Analysis of Academic Tutoring in Higher Education Using Artificial Intelligence

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Abstract. University tutoring is a project that encompasses institutions from all over the world seeking to provide support to students to improve their performance at university, however the traditional model must be adjusted to distance conditions that require virtual or semi-presential attention, in which case a traditional tutor requires virtual environments to improve their tutorial performance, that is why in this work the various virtual tools of tutorial attention and their characteristics are analyzed, in addition a methodology is proposed to measure their performance based on the variables of interest in higher education institutions. With this, the performance of 4 platforms is measured and the way in which they should be integrated to obtain comprehensive tutoring is concluded.

Keywords. Academic tutoring, artificial intelligence, applications, university tutoring.

1 Introduction

With the COVID-19 pandemic, many human activities were modified due to pandemic containment strategies, leading almost all sectors of society to shift from in-person activities to virtual or remote activities, resulting in a significant acceleration of digital communications and existing information technologies. Of course, education was one of the sectors that had to immediately implement this new virtual modality for the training of students at all levels, from basic education to higher education and postgraduate studies [1].

Universities around the world implemented different student guidance and support initiatives. In Mexico, as throughout the world, these challenges forced them to undertake creative and innovative actions to reorganize their core functions of teaching, research, outreach, and extension, making maximum use of available technology.

As in traditional education, once students have access to higher education, graduating is a challenge. However, academic tutoring contributes to creating a supportive environment that can positively influence student retention at the university by improving their educational experience and their connection with the institution. In other words, university tutoring plays a quality-oriented role, as it is considered part of the evaluation process that comprises one of the quality standards at the university level [2].

Tutoring services, in general, are designed to help students succeed in their studies, overcome academic challenges, and achieve their educational and professional goals. Furthermore,

Table 1. Number of units and indicators per factor and dimension of tutoring

Factor	Units of analysis				Indicators			
	Academic dimension	Institutional Dimension	Professional dimension	Total	Academic dimension	Institutional Dimension	Professional dimension	Total
Tutoring structure	91	72	70	237	13	5	9	27
Tutor's knowledge	83	79	98	260	6	4	9	19
Teaching strategy	104	121	91	316	9	8	7	24
Student learning	74	92	85	251	5	5	5	15
Grand Total	356	364	344	1064	33	22	30	85

Table 2. Interview guide structure

Dimension	Questions
Academic dimension	Have you attended tutoring sessions with academic support??
	What was it like?
	What knowledge did the mentor demonstrate in relation to the mentoring?
	How did the mentor teach the mentee what they needed to learn?
	What kind of skills did you develop?
Dimension professional	Have you attended any professional development mentoring sessions?
	What was it like?
	What knowledge did the mentor demonstrate in relation to the mentoring?
	How did the mentor teach the mentee what they needed to learn?
	What kind of skills did you develop?
Institutional dimension	Have you attended tutoring sessions focused on personal development?
	What was it like?
	What knowledge did the mentor demonstrate in relation to the mentoring?
	How did the mentor teach the mentee what they needed to learn?
	What kind of skills did you develop?

tutoring has become a valuable tool for addressing diversity and promoting inclusion, providing support according to individual needs.

This makes it a comprehensive strategy that also aims to solve the contextual problem identified by the student body, primarily addressing the four dimensions established in the tutoring model: affective or emotional, cognitive, professional, and social.

Several studies have analyzed the improvement of students' academic learning through academic tutoring, with results indicating, in the best cases, an efficiency of 75% compared to students without these tutoring programs. However, the implementation of these tutoring programs is not yet widespread in education and has not been fully accepted by students.

In some cases, it has been revealed that 93.4% of students rated the tutoring system as fair, while 6.6% considered it poor or unsatisfactory. However, there are serious shortcomings in measuring tutoring due to the personalization of criteria and the methodology used, such as questionnaires, interviews, etc. [3, 4].

But then this task, which traditionally requires personalized attention, had to shift to a virtual modality. Initially, this was done through a remote personal connection.

However, given the fortunate arrival of the era of Artificial Intelligence, various tools began to be used that not only improved interaction but also supported both teachers and students in their academic activities [5].

Artificial intelligence is an emerging technology that has revolutionized the way we interact with the world. In education, AI can be a valuable tool for university tutors and professors.

