Proactive university students' views on skills gained from a research colloquium

Ma del Carmen Nolasco-Salcedo[1], Kleophé Alfaro-Castellanos[1], Diego Ulises Carranza-Sahagún[1], José Ávila-Paz[1], Angélica Patricia Ávila-Paz[2]

[1]Department of Basic Sciences, University Center of La Ciénega, Ocotlán, Mexico
[2]Department of Communication and Learning, Escuela Regional de Educación Media Superior de Ocotlán (EREMSO),
University of Guadalajara, Ocotlán, Mexico

Article Info

ABSTRACT

Research is a key component of higher education, promoting deep learning, critical thinking, and problem-solving skills. The Academic Body of Engineering and Systems (InySis) organizes the colloquium of research initiation: proactive university students (CIIEUPA) each academic cycle (A and B) to foster research as a fundamental tool for students' educational and professional development. This qualitative, descriptive study aimed to determine the skills acquired by students participating in CIIEUPA. The action-research methodology was employed, with participant observation used as the data collection technique. The sample consisted of second and third-semester students from the Software Engineering Competence Unit from the 2022A and 2022B cycles. The results revealed that participation in the colloquium enriched students with experiences that fostered teamwork, effective communication, critical thinking, and leadership. CIIEUPA, as an active collaborative learning methodology, allowed students to share their findings with the academic community, strengthening their commitment, and motivation toward research. Such initiatives contribute to learning and play a crucial role in the holistic development of students, promoting their growth in both academic and professional fields. This approach demonstrates the value of integrating research into the educational process, allowing students to engage meaningfully with their discipline while developing essential skills for their future careers.

Corresponding Author:

Ma del Carmen Nolasco-Salcedo
Department of Basic Sciences, University Center of La Ciénega
Av. Universidad 1115, Ocotlán, Mexico
Email: mcns08@gmail.com

1. INTRODUCTION

In today's knowledge-based society, one of the key challenges in higher education is ensuring comprehensive education, with university students playing a central role. The Academic Body Engineering and Systems (InySis) recognizes the growing demands of global labor markets and the importance of fostering intellectual, personal, emotional, and professional development. In response, InySis has implemented educational models that promote active student participation in the construction of knowledge. Among these, InySis emphasizes active learning, exemplified by the colloquium "colloquium of research initiation: proactive university students (CIIEUPA)." This event encourages Computer Engineering students to present their research in a plenary session, engaging in discussions on topics they are passionate about-particularly those related to the impact of artificial intelligence on contemporary global society. The

colloquium facilitates dialogue and collaboration, creating a space for students to share experiences and strengthen their academic identity. CIIEUPA, framed within active and collaborative learning strategies, helps students achieve their full potential in personal, social, and academic dimensions. These approaches are aligned with recent research emphasizing that active learning promotes student engagement, deep learning, and meaningful knowledge construction [1], [2].

In this context, introducing a playful and participatory methodologies has been shown to foster creativity, autonomy, and social development in university students [3]. These strategies address psychological and interpersonal dimension of education, acknowledging the importance of nurturing humanistic, emotional, and cognitive aspects simultaneously. Understanding how students perceive the competencies gained through CIIEUPA is essential, as these include a combination of knowledge, skills, and attitudes relevant to their academic and professional growth. Competency-based education increasingly adopted in higher education, aims to develop transferable and discipline-specific skills, with a focus on lifelong learning [4]. In a student-centered learning process, students must be willing to work as a team, developing career management skills is essential for students' future employability and career success [5], as argued by several scholars [6], [7]. Moreover, the guidance and support of teachers remain essential in facilitating learning processes, especially through feedback and structured instructional design [8].

Understanding the perception of university students regarding the skills acquired through CIIEUPA will help develop strategies that enhance classroom quality and foster students' growth. It also provides learning techniques and methodologies to adapt to the social and labor changes in today's globalized world. This is why various methods, techniques, and procedures must be considered, ensuring that student assessment in higher education is formative and competency-driven [9]. Education has undergone a great metamorphosis during the last decade and has shown the need to adapt to the various tools provided by information and communication technologies (ICT) [10]. A society that increasingly demands a new student profile—one that responds to technological advances and changing work environments—requires flexible educational models that promote effective learning and facilitate access to education, regardless of time and space [10].

