

## Integrating creative thinking and cultural insights through the anthropological theory of didactics in university algebra

Yanko Ordóñez Ontiveros, Julián Roa González, José Luis Díaz Palencia

Department of Education, Universidad a Distancia de Madrid, Madrid, Spain

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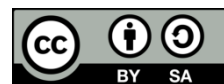
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### ABSTRACT

This discussion explored the integration of creative thinking pedagogy and the anthropological theory of didactics in university-level algebra education, emphasizing the importance of understanding the perspectives of both learners and teachers. The work began by highlighting the necessity of considering these viewpoints to create effective and responsive educational experiences. We then focused on designing classroom sessions for algebra, blending creative thinking with cultural and historical contexts. These sessions included applying creative approaches to group theory, exploring algebraic topology through innovative means, and understanding ring theory in practical scenarios like cryptography. Feedback from both learners and teachers was generally positive, with students appreciating the engaging and practical aspects and teachers recognizing the benefits of creative pedagogies. However, challenges in implementation, such as resource constraints and the need for professional development, were also identified. Suggestions for improvement included deeper content exploration, enhanced use of technology, and better alignment of creative teaching methods with assessment strategies.

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### Corresponding Author:

José Luis Díaz Palencia

Department of Education, Universidad a Distancia de Madrid

C/ Ctra. de la Coruña km 38,500 - 28400 Collado Villalba (Madrid)

Email: joseluis.diaz.p@udima.es

## 1. INTRODUCTION

Creative thinking is a valuable skill that is essential for success in any field, including mathematics and particularly algebra. It involves the ability to generate new ideas, think outside the box, and approach problems from different angles. In the context of algebra, creative thinking skills are particularly important, as they enable students to develop innovative solutions to complex problems and to explore the subject in new and exciting ways. One way to develop creative thinking skills in algebra is to encourage students to engage in open-ended problem-solving activities [1]. This can be achieved through a variety of teaching methods, such as project-based learning, inquiry-based instruction, and collaborative problem-solving [2]. By engaging in these activities, students are able to develop their creativity, critical thinking, and problem-solving skills, as well as their ability to work effectively in teams.

Another important aspect of creative thinking in algebra is the ability to recognize patterns and relationships between different mathematical concepts [3]. This requires students to think abstractly and to apply their knowledge in new and unfamiliar contexts. By doing so, they are able to develop a deeper understanding of the subject and to apply their knowledge in a variety of real-world situations. While there is no single formula for developing creative thinking skills in algebra, there are a number of strategies that can be effective. These include

providing students with opportunities to work collaboratively, encouraging them to take risks and make mistakes, and providing them with feedback and support throughout the learning process [4].

Creative Thinking Pedagogy, which focuses on the development of learners' creativity and innovation across various subjects, and the Anthropological Theory of Didactics, a framework for examining the transformation and transmission of knowledge in educational settings, particularly in mathematics, represent two significant and somehow connected approaches in education. The former is rooted in the idea of fostering creativity in learning processes, encouraging learners to think divergently and approach problems with flexibility, as highlighted by Kaufman and Beghetto [5] in their Four C Model of Creativity. On the other hand, the Anthropological Theory of Didactics, developed by Bosch and Gascón [6], views educational processes through an anthropological lens, emphasizing the cultural and societal influences on how knowledge is transmitted and transformed. The ATD plays a crucial role in understanding learners' and students' perspectives in educational settings. In ATD, the concept of praxeology is central. It involves studying the tasks (type of problems), techniques (methods used to solve problems), technology (justification of techniques), and theory (underlying principles) within a particular field of knowledge [6]. This comprehensive approach allows educators to understand not just what students are learning, but how and why they are learning it, offering insights into the students' perspective. ATD's theory also emphasizes the notion of didactic transposition, which is the process through which knowledge is transformed from being scholarly or expert knowledge into something that can be taught to students [7]. This transformation process is influenced by various factors, including cultural, institutional, and educational norms, which shape the learners' perspectives and experiences. Furthermore, ATD highlights the importance of the study of noosphere, the space of human thought, in understanding the cultural, societal, and historical factors that influence education [8]. This aspect of the theory allows educators to comprehend the complex interplay of external factors that shape students' learning experiences and perspectives. In addition to providing a comprehensive framework for analyzing educational processes, ATD also offers practical tools for teachers. For instance, it encourages the use of didactic engineering, a design process for educational sequences that takes into account various didactic variables. This approach ensures that teaching practices are closely aligned with students' learning needs and contexts, thus respecting and incorporating their perspectives [9]. In summary, the anthropological theory of didactics is essential in understanding learners' and students' perspectives as it offers a holistic view of the educational process, taking into account the cultural, societal, and institutional factors that influence learning. It provides educators with both a theoretical framework and practical tools to design and implement teaching practices that are responsive to the diverse needs and experiences of students.

