

SDG 10:

“An Approach from the Perspective of Mathematics Education”

Julian Azurduy

Facultad de Economía y Administración, Argentina (julian.azurduy@est.fi.uncoma.edu.ar)

Lilia Natali Castro

Facultad de Economía y Administración, Argentina (liliacastro1511@gmail.com)

Rocio del Cielo Dumuihual

Facultad de Economía y Administración, Argentina(rociodumuihual.RD@gmail.com)

Abstract

“The Mate Teachers” project, developed at the School of Informatics of the Universidad Nacional del Comahue, aligns with SDG 10 on reducing inequalities and aims to improve the academic and emotional adaptation of first-year students in the subject Elements of Algebra. The study aimed to analyze the impact of a mixed —digital and face-to-face— mentoring system designed to strengthen learning and institutional belonging. This research is particularly relevant as it addresses a critical stage of university life where differences in study habits and self-confidence often deepen educational gaps. A mixed-method, descriptive, and exploratory approach was adopted, including Instagram surveys, analysis of Discord interactions, and in-person observations. Results show that although digital participation was limited, the inclusion of in-person spaces increased interaction, improved students’ self-perception of exam preparation, and supported academic continuity. In conclusion, the experience demonstrates that teaching mathematics from a humanistic and critical perspective does not mean abandoning rigor, but rather re-signifying it to promote inclusion, collaboration, and equity in the early years of university education.

Keywords: mentoring; mathematics education; students.

1. INTRODUCTION

Mathematics education has been the subject of numerous studies seeking to understand and reduce inequalities in academic achievement. Recent works such as those by Gómez-Talal, Bote-Curiel, and Rojo-Álvarez (2024), Tesfamicael and Enge (2024), and Johansson et al. (2024)

offer valuable insights for addressing these disparities from cultural, sustainable, and transitional perspectives. However, these studies are situated in contexts different from that of the Universidad Nacional del Comahue , where a gap persists regarding integral support for first-year students—particularly in faculties such as Informatics.

The Mate Teachers project emerged in response to this need, proposing mentoring strategies that encompass not only content review but also time management, exam preparation and emotional well-being. The initiative, institutionally supported, combines digital platforms (Discord and Instagram), diagnostic surveys, and in-person activities. It aims to reduce dropout rates, improve adaptation to university life, and strengthen students' sense of belonging.

The study is based on the hypothesis that peer mentoring, when built upon recognition of diversity and mutual care, can enhance both mathematical knowledge acquisition and student well-being.

Within this framework, three research questions are posed. What meanings do students attribute to mentoring in university mathematics? What conditions enable or constrain these practices? What tensions emerge in the relationship between students and The Mate Teachers?

The objectives are to describe the peer support model in mathematics, analyze experiences from the participants' perspectives, and reflect on the role of inclusion in university teaching.

Previous studies that underpin this experience include the work of Gómez-Talal et al. (2024), who analyze gaps in mathematical performance based on cultural, geographical, and gender variables; Tesfamicael and Enge (2024), who propose integrating sustainability into mathematics teaching; and Johansson et al. (2024), who introduce the concept of "cultural shock" in the secondary-to-university transition. These works allow to contextualize the proposal of "The Mate Teachers" within a theoretical framework that recognizes the complexity of educational paths and the need for inclusive strategies.

2. METHODOLOGY

This study adopts a mixed-method approach, combining quantitative and qualitative methods in a descriptive and exploratory design. This choice responds to the need to characterize academic difficulties in the course Elements of Algebra and to assess the effectiveness of a digital mentoring project. The mixed design allows capturing both general participation patterns and subjective perceptions of the learning process, which is essential to understand the academic and emotional impact of the project.

The initiative arises in response to the results of the first exam of the 2025 academic term, in which, out of 316 enrolled students, 221 took the test, with a 12.97% pass rate and 56.96% fail rate. These results justify the pertinence and urgency of the proposal.

The reference population consists of students of the Bachelor's and Teaching Degrees in Informatics at the Faculty of Informatics (FAI) of the University of Comahue, enrolled in the subject Elements of Algebra. The sample was selected through convenience sampling, including students who voluntarily decided to participate in the project. Currently, there are 242 registered students, although not all are actively attending. The sample is not representative of the entire population, due to its voluntary nature and the fact that not all enrolled students participate in the mentoring program.

Data collection employed two digital platforms: Instagram and Discord. On Instagram, surveys and questionnaires designed by the project team were administered, based on previous experience. These instruments gathered both quantitative and qualitative data regarding study strategies, exam preparation, and perceived difficulties. On Discord, discussion forums and course-related materials were provided to support students' mathematical learning. Interactions were recorded and analyzed as part of the evaluation corpus of the project's impact. Even though the instruments were not validated through a formal pilot test, their design is based on didactic criteria and on a review made by teachers experienced on academic support.

