Perception of the Use of AI Chat Playground in Higher Education and its Impact on the Development of Transversal Competence in Digital Transformation

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Abstract

Since the release of ChatGPT, the excitement and skepticism about the use and academic integrity of artificial intelligence (AI) platforms applied for educational purposes have increased notoriously. Particularly, teachers are nowadays interested in integrating AI tools in the learning process and improving the students disciplinary and transversal competencies. The objective of this paper is to measure the ease of use, experience and use for learning of MATLAB AI Chat Playground as a tool in learning activities for undergraduate engineering students. We present a qualitative study and descriptive statistics to analyze the data obtained from a survey applied to the students. The survey is divided into two sections: perception of using the tool and self-evaluation of the transversal competence in digital transformation developed through the course. Also, a comparison between students' self-perception and teachers' final evaluations of the digital transformation competence is presented. The experiment implementation was performed during the early second academic term of first-year engineering students. An instrument was applied to 25 students. The results show acceptance of the tool. Moreover, students perceive AI Chat Playground as useful and powerful. However, there are some concerns and uncertainty about inappropriate use, dependance and abuse on using the tool.

Keywords: AI Chat Playground, Artificial Intelligence, Transversal Competence, Educational Innovation, Higher Education.

1. Introduction

Artificial intelligence (AI) has experienced rapid growth in recent years, and its application in higher education has received significant attention [1]. In addition, Education 4.0 involves the integration of AI in the learner-centered education system [2].

Generative AI can be defined as a technology that leverages deep learning models to generate human-like content in response to complex and varied prompts as languages, instructions, questions [3]. Specifically, ChatGPT (Chat Generative Pre-Trained Transformer), a chatbot driven by GenAI has been attracting headlines and has become the center of ongoing debate

regarding the potential effects that it can have on teaching and learning [4]. Moreover, research indicates that chatbots will assist in solving some of the current opportunities and challenges facing the education sector [5], [6], [7] and [8].

In this context, MathWorks® released MATLAB AI Chat Playground in May 2023. It can be opened in any browser through the link AI Chat Playground. According to its website support, the playground is built on OpenAI and optimized to assist with MATLAB related questions. The usage guidelines indicate that the AI Chat Playground is provided for experimental use, generate initial draft MATLAB code, and answer questions. AI Chat Playground is directed to supporting chats and code output suggestions that are related to technical computing, science, and engineering, and in particular to MATLAB and other MathWorks products [9].

AI Chat Playground describes itself as follows: "I am an expert MATLAB programmer and helpful assistant. I am here

to assist you with any MATLAB-related questions or problems you may have. I have a deep understanding of MATLAB functionalities and features and can provide you with code examples and guidance to help you solve your MATLAB tasks. However, my familiarity with Simulink is still in its early stages, so I may not be able to assist you with Simulink-specific questions. How can I help you with MATLAB today?" [10].

AI Chat Playground is a simple platform divided into two sections: the chat panel and a lightweight MATLAB code editor, as can be seen in Fig. 1. At first, the chat panel shows a welcome message and introduces itself:

"Hello! Whether you're checking out MATLAB for the first time or have been using it for years, I'm here to answer your questions and provide coding tips".

Then a disclaimer message is shown, presenting the next paragraph:

"Please keep in mind that AI sometimes writes code and text that seems accurate, but isn't. AI does not yet have knowledge of features delivered after June 2021 and only limited knowledge of Simulink and specialized toolboxes. This is a space for experimentation. Try it, verify any resulting code, and kindly give like or dislike on the results to help improve the responses".

Moreover, onboarding prompts are shown if you do not know how to start the AI Chat Playground on the chat panel. Finally, in the lower left corner, the chat box, where you can enter natural language prompts to reply with an explanation and code.

According to the MATLAB Central community, there are two ways of using the code returned. If you want to try the MATLAB code, select the insert icon next to the code and then click the run button. This will execute the code and show the results. If you want to copy the code and bring it into the MATLAB editor or Visual Studio Code, select the copy button [11]. Also, the use cases for the AI Chat Playground are ask questions, generate ideas, and get code.
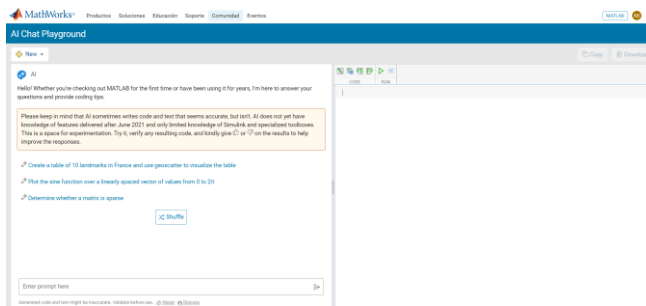
Figure 1. MATLAB AI Chat Playground.