This paper posits that integrating creative thinking pedagogy within the anthropological theory of didactics framework could lead to a more comprehensive educational approach. Such integration could offer a richer understanding of the learning process, combining the cultivation of creativity with a deep understanding of its cultural and societal implications. This conceptual exploration suggests that merging these two theories could benefit learners in diverse educational settings, creating a more holistic and effective educational practice. Our study was further enriched by collecting personal perspectives from both learners and teachers on the subject of algebra at the university level. This aspect was particularly significant for students, as they had prior exposure to algebra during their pre-university education. Therefore, their viewpoints and experiences were not from a blank slate but rather built upon their earlier encounters with algebraic concepts.

## 2. METHOD

Understanding the perspectives of both learners and teachers is essential in education for several reasons, significantly influencing how teaching and learning processes are designed, implemented, and evaluated. Acknowledging and integrating these perspectives ensures that educational practices are effective, inclusive, and responsive to the needs of all participants. Firstly, teachers' perspectives shape their teaching methods, expectations, and interactions with students. Understanding these perspectives is crucial for designing professional development programs that align with teachers' beliefs and classroom realities. When teachers feel that their perspectives are valued, they are more likely to engage and commit to their professional growth, enhancing their effectiveness in teaching [10]. Similarly, learners come from diverse backgrounds and have varied learning styles, needs, and preferences. By understanding learners' perspectives, educators can tailor their instruction to accommodate these differences, thereby improving student engagement and learning outcomes [11]. This customization also fosters a more inclusive learning environment where all students feel valued and understood. Additionally, understanding the perspectives of both parties helps in resolving conflicts and improving communication within the educational setting. When teachers and learners can understand and empathize with each other's viewpoints, it creates a more harmonious and productive learning environment [12]. The integration of both learner and teacher perspectives is crucial in educational research and policy-making. Policies and practices grounded in the realities of those they affect are more likely to be successful and sustainable. This alignment between policy and practice is essential for the continuous improvement of educational systems [13].

In our research, we first aimed to understand the perspectives of both learners and teachers, focusing on their experiences, attitudes, and perceptions within the educational environment and prior to a course in algebra. The study was designed using qualitative methodologies to provide deep insights into the subjective experiences of both groups. Initially, we defined our research questions and objectives, focusing on how learners perceive their educational environment, including their motivations, challenges, and learning preferences. We also sought to understand teachers' pedagogical approaches, challenges in teaching, and perspectives on the curriculum, as suggested by [14]. Based on these mentioned principles, the questions included are provided as follows:

- For Learners: How do you perceive your educational environment, and what factors do you believe contribute to an effective learning experience? What challenges do you face in your educational journey, and how do these challenges impact your learning and motivation? How do you describe your preferred learning styles, and what instructional strategies do you find most effective?
- For Teachers: How do teachers view their role in the educational process, and what pedagogical approaches do you prioritize? What challenges do teachers encounter in delivering education, and how do these challenges affect your teaching methods and interactions with students? How do teachers perceive the needs and preferences of students? and how do you adapt your teaching to meet these needs?

