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Análisis de chatbots de inteligencia artificial y satisfacción en el aprendizaje en educación matemática

Analysis of artificial intelligence chatbots and satisfaction for learning in mathematics education

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RESUMEN

El uso de la inteligencia artificial (IA) está cada vez más extendido en la sociedad actual. Este tipo de tecnología, y más concretamente los chatbots como asistentes virtuales tienen posibilidades de implementación e integración como herramienta de apoyo en los entornos educativos. En este artículo se propone la creación de chatbots en la asignatura de didáctica de la geometría del Grado de Educación Primaria de la Facultad de Educación en la Universidad de Málaga, realizados por 120 estudiantes en dos grupos-clase. El objetivo es hacer un análisis de dichos chatbots, así como de la valoración y satisfacción de estos por parte del alumnado. Para ello, se facilitó a los estudiantes una breve formación para que pudiesen generar sus propios bots y lo supiesen integrar en una red social para después usarlos. Los resultados del cuestionario realizado ponen de manifiesto que el alumnado se ha mostrado interesado en la generación de su chatbot y su integración en la red social, han mejorado su competencia digital, además de demostrar un alto grado de satisfacción con sus creaciones de IA, junto con la idea de que este tipo de experiencias se pueda trasladar a otras asignaturas y contextos educativos.

PALABRAS CLAVE

Chatbots; educación matemática; inteligencia artificial; TIC; enseñanza;aprendizaje.

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ABSTRACT

The use of artificial intelligence (AI) is becoming increasingly widespread in today's society. This type of technology, and more specifically chatbots as virtual assistants, can be implemented and integrated as a support tool in educational environments. This article proposes the creation of chatbots in the subject of didactic of geometry of the Degree of Primary Education of the Faculty of Education at the University of Málaga, carried out by 120 students in two groups. The aim is to analyse these chatbots, as well as the students' evaluation and satisfaction with them. To this end, the students were given brief training so that they could generate their own bots and know how to integrate them into a social network and then use them. The results of the questionnaire show that the students have shown interest in the generation of their chatbot and its integration into the social network, have improved their digital competence, as well as demonstrating a high degree of satisfaction with their AI creations, along with the idea that this type of experience can be transferred to other subjects and educational contexts.

KEYWORDS

Chatbots; mathematics education; artificial intelligence; ICT; teaching;learning.

1. INTRODUCTION

We are witnessing a technological revolution in our society where classical or conventional software is being replaced by intelligent software, i.e. software that is capable of implementing artificial intelligence (AI) capabilities. The concept of artificial intelligence, although complex in itself, can be understood as the ability of computers to perform activities that normally require human intelligence (Porcelli, 2020). In this sense, Russell and Norvig (1994) and Maza and Rodríguez (2021) indicate that artificial intelligence is the combination of algorithms designed with the purpose of creating machines that have the same capabilities as human beings. AI is increasingly present in everyday life and is also making its way as a tool to support and help teaching (Hiremath, 2018). AI is multidisciplinary and is composed of the sum of multiple and diverse knowledge, many of which have a mathematical, statistical or computational basis. Its implementation is based on machine learning algorithms (Vega et al., 2020); although AI appeared theoretically decades ago, we are currently witnessing its implementation in fields such as education due to improvements in software, infrastructures, data platforms and the interface in the different applications offered at the user level (Wilks, 2019). Language as a means to establish communication is one of the characteristics that most differentiates humans from machines, which is why the ability of machines to understand human language, in any language, is one of the key challenges of AI (Jurafsky & Martin, 2020). One of the applications of AI in language use is chatbots. A chatbot is an application that runs on general purpose devices, such as a computer, but can also be found embedded within specific devices such as a smartphone or smartwatch (Aguilar, 2021). The goal of a chatbot is to interact with the user through a communication channel, oral or written, audio or text, to receive orders, queries or requests and provide answers; that is, to maintain communication with a user by simulating intelligent human communication so that, in general, the interlocutor has an experience as similar as possible to the conversation with another person using natural language (Cheng et al., 2022). AI can simulate or maintain some level of conversation with people, based on natural language and conversational user interfaces that are very common in smartphone messaging apps (Ocaña-Fernández et al., 2019).