There exists research on the integration of AI-Chatbot in the education sector, concluding that students are embracing the use of chatbots and that these are facilitating the achievement of student-centered learning [12].

In addition, chatbots have increasingly been used in higher education to boost engagement and academic performance [13], [14] and [15].

With the help of AI, learning can be customized. It can cater to the specific needs for all categories of the students. Every student would enjoy receiving a completely new and unique educational approach that is tailored to individual needs of the students. AI solutions have opened a new horizon of opportunities for teaching, learning as well as for administrative works in institutes of higher education [16].

According to [4], AI integration with human instruction is one of the approaches that encourages the use of AI as a supplementary tool to support teaching and learning rather than a replacement for human instruction. Instructors can leverage AI to augment their lessons, provide additional resources, or spark discussions while still maintaining their role as facilitators and subject matter experts.

On the other hand, a competence refers to individually attainable cognitive abilities and skills that enable effective problem-solving. It involves appropriate actions aligned with situational demands and existing knowledge. Different types of competences exist, including subject specific and transversal competences, which are relevant across all life situations [17].

Transversal competences are also described as life skills, essential skills, and 21st-century skills because they can be valuable across different fields of work. Digital technology creates new paradigms by changing the relations between individuals, industry, and society. This change is supported through use of the internet and digital technology and is known as Digital Transformation [18]. Particularly, Digital Transformation competence is described as: "To generate solutions to the problems in your professional field, with the intelligent and timely incorporation of cutting-edge digital technologies", according to the Tecnologico de Monterrey engineering curriculum [19].

With all the above in mind, AI Chat Playground is integrated in the learning activities of first-year engineering students. Then, an instrument is applied to these students in order to measure

their perceptions on the tool and to measure their own evaluation on the transversal competence in digital transformation, which is also developed in the course. Specifically, the student's self-evaluation on the sub-competence cutting-edge technologies is compared to the teachers' evaluation.

The structure of this paper is as follows, after the introduction, the next section explores the methodology conducted by the authors for this research. The followed steps are explained as well. Section three will present and discuss the results found in the experiment. Lastly, a conclusion will be drawn, as well as the future research directions.

2. Methodology

Participants

The population of the experiment consisted of 25 undergraduate engineering students. The students were enrolled in the Thermodynamic Modeling for Engineering course, in their second semester of a 4-year program at the Tecnologico de Monterrey, Morelia campus. Their ages ranged from 18 to 22. Particularly, 92% of the students were aged 18-19 years old, 4% were 20-21 years old and 4% were 22 years old.

All the participants answered and decided to share their gender for demographics, this included 16% females and 84% males, no one identified as non-binary.

Tecnologico de Monterrey offers 18 engineering programs, so first-year students are grouped according to four initial common entrances, so 72% are in the programs embraced in innovation and transformation engineering, 16% are in the programs involved in bioengineering and chemical processes, 8% are part of the computing and information technologies engineering and 4% are in programs included in the applied sciences engineering.

Instrument and procedure

The students´ participation in this study was voluntary and no incentive was given. The instrument used was an adaptation of the proposal found in [20] and used in [21] as well.

The survey was distributed through a Google Forms link at the end of the course. The application day there was 80% of attendance of students in class. The survey was integrated into two sections: participant´s perception of the use of AI Chat Playground and self-evaluation of the transversal competence in digital transformation developed through the course.

First section is, in turn, divided into three acceptance elements: Ease of use, enjoyment and use for learning. This can be seen in table I. Furthermore, a ten-point Likert scale was used from 1 = totally disagree to 10 = totally agree. Ease of use as an acceptance element is measured through three items considering easiness, satisfying necessity and flexibility of the AI Chat Playground. Experience, the second element, is measured through five items about enjoyment, pleasure, interest, attention, and curiosity on using the AI Chat Playground. Finally, use for learning element considers four items on improving documentation, argumentative skills, redaction and orthography, and identification of truthful information.

Table I Students´ perception survey about AI Chat Playground.

