PERCEPTION OF UNIVERSITY STUDENTS ON THE USE OF ARTIFICIAL INTELLIGENCE (AI) TOOLS FOR THE DEVELOPMENT OF AUTONOMOUS LEARNING

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ABSTRACT

Objective: To explore the perception of university students on the use of Artificial Intelligence (AI) tools for the development of autonomous learning.

Theoretical Framework: The research is based on Technological Acceptance Theory and Constructivism, focusing on the perception of AI in autonomous learning of university students.

Method: Quantitative approach with a descriptive scope, the sample consisted of 665 students enrolled in the Faculty of Education Sciences and Languages (FCEI) of the Peninsula de Santa Elena State University (UPSE)-Ecuador; in the collection of information, the Questionnaire of Perception on the Use of Artificial Intelligence for Autonomous Learning was designed based on 4 dimensions of both variables, and the statistical program SPSS version 29 was used for data processing.

Results and Discussion: The results indicate that students show a favorable perception towards the use of AI tools for the autonomous learning process, however, although AI is recognized as a potential tool in university environments, there are still challenges to be overcome.

Research Implications: The study has practical implications for strengthening in students the digital competencies needed to effectively use AI tools in their autonomous learning.

Originality/Value: The research provides data on the perception of AI tools among university students, offering a starting point for future technology integration strategies in universities.

Keywords: Artificial Intelligence, Autonomous Learning, Technological Tools, Student Perceptions, Higher Education.

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PERCEPCIÓN DE ESTUDIANTES UNIVERSITARIOS SOBRE EL USO DE LAS HERRAMIENTAS DE INTELIGENCIA ARTIFICIAL (IA) PARA EL DESARROLLO DEL APRENDIZAJE AUTÓNOMO

RESUMEN

Objetivo: Explorar la percepción de estudiantes universitarios sobre el uso de las herramientas de Inteligencia Artificial (IA) para el desarrollo del aprendizaje autónomo.

Marco Teórico: La investigación se basa en la Teoría de la Aceptación Tecnológica y el Constructivismo, enfocándose en la percepción de la IA en el aprendizaje autónomo de estudiantes universitarios.

Método: Enfoque cuantitativo con un alcance descriptivo, la muestra se constituyó por 665 estudiantes matriculados en las carreras de la Facultad de Ciencias de la Educación e Idiomas (FCEI) de la Universidad Estatal Península de Santa Elena (UPSE)-Ecuador; en la recolección de información se diseñó el Cuestionario de Percepción sobre el Uso de Inteligencia Artificial para el Aprendizaje Autónomo a partir de 4 dimensiones de ambas variables, y para el procesamiento de datos se utilizó el programa estadístico SPSS versión 29.

Resultados y Discusión: Los resultados revelaron que los estudiantes muestran una percepción favorable hacia el uso de las herramientas de la IA para el proceso de aprendizaje autónomo, sin embargo, aunque la IA se reconoció como una herramienta potencial en entornos universitarios, aún persisten desafíos que se deben superar.

Implicaciones de la investigación: El estudio tiene implicaciones prácticas para el fortalecimiento en los estudiantes de las competencias digitales necesarias para utilizar eficazmente las herramientas de IA en su aprendizaje autónomo.

Originalidad/Valor: La investigación aporta datos sobre la percepción de las herramientas de IA entre los estudiantes universitarios, ofreciendo un punto de partida para futuras estrategias de integración tecnológica en las universidades.
1 INTRODUCTION

The COVID-19 pandemic in 2020 led universities to develop educational processes in virtual learning environments (Araoz et al., 2021, p. 94; Casero Béjar & Sánchez Vera, 2022, p. 244; Chanto Espinoza & Mora Peralta, 2021, p. 21). At present, this modality still represents a challenge for students because they are not achieving the expected curricular competencies (Condori Meléndez et al., 2021, pp. 31-35; Miguel Román, 2020, p. 287). Among the factors involved in the problem is the lack of familiarity with digital technologies that leads to underestimating the capabilities of these tools, influencing the willingness to use them effectively in learning (Flores Huilcatoma & Martínez García, 2020, p. 27; Manrique Maldonado et al., 2021, p. 15; Mereles et al., 2020, p. 1700).

