Program and Curriculum Evaluation Models: A Mini Systematic Review of the Recent Trends. **Universal Journal of Educational Research**, v. 8, n. 9, p. 4048-4055, 2020. DOI: 10.13189/ujer.2020.080930

PHILLIPS, Wendy; LEE, Hazel; GHOBADIAN, Abby; O'REGAN, Nicholas; JAMES; Peter. (2014). Social Innovation and Social Entrepreneurship: A Systematic Review: A Systematic Review. **Group & Organization Management**, v. 40, n. 3, p 428-461. DOI: 10.1177/1059601114560063

REGE, Antonio; SALGADO, Luciana Cardoso de Castro; VITERBO, José. Pensamento computacional no contexto da educação brasileira: um mapeamento sistemático. **RENOTE – Revista Novas Tecnologias na Educação**, v. 21, n. 2, p. 1–10, 2023. DOI: 10.22456/1679-1916.137777

SOMMARSTRÖM, Kaarina.; OIKKONEN, Elena.; PIHKALA, Timo. Entrepreneurship education – paradoxes in school–company interaction. **Education and Training**, v. 62, n.7/8, p. 933-945, 2020. DOI: 10.1108/ET-08-2019-0171

VALENTE, José Armando. Integração do pensamento computacional no currículo da educação básica: diferentes estratégias usadas e questões de formação de professores e avaliação do aluno. **Revista e-Curriculum**, v. 14, n. 3, p. 864–897, 2016. Available at: https://revistas.pucsp.br/index.php/curriculum/article/view/29051, Accessed in: 02 Dec 2025.

VALENTE, José Armando. Pensamento computacional, letramento computacional ou competência digital? Novos desafios da educação. **Revista Educação e Cultura Contemporânea**, v. 16, n. 43, p. 147–168, 2019. DOI: 10.5935/2238-1279.20190008

WIJNEN, Frances; VAN DER MOLEN, Juliette Walma; VOOGT, Joke. Primary school teachers' attitudes toward technology use and stimulating higher-order thinking in students: a review of the literature. **Journal of Research on Technology in Education**, v. 55, n. 4, p. 545-567, 2023. DOI: 10.1080/15391523.2021.1991864

WING, Jeannette M. Computational thinking. **Communications of the ACM**, v. 49, n. 3, p. 33–35, 2006. DOI: 10.1145/1118178.111821

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