Migration Letters

Volume: 21, No: 1, pp. 521-532

ISSN: 1741-8984 (Print) ISSN: 1741-8992 (Online)
www.migrationletters.com

Didactics for Problem Solving in Engineering Programs

José Rafael García- González[1], Juan Manuel Rúa-Áscar[2], Paola Andrea Sánchez-Sánchez[3]

Abstract

Objective: This article presents a didactic alternative for addressing problem-solving in engineering programs. Methodology: Using a socio-critical approach, theoretical categories associated with problem-solving and its dynamics in the teaching-learning process in engineering education are identified, defined, organized, and systematized.

Results: A theoretical and methodological approach is presented, highlighting the different identified categories and their relationship with the teaching-learning processes of problem-solving through a didactic structure as a system that promotes learning in students of these programs.

Conclusions: Based on the didactic structure, a methodological proposal is generated, focusing on the development of critical and systemic thinking, fostering the development of professional skills and comprehensive education.

Keywords: *Problem-solving, teaching-learning, didactic, systemic thinking, critical thinking, comprehensive education.*

Introduction

In the present article, the contributions of the doctoral research "Didactics for Problem-Solving in Engineering Programs" are systematized and summarized. The objective of this research is to explore recent advancements and future perspectives in problem-solving in engineering. Innovative approaches, methodologies, tools, and techniques developed to enhance and optimize processes related to problem-solving in various engineering disciplines will be examined (Rúa, 2021).

In recent decades, the development of science, technology, and innovation has seen significant growth in all sectors of the global economy. From this perspective, business and competitiveness processes worldwide have been influenced by various factors related to the incorporation of new and improved information management tools, as well as new models for managing the different resources available to companies and organizations. This situation has spurred a new dynamic in the so-called knowledge society, leading to transformations at the social, political, cultural, and economic levels, even amid the various effects of the global COVID-19 pandemic.

These transformations occurring within economic, academic, scientific, social, and business organizations, among others, have fostered an integrative dynamic. In this context, professional engineering education programs have become a strategic alternative and professional endeavor aimed at contributing to the improvement of processes and

---

[1] Engineering Faculty, Universidad Simón Bolívar, Barranquilla, Colombia, jose.garciag@unisimon.edu.co
[2] Engineering Faculty, Universidad Simón Bolívar, Barranquilla, Colombia, juan.ruaa@unisimon.edu.co
[3] Engineering Faculty, Universidad Simón Bolívar, Barranquilla, Colombia, paola.sanchezs@unisimon.edu.co

conditions within these organizations through the inherent theoretical and methodological contributions of their curriculum. In this sense, the academic mission presupposes the promotion and commitment to educate professionals with critical thinking skills, capable of developing knowledge and abilities for transforming a world increasingly influenced by the effects of a globalized economy.

Advanced education through higher-level scientific studies enables the utilization of opportunities arising from globalization in the realms of production, information, communication, and human interaction, in order to meet the demands and requirements of the contemporary world.

In this regard, it is essential to adopt an analytical, critical, reflective, and comprehensive (holistic) approach to problems instead of getting stuck with limited solutions that only address a part of them and the system they belong to. It is crucial to consider the interactions and interrelationships with other elements associated with their environment. In this way, we avoid falling into a vicious circle and can better understand the complexity of the situation.

Problem-solving is an essential component of engineering and plays a fundamental role in the development of innovative and efficient solutions to address the technological and social challenges of our time. Engineers constantly face a wide variety of complex problems that require an analytical, creative, and systematic approach to find effective solutions. In this context, the study and application of innovative approaches to problem-solving in engineering have gained increasing relevance in recent years.

Considering the above, it is imperative that organizations in all economic sectors have professionals with advanced knowledge in research and project development processes, information and communication technologies, education and training, organizational management, sustainable technological development, as well as technological and social innovation. These professionals must be capable of responding promptly and effectively to the changing reality of organizational structures and their information needs to promote their productivity, competitiveness, and sustainability.

However, the demands of a society increasingly influenced by various cultural aspects resulting from globalization require that the university, as part of the educational system, commit to training professionals in the field of engineering. These professionals must be able to operate in a space, context, and universe defined by the priority needs of their respective regions. This implies a shift in mindset towards a critical approach to addressing challenges and, therefore, proper contextualization of the proposed solutions for these challenges.

Through the analysis of the academic dynamics in systems engineering programs, it is observed that students in their first semester achieve unsatisfactory academic results in those subjects or courses where the pedagogical approach is based on problem-solving, which is a fundamental part of the implemented academic strategy.