The Royal Spanish Academy defines AI as the “scientific discipline that deals with creating computer programs that execute operations comparable to those performed by the human mind, such as learning or logical reasoning” (definition 1). Similarly, for Luckin et al. (2016) “AI involves computer software programmed to interact with the world in ways that normally require human intelligence” (p. 18). Likewise, Rouhiainen (2018) explains that “AI is the ability of machines to use algorithms, learn from data, and use what they learn in making decisions just as a human would” (p. 17).

In education, AI is used for the design of flexible, inclusive, engaging and personalized learning environments (Luckin et al., 2016, p. 30); that is, it aims to adjust the format, level of difficulty, sequence and pace of educational materials, as well as their dialogues, questions and feedback, to the individual needs of learners (Jara & Ochoa, 2020, p. 8). Therefore, it is used to adapt the educational experience to the specific needs of each student, offering personalized learning.

In the university context, the integration of AI poses several opportunities and challenges. On the one hand, through these technologies, the learning process is personalized (López López et al., 2023, p. 122), designing virtual environments that simulate real situations (Alvites Huamaní, 2019, p. 17). On the other hand, there is a risk of reducing the active
approach of students (Castillejos López, 2022, p.18). In that sense, the integration of AI requires a balance between taking advantage of the opportunities it offers and considering the ethical and pedagogical impacts on students' autonomous learning.

Autonomous learning, described by Crispín Bernardo et al. (2011), is a process in which students self-regulate their learning and become aware of their own cognitive and socio-affective processes (p. 49). Moreover, it stands out as especially relevant in online education where physical interaction with others is limited (García Manrique et al., 2023 p. 4). Thus, this type of learning that emphasizes self-regulation and metacognitive awareness is aligned with the principles of constructivism, since it emphasizes the active and participatory role of the student in his or her own learning process. At the same time, it highlights the growing need to employ tools and resources that enrich the educational experience in virtual environments, which is enhanced by the integration of AI.

Ramos Vera et al. (2021) mention that, digital resources generated by AI are the means by which students develop autonomous learning processes (p. 5); that is, they are elements conducive to the development of self-regulation, decision-making and problem-solving skills, since students have the opportunity to manage their own time, set learning goals and use strategies that allow them to achieve their objectives. In this way, AI is a tool that strengthens the development of self-learning competencies in the integral formation of students in a digitalized world.

On the other hand, the quality of autonomous learning in virtual environments depends on the access to technologies and the digital competencies acquired by the student (León Granizo et al., 2024, p. 64). This implies having the electronic devices and the skills to make the most of these tools; therefore, efficiency in their use guarantees quality learning. These skills include the ability to search, evaluate and use online information effectively, as well as the ability to communicate, collaborate and solve problems in digital environments (Levano-Francia et al., 2019, p. 581). Its acquisition improves efficiency in the use of technology and promotes meaningful learning in virtual environments.

In this order of ideas, it is essential that the student acquires mastery in the use of AI in order to strengthen reflection and critical thinking in a responsible manner (Ramos Vera et al., 2021, p. 10). That is, AI is a tool to deepen understanding and improve analytical skills. In this context, we seek to explore the perception that students have about the use of AI tools to develop autonomous learning in virtual learning environments.
2 THEORETICAL FRAMEWORK

It is imperative to employ an approach that allows an adequate integration of AI in universities based on student perceptions. According to the scientific literature, Manosalvas Vaca (2020) mentions that the Technology Acceptance Model (TAM) is established as one of the most widely used to investigate the adoption of new technologies, including the tools provided by AI, since it is considered as a concise theory by the academic community dedicated to the aspects of Information Systems.

The TAM was developed by Davis in 1989, taking as a basis the principles of the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) (Manosalvas Vaca, 2020, p. 276). The TAM includes two specific behavioral aspects: (a) perceived usefulness (b) perceived ease of use (González-Bravo, 2015, p. 187). Perceived usefulness provides insight into the extent to which students believe that AI improves their academic performance and their experience of autonomous learning, whereas, perceived ease of use reveals whether the use of AI in learning environments requires significant effort. Both perceptions have a direct consequence on a person’s attitude towards using or not using this technology.