The use of chatbots in education, although the tools for their implementation have improved significantly, is not completely new; there have been general studies for decades with positive results that address the successful implementation of conversations through chatbots (Wollny et al., 2021) and specifically in the education system by conducting studies with students

(Kaushal & Yadav, 2022; Cheng et al., 2022). In the study carried out by Smutny and Schreiberova (2020), after analysing the application of 89 types of educational chatbots for Facebook Messenger, they reach some conclusions among which they advise, based on the results obtained, to integrate chatbots into teaching practice for the development of learning situations, allowing training and optimising each educational context through the collection and analysis of conversations. According to the study carried out by Wu and Yu (2023) chatbots in the field of education can provide administrative support, favour teaching-learning processes, adapt to the needs and rhythms of students, create personalised tutorials for tasks such as the practicum or provide information on subject programmes, furthermore, learning outcomes indicate that the use of chatbots is better in higher education learning ecologies, than at primary or secondary levels. They are therefore a useful tool for both students and teaching staff, as they provide immediate feedback in real time. This makes it a support tool in the educational process, more typical of more personalised educational models, an advantageous line that needs to be experimented with and explored (Díaz & Sventlichich, 2016). In future educational scenarios, it is possible to think of a symbiotic collaboration between the teacher and the machine, in which each of them assumes a different role. The former would be in charge of creating content by taking on personalised tutoring tasks, while the chatbot would provide uninterrupted support by answering frequently asked questions and solving the less creative and more repetitive teaching tasks. On the other hand, one of the advantages of chatbots in educational environments is that today there are multiple options that do not require extensive or professional programming knowledge. They also do not require operating systems or complex support and help to make interfaces more accessible, making user experiences more pleasant and interactive, with a consequent increase in interest in the subjects.

Table 1 compares the different chatbot creation software available, analysing whether or not it is free, its integration with web pages or social networks or its simplicity in terms of usability and programming.

Table 1. Comparison of the characteristics of the main chatbots. Own elaboration.

Chatbot	Free	Level code	Simple Interface	Pre-integrated templates	Web	Social Networks	Education Use
Facebook Messenger Platform	X	X				X	
ManyChat	X	X		X		X	
Microsoft Azure	X	X			X		X
Amazon Lex	X		X	X	X		
Pandorabot	X	X	X	X	X		X
Botsify	X	X				X	
IBM Watson Conversation	X	X			X		
Chatfuel	X	X			X		
Dialogflow	X	X	X		X		X
Snatchbot	X		X	X	X	X	X

Chatbots can be useful in education when answering frequently asked questions and solving repetitive tasks that do not require creativity on the part of teachers or students, such as reviewing theoretical questions. Experiences such as those of Guerrero et al. (2017) and Arabit and Prendes (2020) demonstrate the versatility of chatbots for a wide range of functions, such as: increasing motivation, supporting the learning process in education by carrying out simulations, accompanying students, assessing and reviewing learning, solving management tasks and frequently asked questions. There are practical experiences in various universities, such as the Universitat Oberta de Catalunya with the Botter programme where a robot interacts with students to monitor their learning (Domingo, 2017). At the CEU Cardenal Herrera University, a bot has been implemented with Microsoft Azure to resolve administrative queries immediately and uninterruptedly at any time (Rodríguez, 2017). For all these reasons, it seems feasible to accept the idea that chatbots in education help the teaching-learning process, acquiring the task of accompanying the most routine tasks, thus boosting student motivation. In particular, Snatchbot is a free application that allows the creation of a chatbot offering different configurations and templates that can be used at the user level. This application has been used in the educational field to support administrative tasks, as well as to support teaching, and it is usually implemented together with the support and development provided by the social network Telegram (Henriquez et al., 2021). With the results of studies, simple tools and models of chatbot content creation available, this topic and competences should be studied in initial and in-service teacher training. Undoubtedly, this is a new topic in most areas, such as initial teacher training, so it is considered that it is at this level that we can begin to experiment with such models and technologies and evaluate their results.

2. MATERIALS AND METHODS

According to Hernández et al. (2014), this research study is a descriptive cross-sectional non-experimental design. The sample was selected for convenience and accessibility of the students from the University of Málaga. The instrument is an ad hoc instrument designed to address these specific short-term objectives; it is a 17-item questionnaire (See Appendix I).

2.1. Context

In the subject didactic of geometry in the 3rd year of the Primary Education Degree at the Faculty of Education of the University of Málaga, students in groups A and B were asked to create a chatbot on one of the topics covered during the course. This is a sample of 120 students (68 from group A and 52 from group B). Ninety-two of the students are female and 28 are male. Due to the favourable characteristics, presented in Table 1, and its free nature and integration in social networks for this experience, the bot program used was Snatchbot.