These questions were crafted to elicit detailed and nuanced responses, providing valuable insights into the unique experiences of individuals in the educational system. They served as a foundation for our interviews, focus groups, and observations, guiding our investigation into the complex relationship between teaching and learning. In our research, we conducted both expert validation and pilot testing to ensure the validity and relevance of our proposed questions. This rigorous approach was essential for refining the research questions and enhancing the overall quality of the study. We selected a panel of experts, including experienced researchers and practitioners in the field of education. These experts had extensive knowledge and experience in learner and teacher perspectives. We presented our research questions to the panel in a structured consultation session. The experts were asked to evaluate the questions based on their clarity, relevance, and significance in the context of educational research. Their feedback was crucial for identifying potential biases, ambiguities, or gaps in the questions. Based on the experts' feedback, we revised our questions. This involved rephrasing some questions for clarity, refining the scope of others to enhance their relevance, and adding new questions to address identified gaps. The author in [15] emphasizes the importance of expert feedback in refining research instruments to ensure they meet established research standards. One of the feedback from the experts consisted in asking to teachers in a general nuisance first, this is: "How do teacher...?" and then to make the questions particular "How do you..." According to the experts, following this approach would provide a richer overview of teacher's experiences. We conducted a pilot test with a small group of participants representing our target population. This included a mix of learners and teachers who provided diverse perspectives. The pilot testing involved conducting interviews and focus groups using our refined research questions. This process helped us assess the practicality of the questions and the flow of the discussions. After the pilot test, we analyzed the responses for clarity and depth of the data collected. We looked for instances where participants seemed confused or provided superficial answers, indicating a need for further refinement of the questions. In [16], the authors highlight the importance of pilot testing in identifying and rectifying issues before the main study. Based on the pilot test findings, we made final adjustments to the questions. This ensured that they were clear, understandable, and capable of eliciting in-depth and relevant responses from participants.

Afterwards and for designing the study, we selected qualitative methodologies, including interviews, focus groups, and observations. This approach allowed us to gather rich, detailed data. In [17], the author emphasizes, qualitative methods are particularly effective for exploring complex phenomena in depth. Participants were purposively selected to include a diverse range of learners and teachers, ensuring a wide spectrum of experiences and views. This purposive sampling, as outlined in [18], enabled us to focus on individuals who had specific knowledge and experiences related to our research questions. We conducted semi-structured interviews and focus groups with both learners and teachers. Additionally, observations in educational settings provided contextual insights. These methods align with the recommendations given in [19] that advocate for a combination of data collection methods in qualitative research for comprehensive understanding. Data were analyzed using thematic analysis that is flexible and useful for identifying, analyzing, and reporting patterns within data [20]. This approach allowed us to interpret the data in a way that captured the complexities of the participants' perspectives.

In defining university-level algebra classroom sessions under the lens of creative thinking pedagogy, supported by the anthropological theory of didactics (ATD), the methodology intertwines fostering innovative problem-solving skills with understanding algebra's cultural and historical contexts. This approach includes designing sessions that not only covers algebraic concepts but also their application and evolution across various cultures [6]. Pedagogical strategies emphasize collaborative and inquiry-based learning, encouraging students to explore algebra creatively and critically. Assessment techniques go beyond traditional methods, focusing on evaluating the creativity and thought process in problem-solving. Integrating ATD principles involves discussions

on how algebraic knowledge has been shaped by different societal factors, ensuring a comprehensive understanding of algebra's role and significance. This methodological framework, underpinned by continuous adaptation and professional development, as suggested in [5], aims to create a learning environment where algebra is not only learned but also appreciated as a culturally rich and creatively stimulating subject.

Once the sessions were designed in accordance with the mentioned metrological issues, we carried out a specific set of research questions to understand the new perspectives from the students and teachers. Gathering feedback from both learners and teachers is crucial to understand their opinions and gauge the effectiveness of the sessions, particularly in fostering creative thinking. The questions were validated following the same steps as described previously and are posted as follows:

- For Learners: i) How engaging did you find the sessions? ii) Were there any aspects of the sessions that particularly helped you in understanding the complex concepts of algebra? iii) In what ways do you feel the sessions encouraged you to think creatively about algebra? iv) Can you provide an example of how you applied creative thinking during the activities? v) How relevant do you find the incorporation of real-world applications (like in nature or cryptography) in understanding algebraic concepts? vi) Do you feel more equipped to apply these algebraic concepts in real-life situations after these sessions? vii) Did the discussion on the cultural and historical development of algebraic concepts enhance your interest or understanding of the subject? viii) How important do you think it is to include cultural and historical perspectives in learning advanced mathematics? ix) What aspects of the sessions did you find most beneficial? and x) Are there any suggestions you have for improving these sessions in the future?
- For Teachers: i) How did you find the experience of teaching using creative thinking pedagogy supported by ATD? ii) Were there any challenges you faced in integrating these approaches into your teaching? iii) Did you notice an increase in student engagement or participation during these sessions? vi) How effectively do you think the students applied creative thinking in learning the concepts? v) How feasible do you find the integration of these approaches in the regular algebra curriculum? vi) Are there any adjustments or resources that would be needed to implement these methods more broadly? vii) Based on student responses and work, how effective do you think these sessions were in enhancing students' understanding of algebra? viii) Did you observe any notable improvements or changes in students' problem-solving approaches? ix) What are your overall thoughts on the effectiveness of these sessions in teaching advanced algebra concepts? and x) Would you recommend any changes or additional support to enhance the effectiveness of these teaching approaches?

### 3. RESULTS AND DISCUSSION

#### 3.1. Initial learners and student's perspectives

First, we address the research questions for both learners and teachers to know their perspectives. This step was done previous to the introduction of the Creative Thinking Pedagogy in our sessions. Here is a detailed narrative response to each set of questions:

- Learners generally perceive their educational environment as a complex interplay of physical, social, and emotional elements. Factors contributing to an effective learning experience often include a supportive and inclusive classroom atmosphere, access to resources, and engaging teaching methodologies. Learners appreciate when educators understand their individual needs and learning preferences, creating a space that fosters both academic and personal growth.
- Many learners face challenges such as academic pressure, time management issues, and balancing educational responsibilities with personal life. These challenges can lead to stress and anxiety, potentially impacting their motivation and learning. The support from educators and peers, along with effective stress management strategies, help learners navigate these challenges.
- Learners often have diverse learning styles, with some preferring visual aids, others thriving in hands-on learning experiences, and some favoring auditory or reading/writing approaches. Effective instructional strategies that cater to these varied styles include multimedia presentations, interactive sessions, group projects, and personalized feedback. Flexibility and variety in teaching methods are highly valued by learners.
- Concerning teachers, they mostly view their role as facilitators of knowledge, mentors, and guides in the learning process. They prioritize pedagogical approaches that are student-centered, such as collaborative learning, problem-based learning, and the use of technology to enhance learning experiences. The focus is often on developing critical thinking, creativity, and real-world problem-solving skills among students.
- Teachers encounter several challenges, including keeping up with educational advancements, diverse student needs, and administrative demands. These challenges can affect their teaching methods, leading to more adaptive and innovative approaches. The integration of technology, differentiated instruction, and continuous professional development are strategies employed to address these challenges.
- Teachers recognize the diverse needs and preferences of their students, understanding that a one-size-fits-all approach is ineffective. They adapt their teaching by incorporating various instructional strategies,

offering personalized support, and creating an inclusive learning environment. Teachers also strive to build strong relationships with their students to better understand and meet their unique educational needs.

Based on the responses, it appears that both learners and teachers are well-positioned to implement Creative Thinking Pedagogy in their classes, albeit with certain considerations and adaptations to their current practices and perceptions. In particular, the learners' readiness and expectations can be remarked. Indeed, learners show a preference for engaging and dynamic learning environments, which aligns well with the principles of creative thinking pedagogy that emphasize innovation and active engagement. They recognize the importance of supportive and inclusive educational settings, which are essential for fostering creativity. The diversity in learning styles and the need for adaptable instructional strategies suggest that learners would likely respond positively to the varied and flexible approaches inherent in creative thinking pedagogy. In addition, we shall focus on the teachers' approach and adaptability. Teachers view their role as facilitators, aligning with the creative thinking pedagogy that requires teachers to guide, mentor, and inspire creativity rather than just imparting knowledge. Their willingness to adopt student-centered approaches and the emphasis on developing critical thinking and problem-solving skills are key components of creative thinking pedagogy. The challenges faced by teachers, like diverse student needs and keeping up with educational advancements, could be addressed by the innovative and adaptable methods promoted in creative thinking pedagogy. In addition, the teachers consider that there may be a need for professional development to fully equip teachers with the skills and confidence to implement creative pedagogies effectively. Adjustments in curriculum design and assessment methods might be necessary to align them more closely with the principles of creative thinking pedagogy, which values creativity and process over rote learning and standardization. Overall, both learners and teachers might require time to adapt to this shift in teaching and learning paradigms, moving away from traditional methods to more innovative and creative approaches.