Therefore, the model suggests that the acceptance of any technology by the individual is influenced by positive perceptions of usefulness and ease of use, both from a personal, work, professional or academic point of view (Cabero Almenara & Sampedro-Requen, 2018, p. 437). These aspects in the context of the adoption of AI for autonomous learning, TAM provides a solid theoretical framework to analyze the attitude and perception of students towards this tool and their willingness to integrate in the learning processes of university students.

On the other hand, to employ AI in university environments, the constructivism stance must be considered, this theory emphasizes the active role of students in the construction of their own knowledge, arguing that learning is the result of the continuous construction of new information, which leads to the restructuring of previous knowledge (Zamora Saenz, 2017, p. 282). In this sense, AI tools are adapted to offer personalized, novel and engaging learning experiences that are tailored to the individual needs of each student, fostering the active construction of knowledge. In addition, AI facilitates access and interaction with a wide range of resources and information sources, which, according to Hernández & Jiménez (2019) improves cognitive capacity and allows them to explore, question, build their understanding of the world and solve problems more autonomously (p. 27).

In that scenario, the increasingly widespread use of AI is due to its ability to provide tools and resources that enrich this form of learning (Moral-Sánchez et al., 2023, p. 12). These
tools include personalized recommender systems, adaptive feedback, and virtual environments that replicate authentic scenarios (Ocaña-Fernández et al., 2019, p. 538). This aligns with constructivism, which emphasizes the importance of the learning environment containing multiple perspectives and activities based on context-rich experiences (Hernández Requena, 2010, p. 2). Using tools that emulate real-world environments to improve the quality and effectiveness of the educational process is consistent with this approach, as the emphasis on authentic and relevant real-world tasks is related to providing a more personalized and enriching learning experience for students through adaptive learning tools with AI.

3 METHODOLOGY

The research was conducted with a quantitative approach because data was accurately systematized and it is descriptive in scope since the perceptions of university students were described; it did not seek to establish cause-effect relationships.

The population consisted of a total of 3418 students enrolled in the academic period 2024-1, in the Faculty of Educational Sciences and Languages (FCEI) of the Peninsula de Santa Elena State University (UPSE) - Ecuador.

In the selection of the study subjects, chain sampling was used, which consisted of gathering a small group of students, representatives of each career of the FCEI so that they would later recommend the questionnaire to other students based on the inclusion criterion, “to be enrolled in the FCEI of the UPSE”.

For the collection of information, the “Questionnaire of Perception on the Use of Artificial Intelligence for Autonomous Learning” was designed, based on an exhaustive theoretical review. The instrument consists of two main variables, each comprising four dimensions (Table 1). A set of five items (questions) per dimension was formulated with the aim of exploring in depth the variables in question. In addition, 3 dimensions were established to relate AI to autonomous learning (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Variables and Dimensions related to Artificial Intelligence and Autonomous Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>Artificial Intelligence</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Autonomous learning</td>
</tr>
</tbody>
</table>
Perception of University Students on The Use of Artificial Intelligence (AI) Tools For The Development of Autonomous Learning

<table>
<thead>
<tr>
<th>Relationship of AI to autonomous learning</th>
<th>Impact of AI on academic performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-directed learning resources</td>
<td>Establish goals for their training</td>
</tr>
<tr>
<td>Established goals for their training</td>
<td>Regulation of the autonomous learning process</td>
</tr>
<tr>
<td>Regulation of the autonomous learning process</td>
<td></td>
</tr>
</tbody>
</table>

The questionnaire, analyzed with IBM SPSS statistical software, showed high reliability (Cronbach's alpha = 0.945), evidencing a consistent correlation between the questions. In addition, by aggregating the values of each item, which added up to a total of 5 points per item until reaching an overall score of 25, specific ranges and intervals were defined to classify the perceptions of the study group.