2.2. Objectives

The general objective of this study is to experiment with the AI tool through a chatbot in the context of a subject in initial teacher training.

The specific objectives established have therefore been:

> O.1.- Assessment of the Snatchbot tool and its integration into Telegram together with the degree of student satisfaction with the bot created.
>
> O.2.- Assessment of the classroom explanation preceding the process, in addition to the assessments of the use of social networks at an educational and social level.

2.3. Instrument

To achieve the objectives, an evaluation instrument was drawn up in Google Form format, which the students answered online. The instrument consists of 17 questions (see Appendix I) that aim

to collect data on the 2 specific objectives set. The first 3 questions collect statistical data. The next 6 are Likert-type items with a rating scale ranging from 1 to 5 (where 1 is the value most in disagreement and 5 the most in agreement), whose quantitative analysis was carried out using SPSS software. For the reliability analysis, Cronbach's alpha coefficient was proposed with the result of a value of 0,769, as detailed in section 3.1.1, which confirms that the study is consistent. On the other hand, a further 7 items are analysed qualitatively, responding to YES and NO responses and one of them is a free response item.

2.4. Methodology developed for the didactic sequence

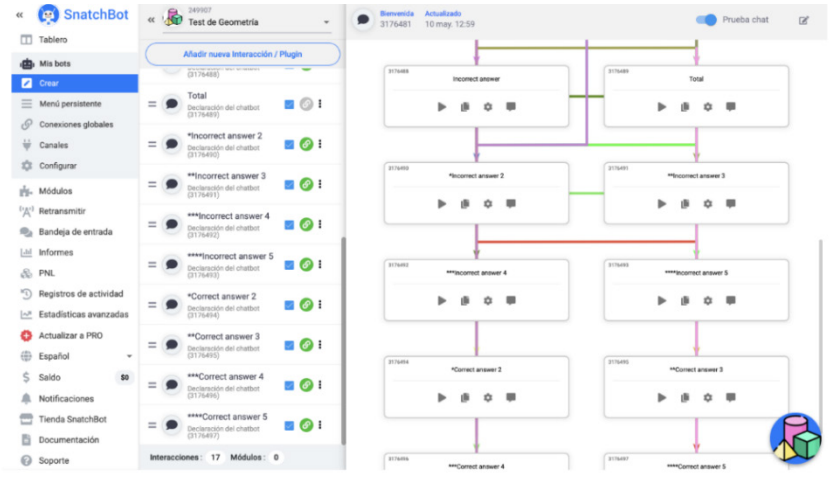
As mentioned above, the experience is carried out in two groups-classes of the subject didactic of geometry, establishing several phases to proceed with the creation and use of chatbots in the subject.

Firstly, in phase 1, the teacher-researchers presented the concept of chatbot, its applications and uses, and a theoretical class was given in which the students were able to see the different implementation options presented by the tool. In phase 2, a test example was created. For this, after a brief explanation of the user interface, each student with their laptop follows step by step, through an example, the explanation of the options that can be used and the different types of chatbots that can be created.

In this case, the starting point was the creation of a blank chatbot without a predetermined template. After giving it a name and adding a photo that will later represent the chatbot when it is integrated, for example, in a web page, a menu appears to add interactions. These interactions can be questions that are answered with a phrase, a number, a URL, an emoji, etc. Each student, after creating the question and programming all the possible answers that he/she considers appropriate, which he/she believes his/her interlocutor may give, must proceed to establish the connections between the questions, thus forming the bot's scheme. As can be seen in Figure 1, in the bottom right-hand corner there is a bubble with the previously assigned image to test the correct functioning of the bot while it is being configured.

In phase 3, students are asked to create a chatbot about some of the content covered in the course. In this chat, they are asked to optimise the answers by programming the largest possible number of answers to the questions posed. Thus, the programme offers a hierarchical structure in the form of a tree so that the student always knows the flow followed in the construction of the chatbot (Figure 1).

Figure 1. Diagram of the bot implemented by a student. Source: Snatchbot.