It is for these reasons that these difficulties are addressed through various publications cited by Muñoz Hueso (2018), which have concluded that students exhibit deficiencies in higher order thinking skills, leading to superficial levels of understanding and transfer (application of what is learned outside the classroom). Additionally, they present deficits in questioning and coping with uncertain or confusing situations.

According to Bolaños Vivas (2017), the teaching-learning process of problem-solving in the systems engineering program is characterized by transmission-based and repetitive educational practices, lacking any form of innovation. It is asserted that teaching based on solving exercises prevails instead of focusing on solving real problems, which is ideal and necessary (Bolaños Vivas, 2017). Furthermore, the same author reiterates that these teaching practices do not reflect the interests and learning needs of students in terms of the dynamics and experiential environments involved in their daily lives (Bolaños Vivas, 2017). In a similar vein, Darling-Hammond and Youngs (2002) point out that academics, who are experts in their respective fields and often have enriching experiences, often do not show concern for pedagogical methods in higher education (Darling-Hammond & Youngs, 2002).

As a result, the teaching-learning process (TLP) refers to the process that links the teacher's activity (teaching) with the students' activity (learning). This process is the subject of study of this research, following the proposal of Alvarez de Zayas (2004).

In the same vein and based on what Alvarez de Zayas (2004) proposes, the learning process of problem-solving in systems engineering programs was identified as the field of research that supports this article. This process is considered the stage for the development of the didactic proposal, and it contains the necessary elements to understand and evaluate the specific contributions of didactics in its dynamics.

Considering the authors' experience and the contributions of various consulted sources, the following research question is posed with the aim of proposing improvements in the teaching-learning process based on problem-solving in the systems engineering program: ¿How can we promote problem-solving learning in engineering students? This question aligns with the proposed objective, which was to propose a didactic approach for problem-solving learning in the systems engineering program (Rúa, 2021).

This proposal has allowed for the creation of a conducive environment for the higher education students' learning process, while also promoting their commitment to learning. In this way, the aim is to develop competencies, skills, and abilities that enable them to progress as professionals in an increasingly demanding work environment, a result of economic globalization, the impact of technologies, and the ongoing processes of social transformation experienced in most countries in Latin America and the world.

Methodology

The research was grounded in the methodological principles of the interpretative approach, aiming to deeply explore the teaching-learning process and uncover the realities of the individuals involved. The goal is to understand their interests, beliefs, actions, and perceptions of the environment, among other relevant aspects. The purpose is to design a comprehensive proposal that promotes the achievement of established objectives (Rúa-Ascar & García-González, 2018).

This article presents the results of a doctoral research based on problem-solving in professional engineering systems programs, which methodologically relies on the guiding principles of the interpretative paradigm. This approach allowed for the objective and critical study of the didactic process as a systemic structure, enabling the identification of the realities of those involved in the process, highlighting their interests and specific circumstances (Rúa, 2021) (Rueda & Vilarroel, 1992).

Additionally, the contributions of the holistic research and the hermeneutic-dialectical analysis are systematized, understood as one of the theoretical methods associated with the didactic construction process that facilitated the qualitative data analysis (Rueda & Vilarroel, 1992) (Arráez, Calles, & Moreno de Tovar, 2006).

Consequently, the hermeneutic-dialectical method was assumed through the articulation of a theoretical framework of categories that served as the basis for the identification, understanding, and explanation of the structures or dynamic systems that occur within social organizations. This structuring led to the development of an organized planning strategy in three (3) main phases (Rueda & Vilarroel, 1992):