The questionnaire was applied by means of an online form that can be accessed through the following link: [https://forms.office.com/r/6mX2jZyK1X](https://forms.office.com/r/6mX2jZyK1X). The instrument was sent via e-mail to the group of selected subjects who subsequently forwarded the questionnaire to other students; a total of 7 days was estimated for the students to complete the questionnaire, at the end of which a total of 665 questionnaires were completed.

**Table 2**

*Distribution of students by career at the FCEI – UPSE*

<table>
<thead>
<tr>
<th>Careers of the Faculty of Education Sciences and Languages - UPSE</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Education</td>
<td>356</td>
<td>53.5</td>
</tr>
<tr>
<td>Basic Education</td>
<td>143</td>
<td>21.5</td>
</tr>
<tr>
<td>Community Family Child Development Management</td>
<td>115</td>
<td>17.3</td>
</tr>
<tr>
<td>Physical Activity and Sports Pedagogy</td>
<td>50</td>
<td>7.5</td>
</tr>
<tr>
<td>Sports Training</td>
<td>1</td>
<td>.2</td>
</tr>
<tr>
<td>Total</td>
<td>665</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Own elaboration based on data collected in 2024.

The table shows the distribution of 665 students among the various degree programs of the FCEI of the UPSE. The majority (53.5%) study Early Childhood Education, followed by Basic Education (21.5%), Community Family Child Development Management (17.3%), Physical Activity and Sports Pedagogy (7.5%), and a small percentage (0.2%) in Sports Coaching.
Table 3

Gender distribution of students

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>104</td>
<td>15.6</td>
</tr>
<tr>
<td>Female</td>
<td>559</td>
<td>84.1</td>
</tr>
<tr>
<td>Prefer not to say</td>
<td>2</td>
<td>.3</td>
</tr>
<tr>
<td>Total</td>
<td>665</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Own elaboration based on data collected in 2024

The table shows a marked majority female (84.1%) among 665 students, compared to 15.6% male and 0.3% who preferred not to specify their gender.

Table 4

Age of university students

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 - 24 years</td>
<td>470</td>
<td>70.7</td>
</tr>
<tr>
<td>25 - 34 years</td>
<td>147</td>
<td>22.1</td>
</tr>
<tr>
<td>34 - 44 years</td>
<td>40</td>
<td>6.0</td>
</tr>
<tr>
<td>45 - 54 years</td>
<td>8</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>665</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Own elaboration based on data collected in 2024

The table indicates that the majority of university students (70.7%) are between 18 and 24 years old, with a smaller presence of older age groups, showing a clear trend towards younger students.

4 RESULTS AND DISCUSSIONS

The results presented indicate students’ disposition towards autonomous learning and their comfort with the use of online resources, also their tendency to favor an education that balances direct instruction with autonomy in learning and the use of AI tools.

Table 5

Dimensions of artificial intelligence

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Usefulness</th>
<th>Usage</th>
<th>Experience</th>
<th>Confidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>Very useful</td>
<td>135</td>
<td>20.3</td>
<td>104</td>
<td>15.6</td>
</tr>
<tr>
<td>Quite useful</td>
<td>390</td>
<td>58.65</td>
<td>453</td>
<td>68.12</td>
</tr>
<tr>
<td>Somewhat useful</td>
<td>114</td>
<td>17.14</td>
<td>89</td>
<td>13.38</td>
</tr>
<tr>
<td>Not very useful</td>
<td>17</td>
<td>2.56</td>
<td>13</td>
<td>1.95</td>
</tr>
<tr>
<td>Not useful at all</td>
<td>9</td>
<td>1.35</td>
<td>6</td>
<td>0.90</td>
</tr>
<tr>
<td>TOTAL</td>
<td>665</td>
<td>100</td>
<td>665</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: F is total frequency of response per item.
Table 5 shows in the usefulness dimension that 79% of the students (adding the percentages of “Quite useful” and “Very useful”) have a positive perception of the usefulness of AI tools in their learning, while 20% (adding “Somewhat useful” and “Not very useful”) and 1% (not useful at all) express a negative perception. The positive finding in the majority of students is indicative of a general favorable trend towards the integration of AI in university educational environments. However, the negative one denotes resistance to adopting the technologies because of their low usefulness in learning processes.