The procedure is carried out in clearly defined chronological stages. The project began to take shape in May 2025, when the use of Discord and Instagram as support environments was decided. In September, institutional accounts were created on both platforms, and a formal note was submitted to the FAI Welfare Secretariat, which provided an institutional framework to the

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proposal. Data collection takes place between September and October 2025 and includes: administering surveys and questionnaires via Instagram; creating forums and publishing academic material on Discord and systematic recording of student interactions.

From an ethical point of view, participation was voluntary and anonymous. No personal or identifying data were collected, and all information was used exclusively for academic and research purposes. Data protection and accessibility were ensured, considering that most students already use these platforms regularly.

Quantitative data were analyzed through descriptive statistics,, including frequency tables and charts, while qualitative information from open-ended surveys and Discord interactions was examined using thematic categorization and content analysis. Triangulation among sources strengthened interpretive validity and provided a comprehensive understanding of the project's impact. Triangulation between sources is planned to strengthen interpretive validity and build a comprehensive understanding of the project's impact.

Finally, the methodological criteria adopted are directly justified by the project's SMART objective: *"To support first-year students of the Faculty of Informatics in the course Elements of Algebra, through digital spaces for consultation and reflection, in order to improve exam preparation and strengthen institutional belonging during the second semester of 2025."* The sample delimitation, instrument selection, and procedure design respond to the need to ensure specificity, relevance, measurability, and internal coherence at each stage of the study.

3. RESULTS

During the development of The Mate Teachers project, aimed at supporting first-year students in the course Elements of Algebra at the Faculty of Informatics, both quantitative and qualitative data were collected and analyzed to assess the scope, challenges, and potential of the initiative. Initially, the mentoring was conducted entirely online, using Instagram and Discord as spaces for consultation, exchange, and reflection. While the Instagram account generated an active community, participation on the Discord server was significantly lower than expected.

This was particularly striking, given that the material had been previously analyzed and a high failure rate had been detected in the Algebra Elements subject.

During the first few weeks on the Discord server, messages were received asking if certain topics would be covered, but no substantive questions or participation in the proposed weekly

challenges were generated. These challenges were designed as prompts to encourage interaction between teachers and students, as well as among peers. Although many students connected to the server and viewed the proposals, sustained attention was not achieved. This phenomenon, although frustrating, can be partially understood due to the voluntary nature of participation.

In response, a face-to-face strategy was implemented: a consultation space was established in the Faculty of Informatics, with a blackboard as the central resource. This intervention successfully attracted a group of students who began to engage spontaneously. As it has been mentioned before, rather than providing direct solutions, the focus was on creating an environment of shared knowledge. Students started solving problems collaboratively, taking photos of the blackboard, uploading their work on Discord, and asking new questions.

During this week, 12 new interactions were recorded on the server, all related to specific questions about Algebra Elements.

From a quantitative point of view, the Discord server currently has 60 registered students (as of today -10/16-), as can be seen in the following Table 1: "Discord Participants." Additionally, a bar chart illustrating interactions on the server over the past few weeks is shown in the following link: "Discord Statistics Table." On the other hand, the Instagram account reached 104 followers in the first month, with sustained growth, as detailed in this Table 2: "Instagram Participants."

The frequency tables and graphical representations showed an increase in attendance at in-person sessions, as well as an improvement in self-perceived preparation for exams, especially among students who participated in both formats.

The Instagram account, initially designed as an informational channel, solidified as a space for interaction. Students participated in surveys, viewed content, and sent private messages with questions about how Discord works, consultation hours, and the project's dynamics. This social network, due to its more relaxed and leisure-oriented nature, allowed for the establishment of an effective communication bridge with the students, promoting the diffusion of information and access to support spaces. Below, in the following link, you can see the statistical data of the Instagram account: "Instagram statistical data."

Triangulation of sources—surveys, digital forums, and face-to-face interactions—allowed for a robust interpretation of the project's impact. Overall, the results show that, although the

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expected level of digital participation was not reached, the combination of digital and in-person strategies strengthened both disciplinary learning and the sense of institutional belonging.

This experience validates the relevance of the mixed approach adopted, but also invites rethinking the ways of convening and sustaining voluntary participation in virtual environments. Beyond the initial challenges, the teaching staff did not run out of tools: new alternatives continue to be explored to create a stronger, more inclusive, and enduring educational connection.

4. DISCUSSION

The findings from the Mate Teachers project provide crucial insight: disparities in first-year mathematics performance are not merely cognitive but are deeply rooted in social, emotional, and contextual factors. This reinforces the need for a comprehensive approach to education, consistent with research explaining educational gaps through the interaction of socioeconomic, cultural, and pedagogical variables (Gómez-Talal et al., 2025).