It is essential to note the theoretical connections between constructivism and active learning. Hartikainen *et al.* [11] argues that active learning is more of an instructional approach than a learning concept itself. Moreover, research indicates that student-centered and activating instructional methods lead to significant learning achievements and, particularly, the development of essential competencies for working life [12], [13]. These competencies are critical as students transition from higher education to the labor market. Active learning, as a broad and student-centered instructional approach, has gained considerable attention for its role in fostering these skills [14]. Active learning has been shown to enhance self-directed and deep learning, improve communication abilities, and facilitate the integration of theory and practice the synthesis of theory and practice [15]–[17], which promotes the development of specific skills [18].

2. METHOD

The study followed a qualitative approach with a descriptive scope. It employed action research methodology to track the application of the teaching methods at every stage. Data was collected through participant observation. The study focused on second- and third-semester students enrolled in the Software Engineering Competency Unit during cycles 2022A and 2022B. In total, 105 male students and 45 female students participated.

The choice of research method was based on the understanding that research processes—especially for novice researchers—require depth and reflexivity rather than rigid simplification [19]. The evaluation process focused on four key aspects: i) information search; ii) organization of information and the use of bibliographic references following APA 7 format; iii) academic report, which included a log documenting their research progress via Trello; and iv) oral presentation, conducted in university auditoriums using the colloquium format. Using established rubrics, three judges assessed students' ability to demonstrate an understanding of the topic, public speaking skills, and teamwork.

The research unfolded in the following phases: i) Questions were generated to know the students' ideas regarding the topic presented at the CIIEUPA; ii) Design of the action plan: the answers to the questions generated allowed us to conceive a plan with which each participant could feel interested in getting involved; iii) Implementing the action plan, which involved simulating presentations, receiving audience questions and providing feedback to engage students further; and iv) Executing action plan with the final plenary presentation at the "colloquium getting started in research: proactive university students."

3.   RESULTS AND DISCUSSION

Today, technology is evolving at an exponential pace, requiring students to develop key competencies for the professional environment [20], [21]. In this context, InySis recognizes the importance of skills development and agrees with studies [22], [23], who highlight that students should receive continuous feedback and reinforcement to enhance their competencies and abilities. The CIIEUPA focuses on guiding the student's learning process by leveraging their prior knowledge and skills while promoting the development of new competencies through an active and collaborative learning methodology. This approach supports the claims of previous authors [24], [25], who emphasize the importance of supporting students in their transformation into active, perceptive, adaptable thinkers, creative problem solvers, and engaged citizens. In this regard, educational institutions play a crucial role in providing the necessary tools for their development.

Various studies on skill development highlight the competencies of the 21st century, which are essential for competitiveness in today's business world. In response to the need to master these competencies, CIIEUPA is committed to helping students acquire key 21st-century skills [26], such as cooperation and collaboration, communication, critical thinking, lifelong learning, and entrepreneurship [27]. Among the benefits offered by CIIEUPA is the ability to help students manage their learning processes and foster their creativity in their chosen fields of work. Teachers can better prepare students for the future by acquiring skills like those mentioned. Critical thinking is implemented by addressing problems, evaluating assumptions, justifying responses, conducting research, and making judgments [28]. Searching, analyzing, and evaluating information are crucial skills in any decision-making process, and critical thinkers always seek and express connections between the issues at hand and other relevant experiences [29].

3.1. Themes

In this phase, the participating students' interest topics are explored through a brainstorming session. The goal is to identify the topic that genuinely excites them, which they will later present in plenary to share with the other listening participants. The topics proposed in this phase, all related to the field of technology and the fourth industrial revolution, included the impact of chatbots on education, 3D printing, how the internet of things (IoT) influences education, and the influence of gamers on society, among others. InySis guides the students' study process of the topics proposed by them. Students apply their knowledge and skills while promoting the development of competencies through the active and collaborative learning methodology in the CIIEUPA participation.

3.2. Design and implementation of the action plan

In this phase, the initial vision is adjusted, and the objective is redefined based on feedback. The university students' initiative to discover the impact their presentation could have on the listening participants of the CIIEUPA is taken into account. From this, an action proposal was designed to impact the student's learning experience positively.