In the dimension of university students' attitudes towards the use of AI in their learning, 83.7% of the students (adding the percentages of “Quite useful” and “Very useful”) show favorable attitudes towards the use of AI in learning. These data suggest that the majority of university students are open with the incorporation of AI in their education. On the other hand, 13.3% of students show no clear inclination, either positive or negative towards AI in learning, indicating a wait-and-see or reserved stance towards the adoption of new technologies. And 3% evidence a negative attitude that is perceived as distrust towards the integration of these tools.

In the dimension addressing undergraduates' prior experiences with AI tools. Overall, 92.3% of students (summing “Somewhat useful”, “Fairly useful” and “Very useful”) have some form of regular experience with AI. However, it is noteworthy to mention that 7.7% (summing “Not very useful” and “Not at all useful”) rank at a low frequency of prior experience, which points to a gap in adoption and familiarity with AI.

On the view of the level of confidence college students have in the accuracy of AI tools. In summary, 93.1% of students (summing “Somewhat useful,” “Fairly useful,” and “Very useful”) have a positive level of confidence in the accuracy of AI tools. On the other hand, only 6.9% (summing “Not very useful” and “Not at all useful”) of the students expressed a low level of confidence in the accuracy.

Table 6

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Independence</th>
<th>Resources</th>
<th>Targets</th>
<th>Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>%</td>
<td>F</td>
<td>%</td>
</tr>
<tr>
<td>Always</td>
<td>43</td>
<td>6,47</td>
<td>54</td>
<td>8,12</td>
</tr>
<tr>
<td>Frequently</td>
<td>234</td>
<td>35,19</td>
<td>303</td>
<td>45,56</td>
</tr>
<tr>
<td>Sometimes</td>
<td>302</td>
<td>45,41</td>
<td>275</td>
<td>41,35</td>
</tr>
<tr>
<td>Rarely</td>
<td>70</td>
<td>10,53</td>
<td>23</td>
<td>3,46</td>
</tr>
<tr>
<td>Never</td>
<td>16</td>
<td>2,41</td>
<td>10</td>
<td>1,50</td>
</tr>
<tr>
<td>TOTAL</td>
<td>665</td>
<td>100</td>
<td>665</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: F is total frequency of response per item.
Table 6 shows the preferences of college students regarding independent learning versus reliance on direct instruction. Overall, 41.7% of students (summing “Frequently” and “Always”) show a tendency toward independent learning. Meanwhile, 12.9% (summing “Rarely” and “Never”) show a preference for direct instruction. The majority of students, at 45.4%, do not have a strong opinion towards one extreme or the other, indicating an opportunity for HEI to offer a wider range of educational options.

On the dimension about the comfort level of undergraduates in using online resources and self-directed learning materials. Overall, 53.7% of students (summing “Frequently” and “Always”) show a clear comfort with online and self-directed learning. This reflects a positive trend towards the adoption of digital and self-directed methods in higher education. However, 4.96% (summing “rarely” and “never”) are not completely comfortable or at ease with the learning resources available to them for self-directed learning.

In the dimension of college students’ goals toward self-management of their learning, specifically in terms of setting and working toward their own educational goals independently. Overall, 61.7% of students (summing “Frequently” and “Always”) show a positive tendency toward self-management of their learning, i.e., suggesting that there is significant movement among students toward autonomy in learning.

In the dimension of regulation of university students on their ability to regulate their own learning progress and adapt their approach when they deem it necessary. In summary, 38% of students (summing “Frequently” and “Always”) are comfortable with self-regulating their learning, showing good adaptability and control over their education. However, there are 4.4% (summing “Rarely” and “Never”) who clearly struggle with this and need more structured support in their progress. On the other hand, 57.59%, considered the majority of students, indicate that they sometimes regulate their own learning and approach.