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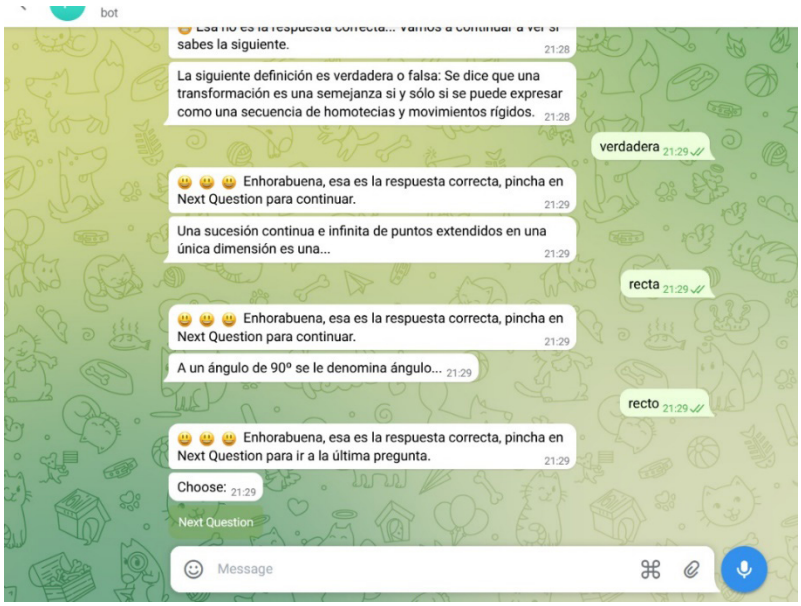
Once the chatbot has been implemented by each student, phase 4 is about sharing it and getting it up and running so that it can be used by the rest of the class. The Snatchbot tool offers the possibility of integrating the chatbot created on websites or social networks such as Whatsapp or Telegram. We chose to do it with a social network so that it would be more affordable when it came to testing it, and among these we chose Telegram because among the social networks that the application allows, it was the one that preserved the greatest privacy in user data. In this way, the different chatbots created are executed and tested (Figure 2) and each of them can be accessed through the shared links.

Figure 2. Execution of a students' bot on the social network Telegram. Source:Telegram.



3. RESULTS

In this section, the student responses are analysed with the SPSS tool by performing a reliability analysis, grouping the items into factors, correlating the results with course and gender variables and offering quantitative results regarding the student responses in each of the items of the questionnaire.

3.1. Quantitative analysis

3.1.1. Cronbach's alpha (reliability analysis) and factor analysis

The six items related to the explanation prior to the activity, the use of Snatchbot and its integration into Telegram, the educational and social use that students make of social networks and the degree of satisfaction of students with the bot they have generated were focused on, studying their reliability and carrying out a confirmatory factor analysis and comparisons of the means according to gender and group.

Reliability was measured using Cronbach's alpha, which yielded a value of 0.769, which can be considered adequate.

With regard to factor analysis, it was necessary to analyse construct validity, considering that it attempts to determine the extent to which an instrument measures an event in terms of the way it is conceptualised, and in relation to the theory underpinning the research (Hurtado, 2012). Evidence of construct validity was obtained through factor analysis. This method groups items

according to their correlations, indicating how many dimensions make up a variable and which items make up each dimension. The items that make up a dimension have high correlations with each other, grouping these items together as a factor. When the results do not belong to a dimension, it means that they are isolated and do not measure the same thing as the other items; therefore, they should be eliminated.

The following analyses were carried out: determination of the correlation matrix; KMO (Kaiser-Meter-Olkin) index or measure of sample adequacy; and Barlett's test of sphericity. The KMO index is interpreted in a similar way to the reliability coefficients, that is, with a range of 0 to 1 and taking as adequate a value equal to or greater than 0.70, which suggests a satisfactory interaction between the items (Hair et al., 1999), obtaining a value of 0,792 in this study. As the KMO index is satisfactory, we can use the principal component factor extraction model, which consists of carrying out the linear combination of all the variables so that the first principal component is a combination that explains the largest proportion of variance in the sample, the second largest and so on. The aim is to find a small number of components that explain the maximum total variance of the original variables.

The total variance explained in the table above includes two factors in which the items described above are integrated. The rotated component matrix is shown in Table 2.

Table 2. Rotated components matrix (rotation has converged in 3 interactions). Own elaboration based on SPSS results.

	Component	
	1	**2**
Question 8. Rate the usefulness of the explanation given in class on how to use the Snatchbot platform for programming a bot and its subsequent integration into Telegram. On a scale of 1 to 5, with 1 being "very little useful" and 5 being "very useful	,440	**,616**
Question 9. Rate the ease of use of the Snatchbot platform for programming a bot. On a scale of 1 to 5, with 1 being "very difficult to use" and 5 being "very easy to use".	**,867**	,050
Question 10. Rate the ease of integrating the Snatchbot-generated bot into Telegram. On a scale of 1 to 5, with 1 being "very difficult to integrate" and 5 being "very easy to integrate".	**,780**	,269
Question 12. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your academic training. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".	,009	**,863**
Question 13. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your social life. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".	,259	**,675**
Question 15. Rate your degree of satisfaction with the bot you have generated in the class assignment. On a scale of 1 to 5, with 1 being "not at all satisfied" and 5 being "very satisfied".	**,780**	,224

Note: Extraction method: Principal component analysis. Rotation method: Varimax normalisation with Kaiser.