Before the colloquium, a methodological adjustment process is carried out based on co-construction, with the active participation of different stakeholders (presenters and audience). This process allows participants to explore the theoretical possibilities of the topic and choose the lines of support for their research. Throughout this phase, circular feedback processes are continued, fostering continuous, and collaborative learning. The students share their experiences:

> "*The simulation of being in the auditorium presenting my topic was critical because the generated questions made me reflect on it, and I consider it good feedback.*" (Student)
> "*I like the topic that I am going to present, I like it a lot, but I am afraid of speaking in public, and this simulation of being in the auditorium has inspired me to face it because the feedback from my classmates with their recommendations and questions made me feel confidence.*" (Student)
> "*It seems that this strategy of participating in the colloquium includes a different way of developing skills, and I am interested in growing in all aspects; I liked participating!*" (Student)
> "*I do not like to participate. I feel anxiety and fear, but I must learn to overcome it; having been in front of my group in the simulation of the Colloquium helped me a lot; my classmates behaved maturely and listened to me attentively, which made me feel good.*" (Student)
> "*The questions they asked me after I presented my topic made me realize that I need to prepare more. I must be more ready for the real Colloquium. Fortunately, this was a simulation. I am going to prepare more!*" (Student)

3.3. Execution of the action plan

In this phase, a conclusive feedback session and closure are carried out, marking the beginning of the process's implementation and monitoring. This cycle also incorporates the circular processes of feedback

and production, ensuring constant evaluation and adjustment. The phases of the research process involve continuous learning, both in the classroom and among the colloquium participants, who ultimately determine the pace and time needed for its development. In general terms, three sessions are planned for the initial cycle, five for the central cycle, and two for the final cycle. The designed instruments are considered and adjusted according to the needs identified in each phase for its implementation.

During the practical application, it was observed that as students engage in co-construction, a positive dynamic is generated that enhances the development of the experience. This approach contributes to the process's sustainability and increases the likelihood that students will commit to the process and its implementation. The 3-day colloquium takes place on the Ciénega campus during the third week of May of school year A and in the first week of December of school year B. Speakers promote active discussion in a workshop-like environment. The topic of the colloquium is different each school year, and there is always something new. Some topics are repeated or deepened from previous colloquiums due to their continued relevance and popularity, leading to various learning experiences. Generally, topics include: i) cooperative and active learning; ii) effective use of discussion; iii) technologies in education; and iv) the IoT and development of critical-reflective thinking. After participating in the colloquium, some students expressed the following:

> "*I have learned to be more creative.*" (Student)
> "*I felt a renewed enthusiasm for my learning.*" (Student)
> "*It was very informative to hear and experience the diversity of learning.*" (Student)
> "*...provided a unique opportunity to exchange ideas with classmates from different groups and grades.*" (Student)
> "*...made me realize that there was a community of teachers interested in improving the teaching-learning process at the university.*" (Student)
> "*... cool...*" (Student)
> "*Participating in the Colloquium made me realize that my classmates have much to teach me in my teaching-learning process...*" (Student)

Through formal evaluations and informal feedback, students consistently applaud the colloquium and reveal how it benefits them professionally. While they recognize the value of the speakers and topics, they find the most beneficial aspect of the colloquium is the way it fosters collegiality. They find the opportunity to interact with students and faculty from other disciplines to be highly stimulating and rewarding, an outcome that is consistent with that of others.

The learning assessment involved the discussion group instrument technique, which generated a socializing scenario of ideas and knowledge regarding the CIIEUPA. The effectiveness of active learning strategies demonstrates that the role of the teacher serves as a guide in the educational journey. The possibility of class optimization has also been confirmed through the implementation of workshops, and teachers' and students' qualitative assessments of the teaching-learning process have been identified [30]. Active learning methodologies have been shown to significantly enhance students' engagement and performance, fostering not only academic success but also the development of skills necessary for meaningful participation in society [31].

Winstone and Carless [32] emphasize the importance of fostering students' active engagement with feedback, highlighting that effective educational processes must consider affective components, such as students' attitudes, emotions, and motivations. These elements play a crucial role in how learners interpret and utilize feedback to develop the competencies and skills required for meaningful learning. Ultimately, this involves identifying the competencies that are actively engaged. Furthermore, Tikkanen *et al.* [33] point out that the development of social and emotional skills is crucial in educational settings, as individual differences in these areas can affect peer relationships, potentially leading to challenges such as isolation or difficulties in effective collaboration.

4. CONCLUSION

It is essential to optimize and encourage the development of active learning methodologies within the classroom and the learning styles of university students, whose learning approaches evolve as they acquire the necessary skills through active methods. The results indicate that CIIEUPA, as a teaching strategy, can benefit learning and communication. After the students had participated in the CIIEUPA, a significant improvement was seen in their skills in critical thinking, empathy, teamwork, and communication.

This study can serve as a starting point for future research to explore the impact of transversal skills, using more precise or comparable indicators and adapting their application to different learning units. In addition to using active learning methodologies, the analysis of specific approaches within these methodologies, such as project-based learning or flipped learning, could be a topic of interest in investigating

which factors mainly influence the improvement of critical thinking skills in students. Likewise, researchers may consider using comparable indicators in the teaching-learning. A key aspect to consider is the importance of active methodologies, which play a fundamental role in supporting students' ability to master competencies and achieve established objectives.