Table 7

Relationship of AI to Autonomous Learning

<table>
<thead>
<tr>
<th>ITEMS</th>
<th>Impact</th>
<th>Ease</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F  %</td>
<td>F   %</td>
<td>F  %</td>
</tr>
<tr>
<td>Very beneficial</td>
<td>55 8.20</td>
<td>33  5</td>
<td>55 8.20</td>
</tr>
<tr>
<td>Beneficial</td>
<td>349 52.50</td>
<td>226 34</td>
<td>139 21</td>
</tr>
<tr>
<td>Neutral</td>
<td>234 35.20</td>
<td>334 50.20</td>
<td>371 55.80</td>
</tr>
<tr>
<td>Harmful</td>
<td>21  3.10</td>
<td>53  7.80</td>
<td>50  7.50</td>
</tr>
<tr>
<td>Very harmful</td>
<td>6   1.00</td>
<td>19  3.00</td>
<td>50  7.50</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>665 100</td>
<td>665 100</td>
<td>665 100</td>
</tr>
</tbody>
</table>

Note: F is total frequency of response per item.
Table 7 reflects the perceptions of university students on the impact of technology on their autonomous learning. In summary, a clear majority of 61% (adding “Beneficial” and “Very beneficial”) have a positive perception of the impact of technology on their academic performance, indicating a generalized trend towards valuing digital tools in education. However, a small percentage of 4.1% (adding “Detrimental” and “Very detrimental”) have a negative view, suggesting that there are still challenges to be addressed to maximize the potential of technology in education.

On the dimension of university students' self-perception of the ease of use of AI tools in their academic activities. Overall, 39% of students (summing “Beneficial” and “Very beneficial”) have a positive perception of the ease of use of AI tools in their academic activities. This suggests that there is a good proportion of students who are adapting to the increasing use of AI in education. However, 10.8% (adding “Harmful” and “Very harmful”) find significant challenges. On the other hand, the finding with the neutral group of 50.2% reflects the lack of awareness and frequent use of these tools among university students.

In the dimension of university students' perceptions of the balance between the benefits and challenges of using AI tools in the academic context. In summary, 29.2% (adding the categories “Beneficial” and “Very beneficial”, perceiving more benefits than challenges) have a positive view on the use of AI, seeing more advantages than disadvantages. On the other hand, 15% (adding together the “Harmful” and “Very harmful” categories, who perceive more challenges than benefits) have a more critical view. The fact that a large percentage see a balance between the two suggests that, while AI is being recognized for its potential, there are still significant challenges in its implementation in academia.

### 4.1 DISCUSSIONS

In the AI dimensions, it was found that students have a positive perception towards the usefulness and use of AI. This finding is similar to the study of Cao et al. (2023) who found a moderate satisfaction, reporting in 62% of the students a favorable disposition in the use of AI in the study. These results are justified by the premises of the Technology Acceptance Model (TAM) that suggest that the students' perception of usefulness of AI will have a direct consequence on their attitude towards the use or not of this technology (Cabero Almenara et al., 2018, p. 437).

It is necessary to indicate that lower percentages of negative perception towards the usefulness and use of AIs were also found. This resistance is based on possible access barriers,
lack of understanding, unfavorable previous experiences and preference for traditional learning methods (Manrique Maldonado et al., 2021). These results represent an opportunity for the university to address through the integration of AI the questions of students through the creation of adaptive learning environments, workshops, conferences, projects, networking events among others (Ayuso-del Puerto & Gutiérrez-Esteban, 2022). In this way, it would influence the attitude for the use of tools and improve the educational experience. According to Ayuso-del Puerto & Gutiérrez-Esteban (2022), the implementation of AI makes the learning process more interesting and dynamic, enriching university environments.

In this vein, Cao et al. (2023) highlight the importance of establishing proactive policies that address the transformative influence of AI in areas such as Higher Education, with the aim of harnessing it effectively and ethically (p. 5). Strategic measures include the creation of regulatory frameworks that promote equity and transparency in the use of AI, which, from a constructivist vision, aims to ensure that students develop the ability to use them autonomously, improve their learning and acquire the necessary skills to adapt to the constantly changing social and work environment, driven by technologies.