Peer support proved to be an essential mechanism for inclusion. The project demonstrated that promoting collaborative learning and community-building through digital spaces is fundamental to improving student retention and performance. Peer support was effective in mitigating the feeling of isolation, strengthening autonomy and engagement, which is vital given the complexity of the "cultural shock" inherent in the transition to university life (Johansson et al., 2024). However, the project was not without reasonable limitations. Participation on Discord was lower than anticipated, likely due to digital overload and limited academic familiarity. This experience served as the basis for the interpretation that the most sustainable solution is the hybrid approach. By incorporating in-person sessions (such as the consultation space at the Faculty of Informatics), more sustained and meaningful interactions were achieved.

In terms of future implications, the project reaffirms that reducing educational inequalities requires going beyond the mere content transmission and rather focusing on the emotional and social dimensions of learning. The Mate Teachers project provides concrete evidence that local actions, even with modest resources, can contribute to the global goals of educational equity (SDG 10) (Tsfamicael and Enge, 2024). By aligning with global trends in mathematics education and sustainability, we propose a replicable support model that ensures sustainable practices and a real commitment to a more inclusive, participatory, and fair university education.

Results show that inequalities in learning mathematics are not only cognitive but also social and emotional. Peer support can reduce the feeling of isolation and strengthen student autonomy. Low digital participation is attributed to the overload of tools and the lack of academic habits in their use. Coordination with in-person activities proved key to creating more lasting connections. The project reaffirms that educational inclusion requires a comprehensive approach that considers the emotional aspects of learning and promotes sustainable and replicable practices.

5. CONCLUSION

The *Mate Teachers* project confirms that the disparities in the mathematical performance of first-year students are not solely cognitive in nature, but are intrinsically linked to social, emotional, and contextual factors. This fundamental finding aligns teaching practice with the global objectives of educational equity (SDG 10).

It is concluded that peer mentoring and the implementation of collaborative digital spaces constitute a relevant and effective strategy to reduce feelings of isolation and to strengthen student persistence and engagement. Despite these achievements, the low level of digital participation revealed a crucial limitation. The experience showed that human barriers, such as fear of embarrassment and the lack of a prior trust-based relationship, prevent full interaction in virtual environments. Therefore, the impact of these initiatives depends on a humanized approach that prioritizes the construction of a pedagogical bond.

As a practical implication, it is established that these proposals should be implemented earlier—before the beginning of the semester—to allow trust to develop solidly before academic pressure sets in.

Ultimately, this work reaffirms that teaching mathematics through the lens of social justice does not renounce rigor but rather redefines it from a critical and committed perspective. The *Mate Teachers* project is consolidated as a replicable and transformative model focused on the integral development of students and on promoting a fairer and more inclusive university education.

The *Mate Teachers* project made it possible to visualize how the teaching of mathematics can enable inclusion processes from a situated and humanistic perspective. Although digital participation was limited, support spaces recognized by students were consolidated. Emotional barriers such as fear of making mistakes and the shame of not understanding were identified as

key obstacles. The experience invites us to rethink the ways of engaging and sustaining voluntary participation, prioritizing the pedagogical relationship and early implementation. Teaching mathematics from a social justice perspective implies redefining rigor through a critical and committed lens. This experience contributes a mentoring model that questions and transforms, promoting a fairer, more meaningful mathematics education focused on the integral development of each student.

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REFERENCES

- Gomez-Talal. M., Bote-Curiel, L., & Rojo-Álvarez, J. L. (2024). *Understanding the disparities in Mathematics performance: An interpretability-based examination. Education and Information Technologies*, 29(5), 6347–6372. Disponible en: <https://www.sciencedirect.com/science/article/pii/S0952197624002677#sec6>
- Johansson H., österholm M., Flodén L. & Heidtmann P. (2024). Clash of Cultures? Exploring Students' Perceptions of Differences Between Secondary and Tertiary Mathematics Education. *International Journal of Mathematical Education in Science and Technology (IJEMST)*. Volume 55, 2024. Issue 7.
Disponible en : <https://www.tandfonline.com/doi/abs/10.1080/0020739X.2022.2070558>
- Solomon A. Tesfamicael & Ole Enge (2024). *Revitalizing Sustainability in Mathematics Education: The Case of the New Norwegian Curriculum*. Department of Teacher Education, Solomon A. Tesfamicael & Ole Enge (2024). *Revitalizing Sustainability in Mathematics Education: The Case of the New Norwegian Curriculum*. Department of Teacher Education, Faculty of Social and Educational Sciences, Norwegian University of Science and Technology (NTNU), NO-7491 Trondheim, Norway. Disponible en: *Revitalizing Sustainability in Mathematics Education: The Case of the New Norwegian Curriculum*.