As can be seen in Table 2, two factors are clearly delimited:

- Factor 1 (questions 9,10 and 15) Assessment of the Snatchbot tool and its integration into Telegram together with the degree of student satisfaction with the bot created.
- Factor 2 (questions 8, 12 and 13) Assessment of the classroom explanation that precedes

the process, in addition to the assessments of the use of social networks at an educational and social level.

3.1.2. T-student

In this section, two analyses are carried out, one with respect to the class group variables and the other with respect to the sex of the pupils.

Analysis according to class group:

The means of some items have been compared according to the class group (the groups chosen were 3rd A (group A) and 3rd B (group B) of the Primary Education degree of the Faculty of Education of the University of Málaga in the subject didactic of geometry). Table 3 shows that the values are higher in the 3rd B group (except for the item that values the importance of social networks in academic training).

Table 3. Results of the analysis according to the group-class variable. Own elaboration according to SPSS.

Group statistics					
	Group	**N**	**Media**	**Standard deviation**	**Standard error of the mean**
Question 8. Rate the usefulness of the explanation given in class about the use of the Snatchbot platform for programming a bot and its subsequent integration into Telegram. On a scale of 1 to 5, with 1 being "very little useful" and 5 being "very useful".	A	68	3,81	1,040	,126
	B	52	4,04	,969	,134
Question 9. Rate the ease of use of the Snatchbot platform for programming a bot. On a scale of 1 to 5, with 1 being "very difficult to handle" and 5 being "very easy to handle".	A	68	3,72	1,005	,122
	B	52	4,00	,886	,123
Question 10. Rate the ease of integrating the Snatchbot-generated bot into Telegram. On a scale of 1 to 5, with 1 being "very difficult to integrate" and 5 being "very easy to integrate".	A	68	3,44	1,214	,147
	B	52	4,15	,849	,118
Question 12. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your academic training. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".	A	68	3,81	1,123	,136
	B	52	3,60	1,176	,163
Question 13. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your social life. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".	A	68	4,03	1,051	,127
	B	52	4,23	,854	,118
Question 15. Rate your degree of satisfaction with the bot you have generated in the class assignment. On a scale of 1 to 5, with 1 being "not at all satisfied" and 5 being "very satisfied".	A	68	4,15	,868	,105
	B	52	4,44	,698	,097

The T-Student analysis for independent sample means indicates that there is a significant difference in favour of group B, the significance level being less than 0.05 in items 10 and 15 (assessment of the ease of integration of the chatbot tool in Telegram and the students' assessment of the degree of satisfaction with the bot they have generated).

Analysis according to gender:

The means of some items have been compared according to sex (group 1 female and group 2 male) The following table shows that the highest values appear in the women's group for all items (Table 4).

Table 4. Analysis according to pupil gender. Own elaboration according to SPSS.

Group statistics

	Gender	N	Media	Standard deviation	Standard error of the mean
Question 8. Rate the usefulness of the explanation given in class about the use of the Snatchbot platform for programming a bot and its subsequent integration into Telegram. On a scale of 1 to 5, with 1 being "very little useful" and 5 being "very useful".	Female	92	3,93	1,036	,108
	Male	28	3,82	,945	,179
Question 9. Rate the ease of use of the Snatchbot platform for programming a bot. On a scale of 1 to 5, with 1 being "very difficult to handle" and 5 being "very easy to handle".	Female	92	3,92	,917	,096
	Male	28	3,57	1,069	,202
Question 10. Rate the ease of integrating the Snatchbot-generated bot into Telegram. On a scale of 1 to 5, with 1 being "very difficult to integrate" and 5 being "very easy to integrate".	Female	92	3,79	1,095	,114
	Male	28	3,61	1,227	,232
Question 12. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your academic training. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".	Female	92	3,73	1,100	,115
	Male	28	3,68	1,307	,247
Question 13. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your social life. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".	Female	92	4,20	,892	,093
	Male	28	3,86	1,177	,223
Question 15. Rate your degree of satisfaction with the bot you have generated in the class assignment. On a scale of 1 to 5, with 1 being "not at all satisfied" and 5 being "very satisfied".	Female	92	4,36	,764	,080
	Male	28	4,00	,903	,171

The T-Student analysis for independent sample means indicates that there is a significant difference in favour of the female group, as the significance level is less than 0.05 in item 15 (students' assessment of the degree of satisfaction with the bot they have generated).