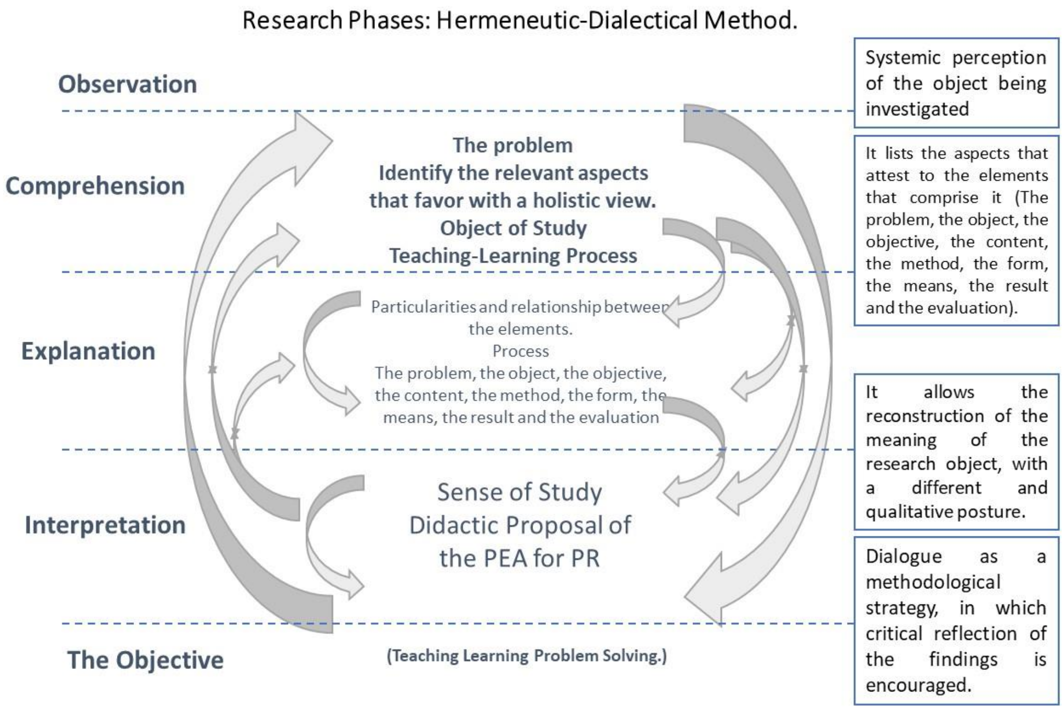
- Phase 1: Defined as the comprehension phase, which is described as the comprehensive understanding of the object of study, implying perceiving it in its entirety and having the ability to interpret and identify its relevant aspects. This holistic approach seeks to promote a complete and profound view of the object.

- Phase 2: Defined as the explanation phase, which allowed for a critical and objective description of the teaching-learning process for problem-solving, enabling the identification of different criteria for integrating the various elements of the research's theoretical design in a systematic manner (García-González & Sánchez-Sánchez, 2020).
- Phase 3: Defined as the interpretation phase, which enabled the total identification of different aspects and elements associated with understanding the dynamics of the teaching-learning process, thereby comprehending the problem-solving process from a systemic perspective (Rueda & Vilarroel, 1992).

As described in the previous section, during the comprehension stage, a detailed analysis of didactic approaches in the teaching-learning process and problem-solving was conducted. The purpose was to understand the complexity of didactics for problem-solving from a global and comprehensive perspective, and as show in Figure 1.

Initially, different criteria for the difficulties in understanding the problem-solving process by engineering students were identified. Additionally, the various didactic categories were identified and related in a systemic manner to obtain an approach to the internal components of the problem-solving process and its didactic relationships, along with the identification of the theoretical and epistemic foundations that shape it in the education of engineers.

Fig. 1. Research Phases: Hermeneutic - Dialectical Method.



Systemic perception of the object being investigated

It lists the aspects that attest to the elements that comprise it (The problem, the object, the objective, the content, the method, the form, the means, the result and the evaluation).

It allows the reconstruction of the meaning of the research object, with a different and qualitative posture.

Dialogue as a methodological strategy, in which critical reflection of the findings is encouraged.

Source: Own elaboration from (Fuentes, Matos , & Cruz, 2004).

In the second phase, corresponding to the explanation, the objective was to characterize the teaching-learning process of problem-solving by identifying the characteristics and peculiarities of the process. Moreover, it aimed to identify the relationships among the various elements of the research's theoretical design.

Finally, in the interpretation stage, the creation of a model that offers a new understanding of the object of study was achieved. This model is based on a proposal that focuses on the field of action and contributes to problem-solving.

As can be seen in Figure 1, the ideas related to hermeneutic praxis in its various areas were logically, coherently, and functionally integrated, along with those derived from the dialectical conception of knowledge. The objective was to have an objective, practical, and efficient variant of the hermeneutic-dialectical method applied to research in stages. These stages are not linear but complement each other.

Results

After the research stage and identifying and describing the methodological design, this section aims to specify each of the stages of the proposed model, not without first offering some conceptions regarding didactics as a preamble, the central axis of the study.

After examining our professional experience, that of our future colleagues, and those with extensive careers, it has been recognized that the problems in both educational practice and the professional field are complex and have multiple causes. These challenges require a higher level of professionalism and commitment to carry out the necessary transformations. Therefore the teaching-learning process is considered complex, with multiple factors and interactions, where conditions play a fundamental role in favoring or hindering the process and the results obtained. Various alternatives must be analyzed based on the desired outcomes and the necessary processes must be activated to achieve them (Addine, 2004).