Acceptance element	Item	Totally disagree	Totally agree
Ease of use	1. Using the AI Chat Playground was easy.	1 to 10	
	2. I obtained from AI Chat Playground what I needed.	1 to 10	
	3. I found AI Chat Playground flexible to interact with	1 to 10	
Experience	4. I enjoyed experiencing the use of AI Chat Playground	1 to 10	
	5. Experiencing with AI Chat Playground was quite pleasant.	1 to 10	
	6. Experiencing with AI Chat Playground was very interesting	1 to 10	
	7. When experiencing AI Chat Playground, my attention was totally focused	1 to 10	
	8. Experiencing AI Chat Playground excited my curiosity	1 to 10	
Use for learning	I consider that using AI Chat Playground in learning activities helped me to…	--	
	9. Have better documentation about the topics.	1 to 10	
	10. Improve my argumentative skills.	1 to 10	
	11. Improve my redaction and orthography.	1 to 10	
	12. Improve my skill to identify truthful information	1 to 10	

Second section focuses on students´ self-perception of the transversal competence in digital transformation, particularly on the sub-competence cutting-edge technologies. Specifically, the sub-competence cutting-edge technologies is described as: "the student evaluates various technologies with an openness to the search and implementation of relevant alternatives in the transformation of professional practice" according to the Tecnologico de Monterrey engineering curriculum [19]. This sub-competence is assessed by a rubric, which includes four domain levels: outstanding, solid, basic, incipient as it is shown in table II.

Table II Description of the levels of domain for the sub competence Cutting-Edge Technologies.

Sub-competence	Levels of domain for the sub-competence			
	Outstanding	Solid	Basic	Incipient
Cutting-Edge Technologies	Comprehensively evaluates appropriate information technologies, strategically selecting the ideal options to add substantial value to your professional practice.	Correctly evaluates information technologies, starting with appropriately selecting the appropriate options to add convenient value to your professional practice.	Partially evaluates information technologies, based on acceptable selection of elementary options to add sufficient value to your professional practice.	Incorrectly evaluates information technologies, selecting them inappropriately, without adding value to their professional practice.

Finally, an open-ended question was asked to students to get information on their expectations or concerns about the use of AI in the academic environment. This provides further context and meaning to complement the students' perceptions regarding to AI use in higher education.

3. Results and discussion

Students´ perception of the AI Chat Playground

To analyze the students´ perception of the AI Chat Playground, descriptive statistics were computed in Excel. Table III shows basic statistics mean, as a central tendency measure, and standard deviation (SD), as a measure of dispersion, for each one of the items in the survey.

Analyzing the survey results for each of the acceptance elements, it can be seen in Table III that in the case of ease of use that the highest mean is 9.3 for item 1 and the lowest SD, which is 0.8 for item 1 as well, so it can be concluded that AI Chat Playground is an easy tool to use. Conversely, the lowest mean 8.3 is for item 2, which has also the highest SD equals 1.8. Hence, it is inferred that not all the students obtained exactly what they needed from the tool. However, all the answers were scored in the Likert scale for item 2 as follows 10 (25%), 9 (40%), 8 (15%), 7 (5%), 5 (5%) and 4 (10%), which shows they generally obtained what they needed. This is clearly seen in table IV, which is determined by the asymmetry coefficient or coefficient of skewness (γ) with a value of $\gamma = -1.4$, that is negative skew, representing that data is distributed right-leaning due to mode is 9. Thus, it can be deduced for the ease-of-use element that students found AI Chat Playground easy and flexible. Moreover, they normally get what they need from the tool.

Table III Mean and Standard Deviation for each item in the perception survey.

Acceptance element	Item	Mean	SD
Ease of use	1. Using the AI Chat Playground was easy.	9.3	0.8
	2. I obtained from AI Chat Playground what I needed.	8.3	1.8
	3. I found AI Chat Playground flexible to interact with	8.9	1.2
Experience	4. I enjoyed experiencing the use of AI Chat Playground	8.7	1.7
	5. Experiencing with AI Chat Playground was quite pleasant.	8.8	1.8
	6. Experiencing with AI Chat Playground was very interesting	8.9	1.5
	7. When experiencing AI Chat Playground, my attention was totally focused	8.1	2.0
	8. Experiencing AI Chat Playground excited my curiosity	8.9	1.7
Use for learning	I consider that using AI Chat Playground in learning activities helped me to…	--	--
	9. Have better documentation about the topics.	8.7	1.5
	10. Improve my argumentative skills.	8.3	2.0
	11. Improve my redaction and orthography.	7.8	2.1
	12. Improve my skill to identify truthful information	8.6	1.5

Table IV Coefficient of skewness and mode for each item in the perception survey.