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This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Ma del Carmen Nolasco-Salcedo	✓	✓	✓	✓	✓	✓		✓	✓	✓			✓	
Kleophé Alfaro-Castellanos		✓				✓	✓	✓	✓	✓	✓	✓		
Diego Ulises Carranza-Sahagún	✓		✓	✓		✓			✓		✓		✓	
José Ávila-Paz					✓		✓			✓		✓		
Angélica Patricia Ávila-Paz					✓		✓			✓		✓		

C : **C**onceptualization	I : **I**nvestigation	Vi : **Vi**sualization
M : **M**ethodology	R : **R**esources	Su : **Su**pervision
So : **So**ftware	D : **D**ata Curation	P : **P**roject administration
Va : **Va**lidation	O : Writing - **O**riginal Draft	Fu : **Fu**nding acquisition
Fo : **Fo**rmal analysis	E : Writing - Review & **E**diting	

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

The Ethical Committee of the University Center of La Ciénega/University of Guadalajara, has granted approval for this study on 2 January 2023 (Ref. No. 001-02-23).

DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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BIOGRAPHIES OF AUTHORS

Ma del Carmen Nolasco-Salcedo 🆔 🔳 🆂🅲 🔵 is a professor and researcher at the Centro Universitario de la Ciénega University of Guadalajara. She is a computer scientist who has a Ph.D. in Education from the Universidad Santander in Tamaulipas and a master of science with a specialty in Programming from the Universidad Central "Marta Abreu" de las Villas, Cuba. She is passionate about improving the quality of teaching and learning for university students. Her research interests focus on teachers and their training, higher education, 21st-century teaching and learning, classroom research, youth practices, and their education. She can be contacted at email: ma.nolasco@academicos.udg.mx; mcns08@gmail.com.

Kleophé Alfaro-Castellanos 🆔 🔣 SC ⊂ is a professor and researcher at the Ciénega University Center of the University of Guadalajara. She is a computer scientist from the University of Guadalajara, master in Information Technology by CUCEA - University of Guadalajara with thesis topic "Simulation of domain patterns of ferroelectric materials". Also, she has Ph.D. in Education Sciences from the University of Santander with thesis topic "Impact of the competency model in high school with engineering careers in higher education". One of her main interests is the development of systems to collaborate in the improvement of teaching in higher education as well as the generation of learning objects. She can be contacted at email: kleophe.alfaro@academicos.udg.mx; kleophe.ac@gmail.com.

Diego Ulises Carranza-Sahagún 🆔 🔣 SC ⊂ is a professor at the Ciénega University Center of the University of Guadalajara. He is a computer engineer from the University of Guadalajara, a master of science with programming specialty from the Central University "Marta Abreu" from Las Villas and a Ph.D. in Science with a focus on computing and automation from the University of Guadalajara. One of his main interests is the development of systems to collaborate in the improvement of teaching in higher education. He can be contacted at email: diego.carranza@academicos.udg.mx; ulisescarranza@gmail.com.

José Ávila-Paz 🆔 🔣 SC ⊂ is a professor and researcher at the Ciénega University Center of the University of Guadalajara; he is a communications and electronics engineer, a doctor of science with a focus on Physics from the University of Guadalajara and a master of science with a specialty in Programming from the University Central, "Marta Abreu" from las Villas, Cuba. His main interest is the development of systems based on bio-potentials to help people with different abilities. The main goals of the research are to detect and help people with various skills to incorporate them into our society without having any restrictions on their actions. He can be contacted at email: jose.apaz@academicos.udg.mx; jocmos7@gmail.com.

Angélica Patricia Ávila-Paz 🆔 🔣 SC ⊂ is a full-time associate teaching professor "B" at the Ocotlán Regional School of Higher Secondary Education (EREMSO), part of the Higher Secondary Education System of the University of Guadalajara. She holds a License in Geography from the University of Guadalajara, a master's degree in Higher Education from the Centro Universitario de la Ciénega of the University of Guadalajara, and a doctorate in Teaching Methodology from the Zapopan Institute of Pedagogical Studies in Jalisco, Mexico. Her academic focus is on communication, with a particular emphasis on preparing teachers to cultivate critical thinking, analytical skills, and reflective practices. Additionally, she is an experienced trainer and advocate for reading and writing, recognized with the FIL Award 2020 in the audio-story category. She can be contacted at email: angelica.apaz@academicos.udg.mx.