### **3.2. Classroom sessions based on creative thinking pedagogy and under the ATD frame**

It is pertinent to emphasize that the forthcoming descriptions of each session are intended to be general and do not delve into the intricate details of the concepts and content. Furthermore, specific resources and materials, which should be carefully chosen by each instructor based on their unique context and needs, are not provided in this overview. Our aim is instead to furnish a broad, top-level overview of the sessions. This approach is intended to outline the general structure and thematic focus, serving as a framework that can be adapted and detailed by educators. This general overview is particularly useful for presenting an overall picture of the sessions after incorporating the feedback received from students, allowing for a more holistic understanding of the educational experience.

#### **3.2.1. Session 1: exploring group theory through creative mapping**

In this session, students will delve into the basics of Group Theory, focusing on important concepts such as subgroups, cyclic groups, and permutation groups. The session begins with a clear overview of Group Theory, introducing its key ideas and essential theorems. Next, students will participate in a Creative Mapping Task where they create visual maps or diagrams to represent different groups and their characteristics. For example, they might illustrate the structure of a cyclic group or show the symmetries found in permutation groups. After creating their maps, students will engage in a group discussion where each person or team presents their visual representation and explains how it captures the properties of the group they studied. Additionally, the session will include an ATD Integration segment that explores the history of Group Theory, highlighting contributions from various cultures and the development of abstract algebra over time.

#### **3.2.2. Session 2: algebraic topology and artistic expression**

This session introduces students to Algebraic Topology, covering concepts like fundamental groups and homotopy. The objective is to help students understand these complex ideas through artistic expression. The session starts with an interactive lecture that provides a basic understanding of algebraic topology and its connections to geometric objects. Following the lecture, students will engage in an Artistic Interpretation activity where they use drawing, sculpting, or digital design to represent advanced concepts from Algebraic Topology, such as how one space can be "continuously deformable" into another. Finally, the class will host a mini-exhibition where students display their artworks and explain their representations. This will lead to a discussion on how artistic approaches can improve the comprehension of abstract mathematical ideas. The ATD Integration component will explore how different cultures have historically visualized and understood complex topological spaces.

#### **3.2.3 Session 3: ring theory and real-world application**

In this session, students will explore Ring Theory, focusing on structures like polynomial rings and their properties. The objective is to understand Ring Theory and see how it applies to real-world situations. The session begins with a Case Study Analysis, where students are introduced to Ring Theory with an emphasis

on polynomial rings. Next, in the Application Workshop, students work on case studies that require them to use Ring Theory concepts to solve practical problems, such as those found in cryptography or coding theory. After working on these applications, each group will present their solutions, discussing how Ring Theory helped address the problem and the creative methods they used. The ATD Integration part of the session will highlight the history and development of Ring Theory, emphasizing its importance in various cultural and historical contexts, especially in the advancement of modern computing and information theory.

### 3.3. Learners and teachers feedback after the sessions

The algebra sessions, designed with a focus on creative thinking pedagogy and underpinned by the anthropological theory of didactics (ATD), were implemented during the 2018/19 academic year. These sessions involved a total of 24 students and 3 teachers. Following the completion of these sessions, the feedback questions outlined in Section 2 of our study were administered. In this narrative, we summarize the responses and insights gathered from both students and teachers who participated in these innovative algebra sessions, reflecting their experiences and the impact of this pedagogical approach.