Perception of prior experiences for students is regularly and directly constructed with AI. This finding relates to Piaget's idea of “schemas” in the context of constructivism; in this case, the widespread adoption of AI technologies among the college student population suggests that they are actively interacting with this new information and incorporating it into their existing cognitive schemas. Furthermore, current knowledge reorganizes students' thinking schemas, reflecting the constructivist process of assimilating a learning into mental structures and adjusting them in response to the adoption and use of these technological tools (Chadwick, 2001, p. 113).

Despite this positive finding from previous experiences, it is highlighted that there are students with a low frequency of interaction with AIs, which points to a gap in the adoption and familiarity with AI (Osorio & Palma, 2024). This result has several implications; on the one hand, they highlight the importance of integrating AI training within university curricula to prepare students for an increasingly technological labor market (Ocaña-Fernández et al., 2019). On the other, it also points to the need for research on how different frequencies of AI use affect student performance and satisfaction. In addition, for those with little AI experience, institutions should consider strategies to increase exposure and improve technological competence.

Students' level of confidence reflects a generally favorable perception. From the TAM approach, confidence in the accuracy of this tool influences their perception of usefulness (Cabero Almenara et al., 2018, p. 438), which, in turn, impacts the attitude and intention to use
AI for their own learning. However, Chávez Hernández (2024) mentions that, if AI tools generate incorrect or biased answers it impacts students' confidence in the accuracy and reliability of these. This possibly explains the cases of students who expressed a low level of confidence in the results presented above.

In the dimensions of autonomous learning, it was found that most students do not have a strong opinion toward direct or independent instruction, which indicates an opportunity for the university to offer a wider range of educational options. In this sense, choosing a hybrid approach that combines direct instruction with opportunities for independent learning would allow students to choose the method that best suits their individual learning style and needs. For, according to Suyo-Vega et al. (2021) the intervention of the teacher as the main direct instructor and organizer of learning, mediator of knowledge and promoter of pedagogical aspects such as autonomous learning in the student is necessary (p. 40). The idea would be in line with constructivism, as it recognizes the role of the teacher as a facilitator of learning, who guides and supports students in their knowledge construction process, promoting autonomy and adaptability in a dynamic educational environment.

On the other hand, the positive trend in the comfort level students have with using online resources and self-directed learning materials suggests that IES should continue to develop and improve its online resources to meet the expectations of the majority of students who are comfortable with these methods. While for those who are uncomfortable, it is beneficial for HEI to offer support and training programs to help them improve their confidence and skills in digital learning environments. Similarly, teachers should present various options that are comfortable for self-directed learning, among those mentioned by Picón (2024) are the development of notes on pages in applications, summaries, underlining that defines the ability of university students to take control and structure their own learning, as well as the adaptation of digital resources and the use of the diversity of information found online, which are complementary in the study process.

The dimension of students' goals shows a significant tendency towards autonomy in learning. From the constructivist notion, this group of university students shows active participation in the construction of their own knowledge. Therefore, it is relevant for the IES since it underlines the importance of offering more opportunities for university students to personalize their educational trajectory and foster independent learning skills. Added to this, it is necessary to take into consideration the ideas of Cerda & Saiz (2018) that, to reach towards learning autonomy, it is necessary to go through three phases: need for information, autonomous search for digital information, and academic use of technologies, which provides
a relevant framework to understand how students develop independent learning skills, especially, through the use of the tools provided by AI. In addition, this trend provides more resources and support structures for self-directed learning, as well as flexible curricular options that allow students to have greater management in their education.

In the ability to regulate their own learning and adapt their approach, most of the students were comfortable, however, a small number showed an urgent need for support in their progress. For the IES this would represent a possibility to offer more tools and strategies to help students improve in this aspect. In this sense, consideration should be given to the inclusion of strategic workshops on study techniques, time planning or counseling sessions to foster stronger self-regulation skills (Picón, 2024). In short, by providing them with tools and strategies to regulate their progress and adjust their approach, they are being provided with the opportunity to empower themselves and be active participants in the construction of their own knowledge, which promotes more meaningful and lasting learning.