Acceptance element	Item	γ	Mode
Ease of use	1. Using the AI Chat Playground was easy.	-0.6	10
	2. I obtained from AI Chat Playground what I needed.	-1.4	9
	3. I found AI Chat Playground flexible to interact with	-1.9	9
Experience	4. I enjoyed experiencing the use of AI Chat Playground	-2.2	9
	5. Experiencing with AI Chat Playground was quite pleasant.	-2.8	9
	6. Experiencing with AI Chat Playground was very interesting	-1.9	10
	7. When experiencing AI Chat Playground, my attention was totally focused	-1.8	9
	8. Experiencing AI Chat Playground excited my curiosity	-2.3	10
Use for learning	I consider that using AI Chat Playground in learning activities helped me to…	--	--
	9. Have better documentation about the topics.	-1.3	10
	10. Improve my argumentative skills.	-1.5	10
	11. Improve my redaction and orthography.	-1.2	9
	12. Improve my skill to identify truthful information	-1.5	10

Then, focusing on experience as the second acceptance element, it can be seen in table III that items 6 and 8 have the highest mean 8.9, particularly item 6 has a SD equals 1.5 and item 8 SD

equals 1.7, so it can be concluded that students found the AI Chat Playground a very interesting tool to experience with and it also excited their curiosity. In contrast, the lowest mean 8.1 is for item 7, which also has the highest SD equals 2.0. Hence, it can be inferred that students' attention was not totally focused while experiencing the tool. However, all the answers were scored in the Likert scale for item 7 as follows 10 (25%), 9 (30%), 8 (20%), 7 (15%), 4 (5%) and 2 (5%), which shows they generally focused their attention while using the tool. This is clearly seen in table IV, which is determined by the asymmetry coefficient or coefficient of skewness with a value of $\gamma = -1.8$, that is a negative skew or representing that data is distributed right-leaning due to mode is 9. Thus, it can be deduced for the experience that students found AI Chat Playground interesting and exciting for their curiosity. In addition, they normally focused their attention while using the tool.

Finally, analyzing use for learning as the third acceptance element, it can be seen in table III that item 9 has the highest mean 8.7 and lowest SD equals 1.5, so it is concluded that students perceive to have better documentation about course topics when using the AI Chat Playground. Whereas the lowest mean 7.8 is for item 11, which also has the highest SD equals 2.1. Hence, it is inferred that students do not perceive a significant improvement in their redaction and orthography when using the AI Chat Playground. However, all the answers were scored in the Likert scale for item 11 as follows 10 (20%), 9 (30%), 8 (20%), 7 (10%), 6 (5%), 5 (5%) and 3 (10%), which shows they frequently get better redaction and orthography while using the tool. This is clearly seen in table IV, which is determined by the asymmetry coefficient or coefficient of skewness with a value of $\gamma = -1.2$, that is negative skew representing that data are distributed right-leaning due to mode is 9. Thus, it can be deduced for the use for learning that students found AI Chat Playground as a tool for improving their documentation about topics. Additionally, they often improve their redaction and orthography while using the tool.

To summarize, including all the items results in this perception survey, it can be concluded that students consider AI Chat Playground an easy tool to use, very interesting platform, which excites curiosity, and as a chatbot that helped them to improve their documentation on topics. Nonetheless, students generally obtained what they needed from the tool and also generally focused their attention while using the tool. Finally, they frequently improved their redaction and orthography while using the tool in learning activities.

Students´ expectations and concerns about AI

At the end of the survey an open-ended question was asked to the students referring to their expectations and concerns about using AI in Higher Education.

On one hand, among the concerns expressed by the students, we can find the following:

"AI could become uncontrollable and could be used for absolutely everything".

"AI could become a solution for students who do not do homework since AIs have the capacity to make essays, summaries, codes…".

"AI could be used to do all the work done".

"AI could return false or erroneous information".

"AI responses are sometimes not 100% accurate".

"AI could replace classroom learning".

"To stop learning due to trusting on using the AI tools.

"People could only use it for immediate answers and not to resolve doubts and learn more".

On the other hand, among the expectations shared by the students we can find the following:

"We have to use AI as an ally not as a solution".

"To give proper use to these AI tools, which are very useful and functional".

"Increase of the demand in activities to students".

"Greater implementation of AI in the academic activities, being aware that it is a tool and not a study replacement".