#### 3.3.1. Learners' feedback

Most learners found the sessions engaging, especially the creative mapping in Group Theory and the artistic expression in Algebraic Topology. They appreciated how these activities made abstract concepts more tangible and easier to grasp. Many highlighted that visualizing Polynomial Rings through cryptography examples was particularly enlightening. Students felt that the sessions encouraged them to think more creatively about algebra. One student mentioned, "Creating stories around symmetry groups helped me think outside the box and see the beauty in mathematical structures." Another student found that applying algebraic concepts to solve real-world problems, like in cryptography, was a creative challenge that enhanced their problem-solving skills. The real-world applications were a hit among students. They appreciated seeing the practical side of algebra, with many stating it made the subject more relevant and interesting. The historical context added depth, making algebra feel less abstract and more connected to human development and societal progress. The overall experience feedback was overwhelmingly positive, with students valuing the innovative approach to learning algebra. Some suggested more interactive digital tools for future sessions and expressed interest in exploring other mathematical topics using a similar approach.

#### 3.3.2. Teachers' feedback

Teachers found integrating creative thinking pedagogy and ATD rewarding but challenging. They had to think differently about lesson planning and execution. One teacher mentioned, "It was a learning curve but seeing my students engage so deeply with the material made it worthwhile." Teachers observed an increase in student participation and enthusiasm. They noted that students who usually seemed disinterested were more involved, especially during hands-on activities like the art-based exploration of Algebraic Topology. While teachers saw the value in this approach, they also recognized challenges in integrating it into the standard curriculum due to time constraints and the need for additional resources. They suggested that a blended approach, mixing traditional methods with creative pedagogies, could be more feasible. Teachers observed an improvement in students' conceptual understanding and problem-solving abilities. They noted that students were more willing to tackle complex problems and showed enhanced critical thinking skills. Teachers were generally positive about the sessions, seeing clear benefits in student engagement and understanding. They recommended ongoing professional development in creative pedagogies to better integrate these approaches and suggested collaboration among faculty to share best practices and ideas.

#### 3.3.3. Areas for improvements

In considering areas for improvement based on feedback from both learners and teachers, it's important to acknowledge that while the overall response to the creative, culturally-informed algebra sessions was positive, there are always aspects that can be enhanced. This feedback, while constructive, does not contradict the overall positive nature of the initial responses. Some learners expressed a desire for deeper exploration of certain complex algebraic topics. For instance, while the creative approaches were engaging, a few students mentioned they would appreciate more rigorous problem sets to challenge their understanding further: "I loved the creative aspect, but sometimes I wished for more traditional problem-solving to really test my grasp of the theory." A common suggestion was about pacing of sessions. A few students felt that some sessions tried to cover too much ground too quickly, especially when introducing new or complex concepts. They suggested spreading out the content over more sessions or providing additional resources for self-study. Several students recommended greater use of technology in sessions. While they enjoyed the hands-on activities, they saw potential for enhancing learning through digital tools, like interactive simulations for complex concepts in Ring Theory or Algebraic Topology.

Teachers noted the need for more resources, both material and time, to effectively implement these methods. “Finding the right balance between creative teaching and covering the syllabus within time constraints is challenging,” one teacher noted, suggesting that additional support from the institution could be beneficial. While teachers were enthusiastic about the new approach, they also expressed a need for more structured professional development opportunities to fully harness these pedagogies. They suggested workshops or collaborative sessions with peers to share ideas and strategies. Another area for improvement mentioned by teachers was assessment. Aligning creative teaching methods with effective assessment strategies was seen as a challenge. Teachers expressed a desire for more training and resources on designing assessments that could accurately measure student understanding in a creative learning environment. The feedback underscores the need for a balanced approach that combines creative and traditional methods, adequate pacing, enhanced technological integration, more institutional support, continuous professional development for teachers, and refined assessment strategies. These improvements aim to further enrich the learning experience while maintaining the effectiveness and engagement levels observed in the sessions.