It's worth noting that goodwill or vocation alone is not enough to become a teacher. It's also necessary to acquire strategies, make use of pedagogical resources, study specialized knowledge, become familiar with fundamental works and authors, and, in conclusion, truly qualify oneself in the discipline of teaching. This requires engaging in a genuine professional field with specific curricula and practices, alongside teaching proposals that harmoniously combine the "what" and the "how" of effective teaching (Alvarez de Zayas, 2004).

Didactic Proposal:

Problem-solving is based on preparing students in the teaching-learning process, but from the perspective of their future field of action. In other words, the assimilation of knowledge by students takes place within their lives and society, which enhances experiential and developmental learning (Ortiz, 2012) (Velasco Ramírez, 2020).

Next, the classroom dynamics are described, beginning with the teacher's request for students to propose alternative solutions to a given problem. The student should refer to the didactic model as follows:

1. Identifying the nature and components of the problem.

In this phase, the student may use guiding questions such as, ¿" What is the unknown?" "What are the data?" These questions help identify relevant aspects such as causes, effects, and variables associated with the problem.

2. Formulating the problem.

This phase is where the research idea is formally structured. A good problem formulation necessarily involves delimiting the research scope, clearly defining the boundaries within which the solution will be developed. In this phase, guiding questions may include, ¿" Have you encountered a similar problem?" "Do you know of a problem related to this one?" "Could you phrase the problem differently?" "Have you used all the data?" These questions will enable the use of relevant tools and techniques for problem formulation.

3. Solving the problem through the application of engineering, science, and mathematical principles.

In this phase is where the student truly integrates the acquired knowledge, their historical-social context, previous experiences, and creativity. The question that can guide this phase is, "Are the steps taken, correct?" This will allow for the appropriate and rigorous application of engineering, science, and mathematical principles to solve the problem.

4. <u>Expressing their arguments and concepts clearly through oral, written, graphic, and other means, starting from the proposed solution.</u>

In this phase, the student expresses or externalizes their solution proposal. The questions that can guide the development of this phase are, "Can you verify the result?" "Can you verify the reasoning?" These inquiries will help build an experiential support through which the student draws relevant conclusions for problem-solving and suggests new applications of the solution. Work in collaborative environments.

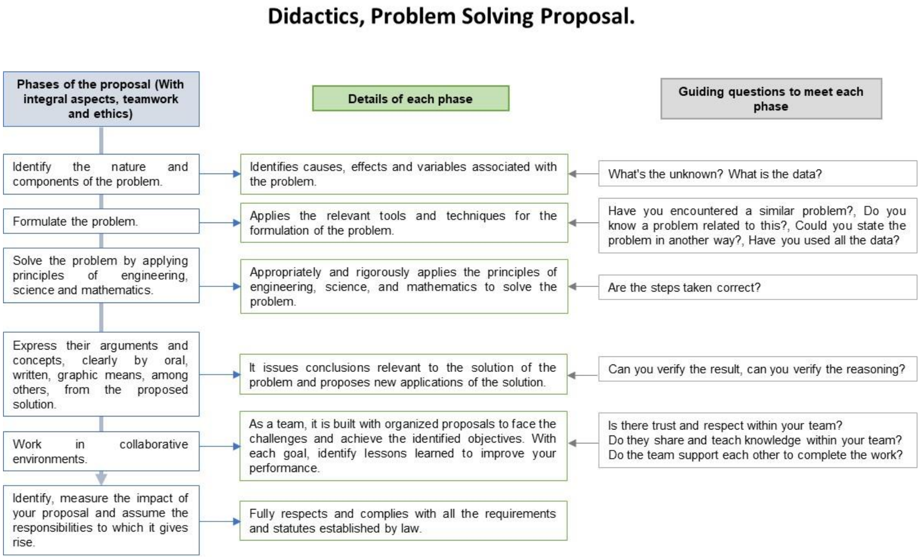
This phase is characterized by the student evaluating their contribution to the process as an individual, which also includes developing teamwork skills and thereby promoting balance among all process participants. Additionally, this phase aims to enhance self-learning and the development of skills and abilities associated with self-discovery, autonomous learning, optimal resource management, among other considerations.

The questions that can guide this phase are: "Is there trust and respect within your team?" "Do team members share and teach knowledge within the team?" "Do team members support each other to complete the work?" These questions encourage the team to build organized proposals to address challenges and achieve identified objectives. With each goal, identify lessons learned to improve performance.