"I really hope they become tools that we can use and exploit".

"I hope it is no longer considered plagiarism when using an AI".

Reading through the comments it can be realized that students' concerns have to do with dependence on the AI if it is used to do all the work done or used for absolutely everything. Then, it is also read that students are concerned about abuse of using AI, if you use it to have immediate answers and not to learn or as a replacement of classroom activities. Moreover, if AI becomes a rapid solution for solving homework. There are also concerns on reliability of responses and information provided by AI tools.

Referring to expectations students recognize AI usability and functionality. Furthermore, they consider AI as an ally tool to be properly used and exploit. However, they are aware of plagiarism and increasing of the demand in activities when using AI tools.

Hence, it is implicit through these students' comments that a framework on ethical use of AI tools must be developed in Higher Education Institutions. In addition, a guidance for the proper use of AI tools in the teaching-learning process and in evaluating processes as well, in order to regulate AI tools for academic purposes and to avoid plagiarism or inappropriate use.

Development of digital transformation competence

Students´ self-perception of the transversal competence in digital transformation, particularly on the sub-competence cutting-edge technologies was measured through the rubric shown in table II. The obtained results can be seen in Fig. 2. It should be noticed that 45% of the students perceive themselves as outstanding performance for the sub-competence cutting-edge technologies, in other words, they consider themselves as comprehensively evaluating appropriate information technologies, strategically selecting the ideal options to add substantial value to their professional practice. Furthermore, 40% of the students perceive themselves as solid performance for the sub-competence cutting-edge technologies, in other words, they consider themselves as correctly evaluating information technologies, starting with appropriately selecting the appropriate options to add convenient value to their professional practice.

In contrast, only 15% of the students perceive themselves as basic performance for the sub-competence cutting-edge technologies, in other words, they consider themselves as partially evaluating information technologies, based on acceptable selection of elementary options to add sufficient value to their professional practice. It is remarkable that none of the students perceive themselves as incipient performers.
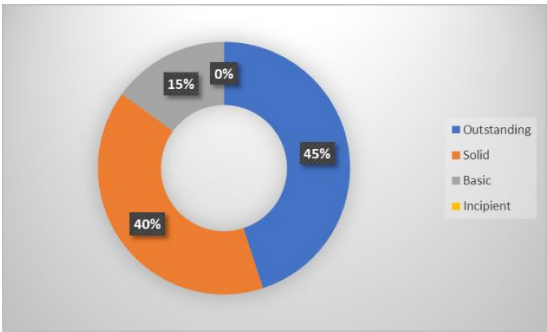

Figure 2 Students´ self-perception on the sub-competence cutting-edge technologies.

In summary, 85% of the students perceive themselves in outstanding or solid domain level of the sub-competence cutting-edge technologies, while only 15% of the students perceive themselves in basic domain level of the sub-competence cutting-edge technologies. Importantly, none of the students perceive themselves in incipient domain level of the sub-competence cutting-edge technologies. This could be related to this generation Z is also called as digital natives, since they grew up with internet and rise of smartphones.

On the other hand, the three professors teaching the Thermodynamic Modeling for Engineering course assigned individual scores corresponding to the domain level of the sub-competence for each student at the end of the course. This evaluation was determined by the rubric in table II and corresponds to the students' performance and development along the course. Also, an aggregate score of the three professors is obtained by using eLumen portfolio to get the final score for each one of the students. This is shown in Fig. 3.
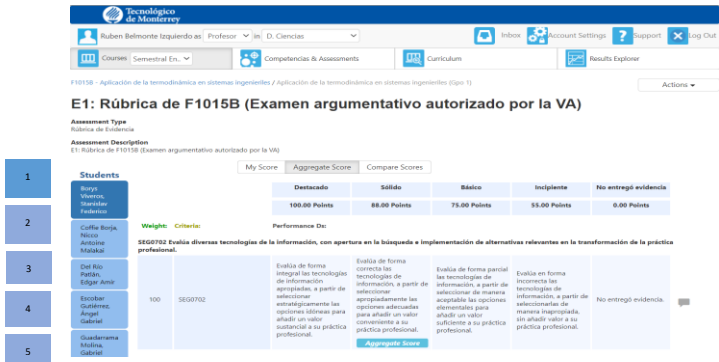

Figure 3 Aggregate score of the sub-competence cutting-edge technologies in eLumen.