In response to the challenges highlighted by teachers regarding the implementation of creative teaching methods, integrating increased resources and professional development can significantly enhance the educational process. The importance of innovative teaching has been increasingly recognized, as demonstrated by a study which found that factors such as teacher enthusiasm, flexible teaching, and strong teacher-student interactions are crucial for student engagement and learning value [21]. A scoping review has emphasized the diverse conceptualizations of teacher effectiveness and the importance of observational data for enhancing teaching practices in higher education [22]. This indicates a need for more structured professional development and advanced tools for assessing teacher effectiveness. Additionally, the rapid advancements in AI present new opportunities for teaching and learning. AI can significantly augment teaching processes, offering personalized solutions and new challenges for higher education [23]. This suggests that integrating AI into educational practices could help address the demand for innovative teaching methods. However, despite the recognized importance of creativity and innovation in education, studies show that there is a significant gap in teaching for creativity within higher education institutions [24], [25]. This lack of focus on creativity not only hampers student development but also affects the overall quality of education. Moreover, the role of the educational environment and institutional support in fostering innovative teaching methods cannot be overstated. Adequate support and digital resources are essential for educators to effectively implement and sustain innovative pedagogies based on different methodological approaches to maintain students’ engagement.

Therefore, it is crucial that higher education institutions prioritize the support for innovative teaching methods through increased resource allocation, continuous professional development, enhanced technological integration, and the creation of an educational culture that values and promotes creativity and innovation. By addressing these areas, institutions can help teachers overcome the challenges of integrating creative teaching methods and developing effective assessment strategies, thereby enhancing the overall student learning experience.

#### 4. CONCLUSION





Throughout our work, we have explored several facets of integrating creative thinking pedagogy and the anthropological theory of didactics (ATD) into university-level algebra education. Initially, we discussed the importance of understanding the perspectives of learners and teachers in education. We noted that considering these perspectives is essential for creating effective, inclusive, and responsive educational experiences. We then shifted our focus to designing classroom sessions in algebra, anchored in creative thinking pedagogy and supported by ATD. The proposed sessions were aimed at encouraging creative and critical engagement with algebraic concepts while embedding them within a rich cultural and historical context. These sessions included exploring group theory through creative mapping, investigating algebraic topology with artistic expressions, and applying ring theory to real-world problems like cryptography. Feedback from learners and teachers on these sessions was largely positive, indicating an appreciation for the innovative and engaging approaches to learning complex algebraic concepts. Learners valued the integration of creativity and real-world applications, which made algebra more tangible and relevant. Teachers, while enthusiastic about the creative methods, identified challenges in implementation, particularly regarding resource constraints and the need for professional development. Suggestions for improvement included a deeper exploration of algebraic topics, better pacing of content, increased use of technology, additional institutional support, and refined assessment strategies. These improvements aim to balance creative and traditional teaching methods, enhancing the overall learning experience. In conclusion, our work underscores the potential of creative thinking pedagogy, supported by ATD, to enrich algebra education at the university level. By considering learners' and teachers' perspectives and continuously striving to improve teaching methodologies, we can create a more engaging, effective, and culturally informed educational environment in advanced mathematics.

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## BIOGRAPHIES OF AUTHORS






**Yanko Ordóñez Ontiveros**     is a professor of innovation and research in education with an emphasis on physical education and the didactics of physical education at the Distance University of Madrid (UDIMA). His background as an engineer and educator gives him an interdisciplinary profile. His research interests are related to educational innovation and, more particularly, how it can be applied to physical education classes. He can be contacted at email: yanko.ordonez@udima.es.





**Julián Roa González**    is the Dean at the Faculty of Education at the Distance University of Madrid (UDIMA). He has been a mathematics teacher at various educational levels, from primary school to university. His areas of interest focus on the didactics of mathematics, innovation, and research in education, with a special emphasis on mathematics. He can be contacted at email: [julian.roa@udima.es](mailto:julian.roa@udima.es).



**José Luis Díaz Palencia**    is professor of Mathematics at University level and professor of Innovation and Research Methodology for the Didactics of Engineering. He accumulates more than 15 years in the educational context teaching and learning mathematics. He is Ph.D. in Science and Technology and MsC in Aerospace Engineering. He can be contacted at email: [joseluis.diaz.p@udima.es](mailto:joseluis.diaz.p@udima.es).