5. <u>Identifying, measuring the impact of their proposal, and assuming the resulting responsibilities.</u>

In this stage, the didactic proposal for addressing problems in engineering programs was developed, as shown in the form of a structure in Figure 2. It is important to note that, although the structure is organized into phases, these do not follow a linear order but are integrally related, promoting feedback processes and continuous improvement if the problem requires it. In this way, it implicitly aligns with the hermeneutic-dialectical research method approach.

Fig. 2. Didactics, Problem-Solving Proposal.



Source: Rúa-Ascar J. 2021.

Discussion of Results:

The Teaching-Learning Process (TLP) is the process that, in its development, relates the teacher's activity (teaching) to the students' activity (learning) as they interact with a certain subject of study. In the words of Álvarez de Zayas, the TLP is the process of efficient formation (Alvarez de Zayas, 2004).

This efficiency will be described below, where the articulation between each component and its context is evident. The didactics for problem-solving emerges from the experiential characterization of the teaching-learning process, in which the articulation between each of its constitutive elements becomes clear (Figure 3):

1. Teaching is, in turn, the activity carried out by the teacher to enable the student to learn.

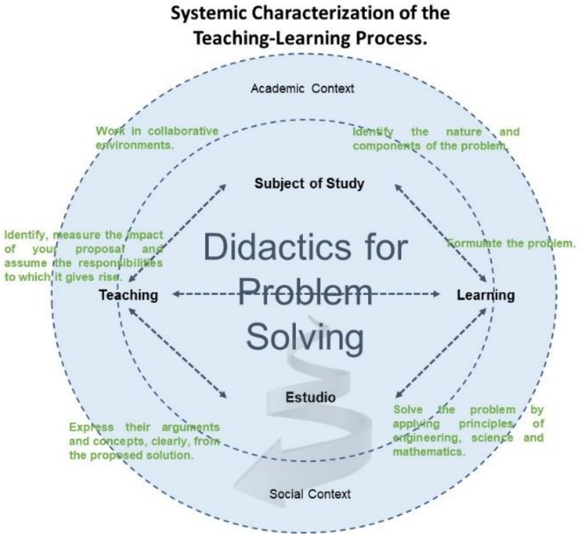
2. Learning is the activity that the student engages in to learn, to assimilate the subject matter of study.

3. The subject of study, where both students and teachers act.

4. Study is the process through which learning occurs.

Subsequently, the academic context is integrated, encompassing all those actors who make up the university community, and the social context, which includes all cultural, economic, historical, etc., factors that are part of the identity and reality of a society."

Fig. 3. Systemic Characterization of the Teaching-Learning Process



Source: Rúa-Ascar J. 2021.

The Teaching-Learning Process (TLP) for problem-solving is projected into six distinct processes, which are executed simultaneously, interacting, and influencing each other, not in a linear and direct manner, but dialectically, resulting in a single integrated process.

<u>Implementation Process of Didactics for Problem Solving in Engineering.</u>

The didactic model for problem-solving has been implemented in the Systems Engineering Program during each semester with the objective of monitoring the learning outcomes (LO) in each of the courses in the curriculum. Below, we describe the implementation of the strategy during the 2022-2 semester in the Algorithms and Programming I course, in the first academic assessment, in which 39 students participated.

The course instructor designed the rubric for the application of the first midterm, focusing on key evaluation points that demonstrate the progress indicators (PI) that reflect the learning outcome (Table 1).

Table 1. Rubric for the ability to identify, formulate, and solve complex engineering problems using principles of engineering, science, and mathematics.

SO (1): an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.				
Rubric SO (1)	Unsatisfactory	In Progress	Satisfactory	Outstanding
PI 1: Identifies problem elements and adapts them to variables/constants.	Unable to identify problem elements, does not adapt them to variables/constants.	Identifies some problem elements, is not able to associate them with the problem, and adapt them to variables/constants.	Fully identifies problem elements and associates them with variables/constants.	Fully identifies problem elements, causes, effects, and prioritizes variables/constants according to their respective impact
PI2: Establishes the relationship between variables, identifies the algorithmic and data structures to be used.	Unable to apply methodological tools to establish the relationship between variables, unable to identify the algorithmic and data structures to be used in relation to the problem.	Applies some methodological tools for problem formulation, but not correctly; identifies the algorithmic and data structures to be implemented for problem-solving to a moderate extent.	Applies the tools and techniques for problem formulation, establishes the relationship between variables, and identifies the algorithmic and data structures to be used for problem-solving.	Fully establishes the relationship between variables, fully identifies the algorithmic and data structures to be implemented in the formulation and solution of the problem.
PI 3: Constructs the algorithm/program.	Unable to apply the principles of engineering, science, and mathematics to construct the algorithm that provides a solution to the problem.	Applies the principles of engineering, science, and mathematics to solve the problem, but not in an appropriate manner.	Appropriately applies the principles of engineering, science, and mathematics to construct the algorithm that solves the problem.	Appropriately and rigorously applies the principles of engineering, science, and mathematics to solve the problem, constructing the algorithm/program.
PI4: Draw conclusions from the proposed	Does not argue improvement and effectiveness	Interprets the obtained solution but does not relate	Issues reasonable conclusions for the problem	Issues relevant conclusions for the problem solution and