In the perceptions of university students on the impact of technology on their autonomous learning, a generalized tendency was found towards valuing AI tools in their education. These findings coincide with the research of Morocho Cevallos et al. (2023) who found tangible improvements in academic performance and student participation due to the introduction of AI, highlighting aspects such as personalization and learning resources provided by this tool, adapting to individual needs and providing quality learning. However, authors such as Marzal & Vivarelli (2024) highlight the existence of a significant controversy surrounding the effects of AI in the educational environment, highlighting the need to address the impact and digital competencies possessed by the student to ensure the effective use of AI in their performance.

In the dimension of ease of use of AI in academic activities, a positive perception was found, i.e., there is a good proportion of students who are adapting to the increasing use of AI in their education. On the other hand, the finding with the neutral group reflects the lack of knowledge and lack of frequent use of these tools in university students, which supports the observation of Osorio & Palma (2024), the lack of knowledge affects the willingness of students to adopt AI in academic activities. As established by the TAM, the lack of familiarity with these tools influences the perception of ease of use, which in turn interferes with the intention of use by students (Cabero Almenara et al., 2018, p. 439). In this sense, this negative aspect indicates the need for further training and resources to support the effective integration of AI in academic environments, as well as representing an opportunity for the university to improve familiarity and comfort with these tools through education and training.
In the dimension of balance between the benefits and challenges of using AI tools in the academic context, a neutral position was found on the part of the students, which indicates a possibly critical and conscious view of these tools. This result is directly related to and justified by what Murtaza et al. (2022) mentions where he emphasizes that it is necessary to recognize the limitations of AI as an educational tool and advocate for a balanced approach that combines the strengths with the direct interaction of the teacher. This balanced approach is essential to leverage the benefits of technology while maintaining the human elements essential for a comprehensive and holistic education, reflecting the TAM's understanding that, successful adoption of technology depends on considering both the technical and human aspects involved in its implementation (Palos-Sánchez et al., 2019, p. 7).

5 CONCLUSION

In the dimensions such as usefulness, use, previous experiences, level of confidence in AI, positive perceptions were found, which justifies the Model of Adaptation of Technologies, this is because students perceive that AI provides them with useful tools and functionalities, improving their academic productivity and; familiarity and previous experience with AI systems has allowed them to feel comfortable and confident in interacting with this technology. However, despite this, it is suggested that IES take into consideration the negative perceptions and create opportunities that connect students with AI, thus generating a more interesting and dynamic learning experience, enriching university environments.

Positive perceptions were found in the resource, goal, and regulation dimensions of Autonomous Learning, with the exception of the independent dimension where most students were neutral. The lack of a strong opinion toward direct or independent instruction suggests that students could benefit from a hybrid approach to learning. Under the constructivist approach, learning is conceived as an active process in which students construct their own knowledge from their prior experiences and interaction with the environment. In this sense, providing students with a combination of direct instruction and opportunities for independent learning would foster a more meaningful and personalized learning process. In the long run, this translates into greater motivation, engagement and responsibility on the part of the students, while the teacher provides structured support and guidance.

The results of the dimension of impact and ease of use of AI in autonomous learning show positive perceptions that, from the premise of the TAM, visualize AI as a digital tool that can improve performance and be easy to use in the context of autonomous learning. However,
the finding of the neutral perception of the benefits provides a critical and conscious assessment of this tool, as it establishes a balance in which both the benefits and the limitations or potentially negative impacts of AI are weighed. This demonstrates a process of knowledge construction and a reflective attitude, rather than an absolute acceptance or rejection of the technology.

Finally, given the scope and limitations of the study, it is hoped that the results presented will provide a guideline for future research to deepen the understanding of the factors that influence students’ critical and conscious attitude towards AI for their autonomous learning, inquiring into their concerns, expectations and assessments of the benefits and limitations of this technology. In addition, to conduct a study on the perceptions and attitudes of teachers towards AI, their expectations, concerns and training needs in order to design more effective implementation strategies aligned with the needs of the faculty.

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