Figure 3 shows the results of the students' responses to these items.

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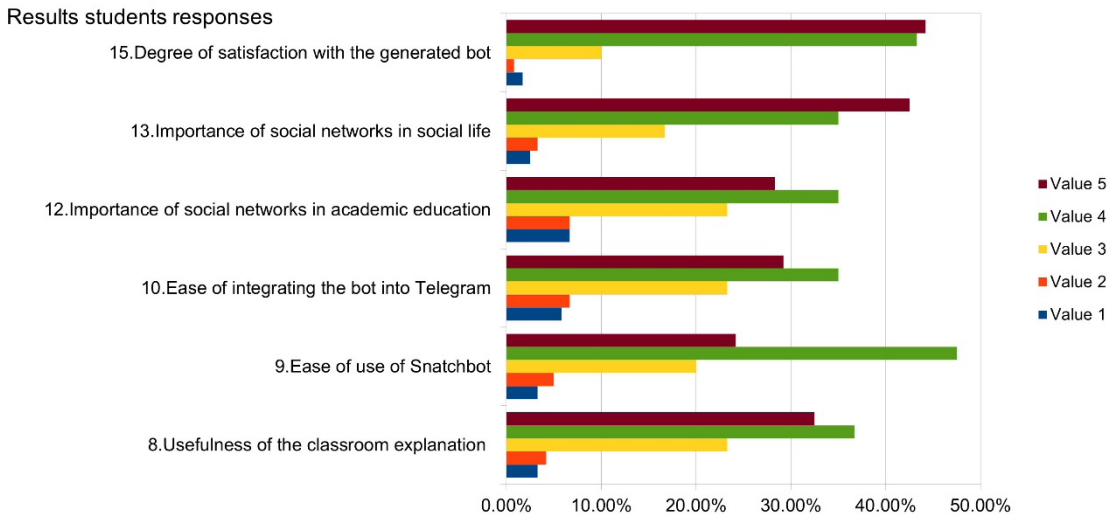
Figure 3. Student responses. Own elaboration.



As can be seen in Figure 3, the students' responses to all these questions are very positive, most of them giving the highest values of 4 and 5 for each of the items. Most of them are satisfied with the explanation given in the classroom about the usefulness and handling of the chatbot, considering it to be easy in terms of its interface and handling. Also, a high percentage had no problems integrating it into Telegram with the instructions given, only some problems arose due to duplication of usernames or having skipped a step in the instructions. They also consider the use of social networks in this type of educational experiment to be a good idea and in general they are satisfied with the bot generated by each of them.

3.2. Analysis of qualitative student responses

This section provides the results of the qualitative analysis as shown in Figure 4.

Figure 4. Percentages with the students' responses to the qualitative items. Own elaboration.