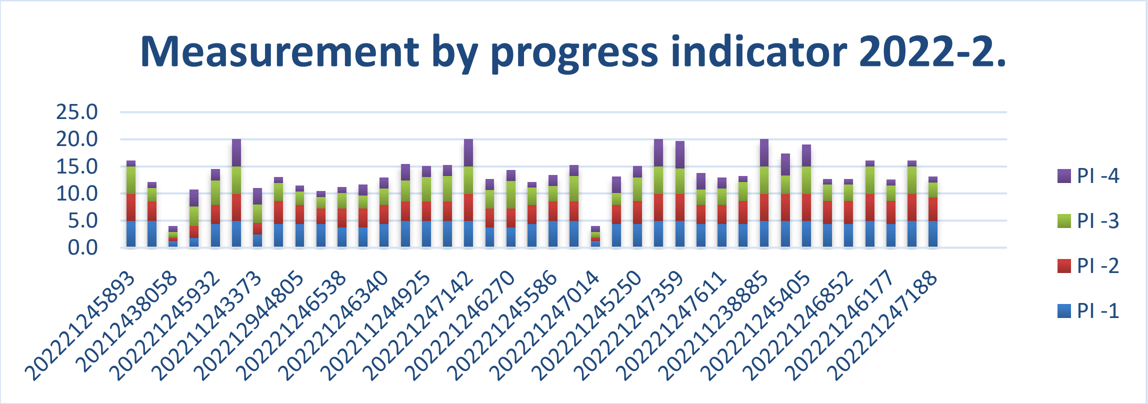
solution.	aspects, is unable to propose necessary changes in the elements of the problem context.	it to the context.	solution, argues aspects of efficiency and effectiveness of the proposed solution.	proposes new alternative solutions, providing arguments for efficiency and effectiveness.

Source: Systems Engineering Program, U. Simón Bolívar 2022.

Once the rubric and the assessment tool are aligned, the measurement instrument is applied, and the results obtained by the students are tabulated and graphed, providing the following outcomes:

The Figure 4 illustrates the individual results achieved by the students. The graph identifies the Goal level (70%) with a horizontal line for each Progress Indicator (PI).

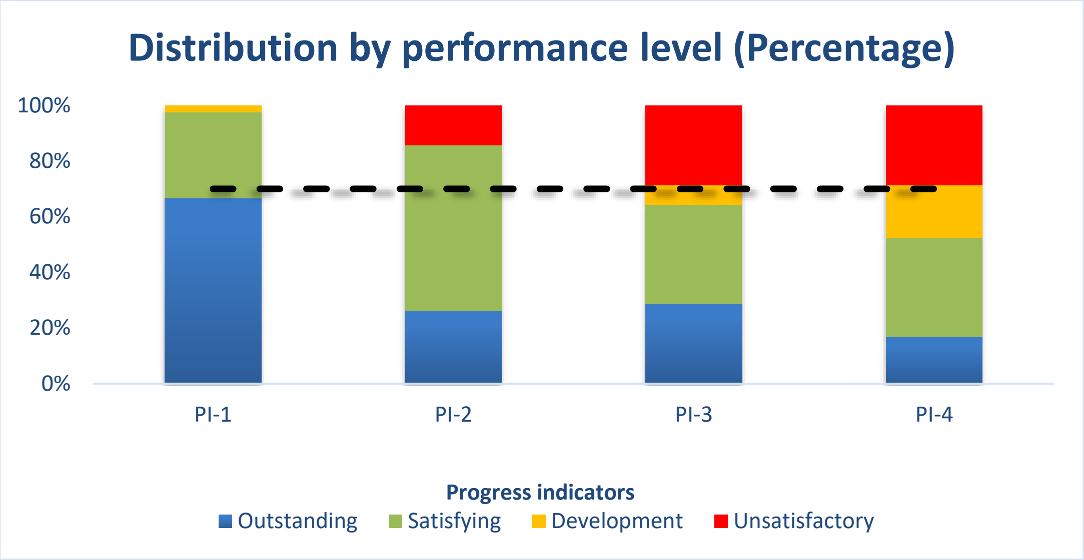
Fig. 4. Measurement by Progress Indicator.