The final evaluation of the sub-competence cutting-edge technologies assessed by the professors is shown in figure 4. It can be seen in Fig. 4 that none of the students were evaluated as outstanding, 72% were solid in their domain level, 24% were scored basic for the sub-competence, and 4% were incipient, that is, they incorrectly evaluated information technologies, selecting them inappropriately, without adding value to their professional practice.
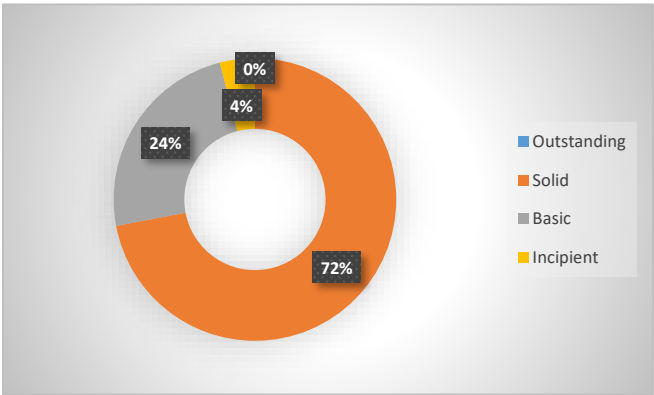

Figure 4 Professors assessment for the students on the sub-competence cutting-edge technologies.

A comparison between students' self-perception and teachers' final evaluations of the sub-competence cutting-edge technologies is presented in Fig. 5. It is remarkable that students' self-perception is quite higher about the development of the sub-competence compared to their final assessment assigned by the professors' aggregate score. Students assumed that they can comprehensively evaluate and strategically select information technologies to add substantial value to their professional practice. However, as they are first-year engineering students, they have not developed enough knowledge, skills, attitudes, and values to have total comprehension and tools to be strategic. Thus, at this point of their curriculum, they, at most, can correctly evaluate and appropriately select information technologies to add convenient value to their professional practice. Proof of this is shown by the professors' assessment, which 96% of the students reached solid (72%) or basic (24%) domain levels of the sub-competence.
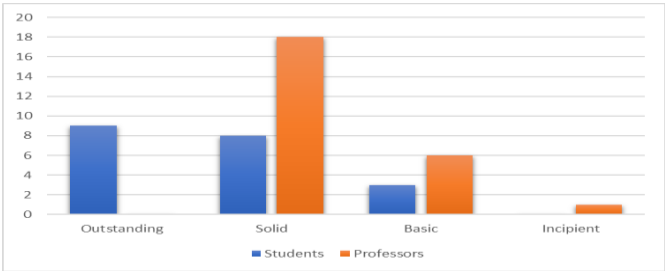

Figure 5 Comparison between students' self-perception and teachers' final assessments of the sub-competence cutting-edge technologies.

4. Conclusion

The research in this paper shows evidence of the students' perception on the use of MATLAB AI Chat Playground, in a first-year engineering course, as a tool for learning activities. The overall findings of the research demonstrate students' acceptance of the tool as they consider it, easy to use, a very interesting platform, and a tool that excites their curiosity. Moreover, students consider this chatbot helped them to improve their documentation. In brief, they indicated that this tool is useful and powerful.

Nevertheless, there exist some concerns about dependance and reliability of this AI tool. Therefore, a validation process of the information returned by the AI tool is needed as well as the development of competencies as critical thinking, problem solving and digital transformation in order to face possible dependency on the tool.

It should be noted that students´ self-perception on the sub-competence cutting-edge technologies is self-assessed as solid or outstanding. In addition, none of the students perceived themselves as incipient in the domain level. In comparison to teachers´ assessment which was basic and solid mainly. Such difference comes from the outstanding domain level requires comprehension to evaluate, strategy to select and addition of substantial value, unfortunately competencies are not developed at that level yet at this phase in the curriculum of first-year undergraduate engineering students.

The use of AI Chat Playground in the learning environment improves the experience of the students and supports the teaching-learning process. For future studies it is recommended having a larger sample of participants and replicate the research in other academic institutions. Furthermore, it would be interesting to know the expectations and concerns on evaluation and teaching-learning processes of both, students, and teachers in order to continue being prepared for the daily use of AI in higher education.

Higher Education Institutions must be prepared for these challenges in the teaching-learning process and have an ethics framework in the use of AI tools. An example of this is the Guidelines for the Ethical Use of Artificial Intelligence [22] proposed by Tecnológico de Monterrey. These guidelines provide a framework for adopting and adapting these technologies responsibly and transparently in educational programs.

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