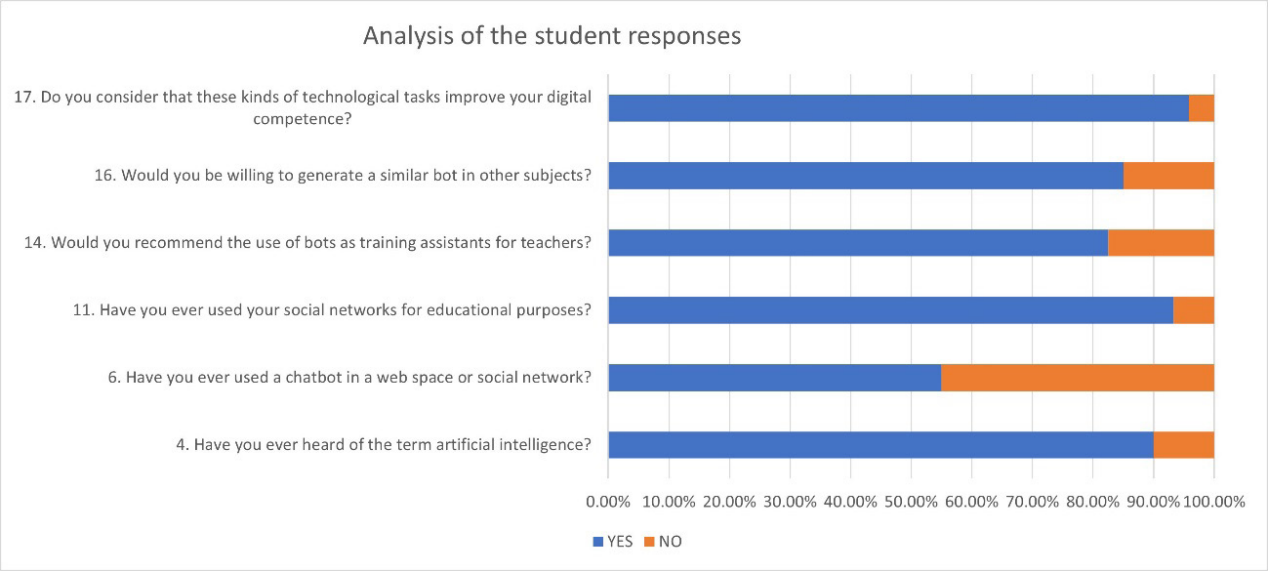
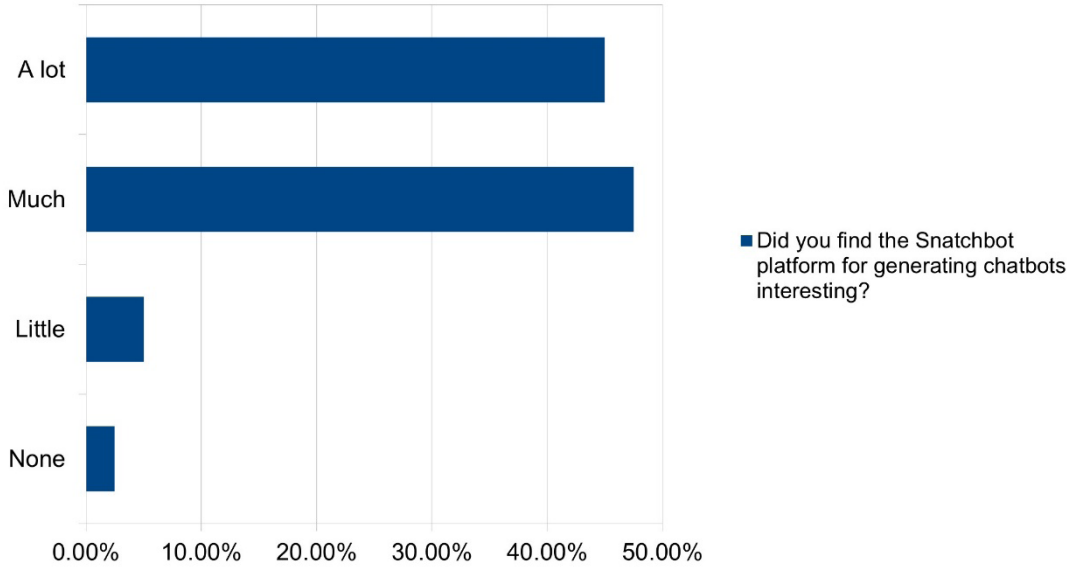


Figure 4 shows that 90 % of the students surveyed had ever heard of artificial intelligence. Regarding the usefulness of the tool, 82.5 % would recommend the use of bots as training assistants in degree subjects, and 85 % were in favour of using them as support in other subjects and in the internship process. On the other hand, 55 % said they had used a chatbot in some web space or social network to consult or ask for information. In the integration of the bot in social networks for educational uses, 93.3 % of the students surveyed stated that they regularly use social networks for educational purposes and that they would also use it for this purpose. 95.8 % valued positively the use of this type of tool in the subject to improve their digital competence for their future teaching.

As can be seen in Figure 5, regarding the implementation of the chatbot through the Snatchbot platform, 45 % considered the knowledge and use of this platform to generate chatbots and use it to be very interesting and 47.5 % considered it to be quite interesting.

Figure 5. Students' answers to question 7 of the questionnaire.



Regarding the qualitative answers given in relation to the question "What do we understand by artificial intelligence?" The words most frequently repeated in the definitions are robots, artificial brain, machines, technology, algorithms, machine intelligence, automata, software, computer programs, computers. All these words bring them closer to the concept, but only 20 % of respondents were able to give a more or less exact definition of the concept. 10 % were unable to answer this question.