Analysis of the result of the assessment instrument and the strategy.

As seen in Figure 5, the percentage of the First Midterm Evaluation Scale, the sum of the measurement ranges conducted in the first assessment, in the first two indicators (PI-1 and PI-2) exceeds the established threshold of 70%. However, the PI-3 indicator, which is related to the development of the algorithmic structure proposing the solution to the given problem, is on the borderline between the development and unsatisfactory range. Meanwhile, the PI-4, which is used to argue and justify the proposed algorithmic model, falls within the unsatisfactory range. As a reference for considering whether the Learning Outcomes (LO) have been appropriate for the students, based on these results, it was decided to increase the number of problems in which students apply their knowledge, strategic, and methodological skills to improve the indicators that fall below 70%. Below are the ranges for the first assessment: Outstanding 17%, Satisfactory 28%, In Progress 35%, and Unsatisfactory 20%.

Fig. 5. Performance Level Distribution.



The strengths that can be highlighted in the process are the first two PIs, which have a significant representation of students who largely meet them:

a. Identify the input, output, and process variables and/or constants proposed in the problem statement. Likewise, determine the data type of each variable and their dimensions if necessary.

b. List the algorithmic structures that you consider can aid in constructing the algorithm.

c. As skills to be strengthened, it can be mentioned that the third and fourth PI:

d. Develop the algorithmic structure that provides a solution to the given problem.

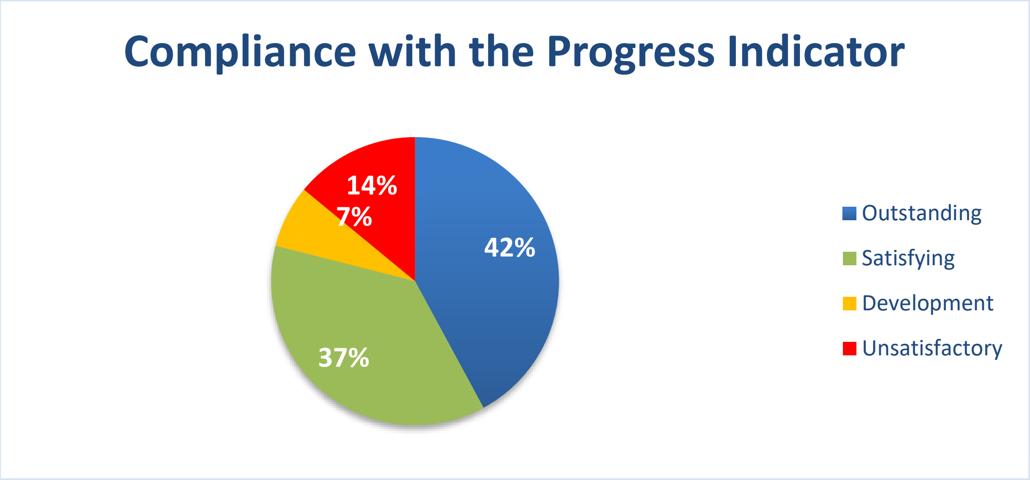
e. Argue why your algorithmic model provides the solution to the given problem.

These PIs demand from the student the ability to develop the algorithmic structure that provides a solution to the given problem, implementing reasoning, prior knowledge, and the experience gained from their surroundings. Additionally, it requires the skill of argumentation based on reflection applied to the proposed solution presented in the evaluation, with the purpose of having the student justify the solution in terms of efficiency and functionality.

<u>Identify in the graph the fulfillment of the Development Indicators.</u>

As can be seen in the Figure 6, the achieved levels in the test results are evident, and at the same time, the levels of development of LO in problem-solving skills are in the following state: Satisfactory for PI-1 and PI-2, In Progress for PI-3, an indicator that needs improvement at a general level related to the solution (design and construction), and Unsatisfactory for PI-4, an indicator that definitely needs emphasis and strategies to improve, as it relates to the theoretical justification and argumentation in terms of efficiency and effectiveness of the solution.

Fig. 6. Fulfillment of Progress Indicators 2022-2.