However, like any technology, AI has its pros and cons. UNESCO has indicated that artificial intelligence has the capacity to address some of the greatest challenges facing the field of education, to develop innovative teaching and learning practices, and ultimately, to accelerate progress toward achieving the Sustainable Development Goals. Nevertheless, these rapid technological advances inevitably generate numerous risks and challenges. It is important to keep in mind that AI is not a magic bullet intended

Table 3. Proposed questionnaire for the application with AI

Dimension	Traditional Questions	Questions for AI Users
Academic dimension	Have you attended tutoring sessions with academic support?? What was it like? What knowledge did the mentor demonstrate in relation to the mentoring? How did the mentor teach the mentee what they needed to learn? What kind of skills did you develop?	Have you used the app for academic tutoring? What knowledge did the app provide about the material you needed? What support elements did the app use to show you the content? What kind of skills did you develop?
Dimension professional	Have you attended any professional development mentoring sessions? What was it like? What knowledge did the mentor demonstrate in relation to the mentoring? How did the mentor teach the mentee what they needed to learn? What kind of skills did you develop?	Have you used the app for professional tutoring? What knowledge did the app provide about the material you needed? What support elements did the app use to show you the content? What kind of skills did you develop?
Institutional dimension	Have you attended tutoring sessions focused on personal development? What was it like? What knowledge did the mentor demonstrate in relation to the mentoring? How did the mentor teach the mentee what they needed to learn? What kind of skills did you develop?	Have you used the app for one-on-one tutoring? What knowledge did the app provide about the material you needed? What support elements did the app use to show you the content? What kind of skills did you develop?

to replace humans in their traditional roles; therefore, AI must be complemented and supervised [6].

AI is defined as the ability of a machine or program to mimic human logical capabilities such as reasoning, creativity, and organization. Through interaction with its environment and available information, it can relate the information at its disposal to solve problems oriented toward a specific goal, following an external command.

For university professors, AI can be a tool that complements and enhances quality by optimizing repetitive processes, supporting personalized learning, and fostering student interest. It radically changes the way the student-tutor relationship is conducted and developed, fostering a continuous collaborative creation of internalized concepts through practice, while keeping in mind an ethical, human, and sustainable perspective (Rocketcontent, 2020).

In this digital age, artificial intelligence is rapidly transforming various sectors, and education is no exception. These AI tools for teachers are revolutionizing how lessons are planned, implemented, and evaluated, offering new opportunities to personalize teaching and improve student learning. From creating dynamic assessments to providing personalized feedback, these technologies are designed to facilitate teachers' work and maximize each student's potential.

2 Theoretical Framework and State of the Art

This paper presents some of the most widely used tools in university academic tutoring, their characteristics, and their impact on university students. It then proposes a methodology for analyzing variables reported in other studies and the relevance of using available tools and integrating them into a comprehensive analysis and diagnostic framework.

This aims to foster the creation of personalized or collaborative virtual learning environments tailored to the needs of the end user, whether an individual, group, section, department, faculty, or institution.

Fig. 1. Comparative graph of the average response of the 3 categories for the 4 tutoring platforms.

In general, there are various AI-based tools available to support tutoring activities in different aspects. Most are complementary, as there is no known comprehensive system that offers all these features. Therefore, some of the best-known tools and their characteristics are presented below.

Socrative: This is a student response system that provides teachers with real-time feedback on student learning during activities and assessments. It can be used to create quizzes, surveys, rewards, and open-ended questions, thus collecting formative assessment data, which is very useful for identifying misconceptions and adjusting instruction according to students' needs [7].

Yippity: This is a platform for creating personalized quizzes for student assessments. It can automatically generate quizzes based on specific learning objectives and adjust the difficulty of the questions according to each student's performance, ensuring that students face appropriate challenges without feeling overwhelmed. It also helps teachers identify areas where more support is needed [8].

Gradescope: This online tool transforms how educators assess student work and streamlines the entire grading process, while also providing valuable insights into learning [9].

Google Gemini: This extensive language model and powerful artificial intelligence tool uses a vast dataset of text and code to generate text, translate languages, create various types of creative content, and answer questions informally. Teachers can leverage its capabilities to create interactive learning materials such as quizzes and flashcards, personalize feedback for students, and even generate creative prompts for writing or lesson plans. Students can use this tool to research, explore concepts in new and engaging ways, and receive real-time feedback on their writing. It is a comprehensive assessment platform that allows teachers to design various types of formative assessments, such as quizzes, surveys, and open-ended questions. It also provides real-time data on student performance, enabling teachers to identify areas that require additional support and adapt their teaching methods accordingly [10].