4. DISCUSSION

In general terms, in terms of the specific objectives of this study, the quantitative factor analysis points to the first specific objective with factor 1 and to the second with factor 2, giving very high values in all of them, as shown in Figure 3. A degree of satisfaction of the created bot of more than 90 % and of its integration and use in the social network of more than 70 % is achieved. In addition, more than 60 % of the students consider that its implementation is easy to implement, based on a simple explanation without prior knowledge.

Regarding the qualitative analysis of Figure 4 and Figure 5, the value of the answers given in items 4 and 8 show high values related to O.1 in terms of the assimilation of the explanation of

how to use the Snatchbot interface. The answers of items 11, 14, 15 and 16 related to O.1 show that the students are very satisfied with the designed chatbots. On the other hand, the results of items 7, 9, 10 and 17 show a high appreciation and knowledge of this tool after the implementation of the chatbots in relation to objective O.2. Finally, in relation to O.2, questions 6, having obtained a value slightly above 50 % due to the novelty of the use of chatbots in different environments, we expect this percentage to improve with more continuous exposure to this type of tools, with respect to questions 12 and 13 show that they consider the Telegram network ideal for supporting and using this type of application. Therefore, this study shows that after a brief explanation and without previous technical concepts, the chatbot designed for learning recurring definitions in the subject didactic of geometry, has been implemented by students and integrated into the social network in a satisfactory way. In addition, the chatbots generated and used by the rest of the classmates have been satisfactory for learning, opening some possibilities for their application in common and repetitive tasks and queries (Ruiz-Rey & Moral-Sánchez, 2023).

Therefore, it can be concluded that chatbots are a useful tool for both students and teachers as a support in the educational process. Moreover, as Wu and Yu (2023) have already shown with their study results, they work very well in higher education learning ecologies. The results of this study show how chatbots can be useful when answering frequently asked questions, promoting the review of acquired learning and as support in the teaching-learning process. This coincides with the experiences of Guerrero et al. (2017) and Arabit and Prendes (2020) in which they demonstrated the versatility of these bots with frequently asked questions and support for the whole process. Therefore, the overall objective regarding the experimentation of the artificial intelligence tool through chatbot is quite positive, as each chatbot has adapted to the learning pace of each student providing real-time feedback supporting the educational process, this is reflected in the qualitative responses of the students as they have considered it a useful tool and applicable to different subjects and as training assistants (Smutny & Schreiberova, 2020; Kaushal & Yadav, 2022; Cheng et al., 2022).

This work shows contextualised results that need to be extended to other contexts and the breadth of the sample and subjects for their generalisation, as well as the specification of the study instruments that can be improved by the expert method. Undoubtedly, AI opens a new path in terms of the possibilities offered in the educational field for personalisation in different areas and contents. The results of the study and the literature consulted encourage further work and research from an educational and training perspective in a society immersed in technological development.

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APPENDIX I: QUESTIONS FROM THE QUESTIONNAIRE.

1. Group
2. Gender
3. Age
4. Have you ever heard of the term "artificial intelligence"?
5. Write below what you understand according to your knowledge as "artificial intelligence".
6. Have you ever used a chatbot on a website or social network to consult information?
7. Have you found the Snatchbot platform interesting to generate a chatbot in a simple way?
8. Rate the usefulness of the explanation given in class on how to use the Snatchbot platform

for programming a bot and its subsequent integration into Telegram. On a scale of 1 to 5, with 1 being "very little useful" and 5 being "very useful".

9. Rate the ease of use of the Snatchbot platform for programming a bot. On a scale of 1 to 5, with 1 being "very difficult to use" and 5 being "very easy to use".
10. Rate how easy it is to integrate the bot generated in Snatchbot into Telegram. On a scale of 1 to 5, with 1 being "very difficult to integrate" and 5 being "very easy to integrate".
11. Have you used any of your social networks (Facebook, Twitter, Instagram, Telegram, etc.) for educational purposes?
12. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your academic education. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".
13. Rate the importance of social networks (Facebook, Twitter, Instagram, Telegram, etc.) in your social life. On a scale of 1 to 5, with 1 being "not at all important" and 5 being "very important".
14. Would you recommend the use of bots for teachers to use as teaching assistants in other subjects?
15. Rate your degree of satisfaction with the bot you have generated in the class assignment. On a scale of 1 to 5, with 1 being "not at all satisfied" and 5 being "very satisfied".
16. Would you be willing to generate a bot like the one in the assignment in other subjects or to support the internship process?
17. Do you consider that this type of technological tasks improves your digital competence?

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