Conclusions

Problem-solving in engineering is fundamental for developing efficient and effective solutions in an ever-evolving technological environment. The application of analytical, creative, and systematic approaches is essential for addressing the complex challenges engineers face daily.

Multidisciplinary and integrated collaboration plays a key role in engineering problem-solving. Interaction between different specialties and the incorporation of diverse perspectives foster the generation of more comprehensive and robust solutions.

Approaches based on systems thinking and complexity management allow us to understand technical systems as a whole and address problems from a holistic perspective. These approaches promote a comprehensive view, considering interactions and the implications of proposed solutions in the broader context.

Emerging tools and techniques, such as advanced computational simulation, machine learning, artificial intelligence, and heuristic optimization, are transforming the way engineering problems are addressed. These tools provide more powerful analytical capabilities, enabling deeper analysis, identification of optimal solutions, and optimization of available resources.

Sustainability and social responsibility are essential aspects that must be considered in engineering problem-solving. The integration of environmental, social, and ethical factors in the decision-making process is crucial to ensure solutions that are sustainable in the long term and have a positive impact on society and the environment.

Finally, engineering problem-solving requires innovative approaches, multidisciplinary collaboration, and the application of advanced tools and techniques. By addressing challenges comprehensively and considering sustainability, engineers can develop more effective solutions and contribute to technological advancement and the well-being of society at large. It is essential to continue exploring new methodologies and approaches to drive continuous improvement in engineering problem-solving and successfully address future challenges.

References

ABET. (2023). ABET.org. Obtenido de Criteria for Accrediting Engineering Technology Programs 2022-2023: https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-technology-programs-2022-2023/

Addine, F. (2004). Didáctica! Qué Didáctica? En F. Addine, Didáctica: Teoría y Práctica. La Habana: Pueblo y educación.

Alvarez de Zayas, C. (2004). Didáctica general la escuela de la vida. Cochabamba-Bolivia: Grupo Editorial Kipus.

Arráez, M., Calles, J., & Moreno de Tovar, L. (2006). La Hermenéutica:una actividad interpretativa. Sapiens. Revista Universitaria de Investigación, 7(2), 171-181.

Bolaños Vivas, R. (2017). El Problema del Conocimiento y la Educación desde las Tendencias Filosóficas Analíticas. Sophia, Colección de Filosofía de la Educación, 1-21.

Darling-Hammond, L., & Youngs, P. (2002). Defining “highly qualified teachers:” What does scientifically-based research” actually tell us? Educational Researcher, 31(9), 13-25.

Fuentes, H., Matos , E., & Cruz, S. (2004). El proceso de investigación científica desde un pensamiento dialéctico hermenéutico. Reto actual en la formación de doctores. Santiago de Cuba: Universidad del Oriente.

García-González, J., & Sánchez-Sánchez, P. (2020). Diseño teórico de la investigación: instrucciones metodológicas para el desarrollo de propuestas y proyectos de investigación científica. Información tecnológica, 31(6), 159-170. doi:http://dx.doi.org/10.4067/S0718-07642020000600159

Muñoz Hueso, A. (2018). Enseñar a pensar. Bogotá: Ediciones de la U.

Ortiz, A. (2012). Metodología de la Enseñanza Problemica en el Aula de Clases. Barranquilla: Asiesca.

Rúa, J. M. (2021). Didáctica para la resolución de problemas en programas académicos de Ingeniería. Tesis de Doctorado. (U. S. Bolívar, Ed.) Barranquilla, Colombia. Obtenido de https://bonga.unisimon.edu.co/handle/20.500.12442/9284

Rúa-Ascar, J., & García-González, J. (2018). Pensamiento algorítmico, alternativa metodológica para la solución de problemas de ingeniería. En J. González, F. Carmona, A. Arboleda, & A. Porto, Educación transdisciplinar, tecno-didáctica y paradigmas emergentes: para una ciudadanía planetaria. Barranquilla: Ediciones Universidad Simón Bolívar. Obtenido de https://hdl.handle.net/20.500.12442/3780

Rueda, P., & Vilarroel, I. (1992). El metodo hermenéutico-dialéctico una estrategía para las ciencias de la conducta. Revista Ciencias de la Educación, 3(5), 1-11.

Velasco Ramírez, M. (2020). Resolución de problemas algorítmicos y objetos de aprendizaje: una revisión de la literatura. RIDE Revista Iberoamericana Para La Investigación Y El Desarrollo Educativo, 10(20). doi:https://doi.org/10.23913/ride.v10i20.630