3 Discussion of Reported Results

Based on the various platforms, it is necessary to measure their performance using accredited bodies such as ANUIES [11], in order to have an objective assessment of university education. Therefore, the following elements are measured and are presented in Table 1:

− Tutoring structure.

− Tutor knowledge.

− Teaching strategy.

− \Student learning.

The number of reported indicators is higher for the tutoring structure within the academic dimension and lower for tutor knowledge when the tutoring had an institutional dimension [12].

The survey included the questions shown in Table 2.

Based on this, the questions that will be asked anonymously to users of the different platforms must be reformulated, leading us to the following proposal:

Using these criteria and the methodology implemented by ANUIES, the following comparative results are presented between the traditional methodology and that provided by the four digital platforms that utilize AI. Figure 4 presents a comparative graph of the four platforms and the average score each generated for the three question categories.

5 Conclusions and Future Work

The use of AI-powered tools provides better results compared to a traditional tutor. However, there is no tool that can offer comprehensive tutoring, at least in the aspects recommended by ANUIES (National Association of Universities and Institutions of Higher Education). Therefore, the integration of these tools is necessary to generate support comparable to that of a traditional tutor.

It was also observed that the Google Gemini platform performed very well in the professional and academic categories, while the institutional category performed better with the Socrative application.

Although this methodology is currently being used on only four AI-powered platforms, it should be tested on a larger number to develop a repertoire of applications that can even be switched depending on the type of tutoring assistance required. This would lead to a system that decides which platform is best suited to the type of advising needed.

Furthermore, it could be developed into a system that, based on these responses, makes its own decisions and even generates combined responses from different platforms, thereby creating a personalized environment for each user requiring comprehensive university tutoring.

References

1. **Yana-Salluca, M., Coila Torres, A., Vargas Velásquez, D., Hancco Monrroy, D. E., Yana-Salluca, N., Adco-Valeriano, H. (2024).** Vista de tutoría y desempeño académico en estudiantes universitarios, Horizontes. Revista de Investigación en Ciencias de la Educación, 8(32), 80–92.

2. **Montoya, M. (2024)**. La tutoría integral como estrategia educativa, para favorecer los procesos de aprendizaje y desarrollo integral de los alumnos de la ENSVMT, en tiempos de pandemia. Congreso Nacional de Investigación Educativa. pp. 1–13.

3. **Pari Orihuela, M., Díaz Vilcanqui, Y.D., Mamani Coaquira., H. (2024)**. Tutoría y rendimiento académico en universitarios del altiplano Peruano. Journal of Law and Sustainable Development, Vol. 12, No. 2, pp. 1–19. doi: 10.55908/sdgs.v12i2.3278.

4. **Pantoja Vallejo, A., Colmenero Ruiz, M.J., Molero, D. (2022)**. Aspectos condicionantes de la tutoría universitaria. Un estudio comparado. RIE, Vol. 40, No. 1, pp. 33–49. doi: 10.6018/rie.373741.

5. **Aguilera-García, J.L. (2019)**. La tutoría universitaria como práctica docente: fundamentos y métodos para el desarrollo de planes de acción tutorial en la universidad. Pro.posicoes, Vol. 30, pp. 1–27. doi: 10.1590/1980-6248-2017-0038.

6. **UNESCO (2025)**. La inteligencia artificial en la educación. https://www.unesco.org/es/digital-education/artificial-intelligence.

7. **Socrative (2025).** Socrative. https://www.socrative.com.

8. **Yippity (2024).** AI Question Generator: Instant Multiple Choice, True/False, Fill-in-the-Blank Questions & More! https://yippity.io.

9. **Gradescope (2025).** Save time grading. https://www.gradescope.com.

10. **Gemini (2024).** Gemini. https://gemini.google.com

11. **Angulo Moreno, Á. de J. (2021).** Indicadores de la tutoría integral desde la percepción de los estudiantes de universidades públicas de México. Dilemas Contemporáneos: Educación, Política y Valores. pp. 1–23. doi: 10.46377/dilemas.v8i2.2512.

12. **Olaguez, E., Espino, P., Mancilla, H., Díaz, J. (2016).** Evaluación de la tutoría entre pares en los estudiantes de ingeniería de la Universidad Politécnica de Sinaloa. Revista Dilemas Contemporáneos: Educación, Política y Valores. pp.1–17.