



# THE EFFECTIVENESS OF ARTIFICIAL INTELLIGENCE CHATBOT FOR TEACHING COMPUTER-AIDED DESIGN (AUTOCAD) IN POLIMAS

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## ABSTRACT

*AI-powered chatbots have attracted considerable attention and research in the education sector in regards to their effectiveness as learning tools. This research was conducted to determine whether AI-powered chatbots are effective e-learning tools for students learning complex software like Computer-Aided Design (AutoCAD). A survey was conducted among 49 students studying electrical engineering at POLIMAS using self-structured questionnaires designed on a six-point Likert Scale. The scale ranged from "Strongly Disagree" to "Strongly Agree" responses. Findings indicate that e-learning tools like chatbots are effective learning tools. All respondents were satisfied with the functionality and content of these tools. However, future research should factor in the ethical issues surrounding chatbots as e-learning tools.*

**KEYWORDS:** chatbots, artificial intelligence, e-learning, AutoCAD.

## INTRODUCTION

AutoCAD has always provided a platform for designing and drafting conceptualized ideas, product designs and drawings based on the required levels of technical accuracy. It provides numerous benefits, including the ability to perform rapid design simulations and generate drawings done up to the desirable scale (Patpatiya et al., 2019). AutoCAD contains various components that enable it to optimize its output as software. These components include algorithms that enable users to place custom commands from the Customize User Interface (CUI) (Patpatiya et al., 2019). However, learning these components has proven to be difficult for students due to the complexity of the interface and the lack of an interactive, inbuilt platform within AutoCAD. This calls for the use of chatbots, which have been proven to be highly effective as real-time, interactive tools. With the rapidly advancing chatbot technology, it makes considerable sense to replace these systems with a chatbot to improve interaction and overall learning experience in AutoCAD. This way, users can simply type in plain English, and the chatbot scans into the system to retrieve the desired response to the command given. This technique will not only save time but also enhance UI.

However, the effectiveness of chatbots in AutoCAD has limited evidence-based assurances, a situation that leaves many to rely on re-assurances of proponents of this technology. There is limited research generated from both qualitative, quantitative and mixed-methods designs to provide meaningful insights in regards to the effectiveness of chatbots as learning tools in software like AutoCAD. This research uses a quantitative design to generate and analyze primary data to determine the effectiveness of chatbots as e-learning tools among students.

## CONCEPTUAL FRAMEWORK

The effectiveness of chatbots as a learning tool has been documented in other domains other than AutoCAD. A study conducted to determine the impact of chatbots as digital learning tools revealed that this technology created positive learning outcomes and helped provide a better-personalized learning experience (Vanichvasin, 2019). Chatbots have empirically been proven to increase learner memory retention and learning efficiency in different environmental settings (Abbasi & Kazi, 2014). Chatbots are increasingly being used in various aspects of education due to their effectiveness (Okwonkwo & Ibijola, 2021). They have the potential to provide standardized details, particularly when deployed on web-based applications (Okwonkwo & Ibijola, 2021). When equipped with machine learning techniques, chatbots give learners the opportunity to discover new insights in a highly interactive learning environment. AI-based chatbots offer a change since they stop a one-way conversation that tends to bombard learners with generic information. They provide tailor-made interactive training components that enhance the level of engagement of learners to improve knowledge acquisition,



retention and implementation (Wu et al., 2020). Due to their highly conversational and interactive nature, chatbots provide instant responses to users, enhancing engagement and support (Nguyen et al., 2019). Notwithstanding the positive implications of chatbots as learning tools, there is considerable controversy regarding their inherent advantages and benefits in relation to the previous practices in learning. For instance, there are concerns over the ethical credibility and soundness of the chatbot systems (Murtarelli et al., 2021). Users are made to think that they are conversing with real people when they are actually conversing with chatbots (Adamopoulou & Moussiades, 2020). Nguyen et al. (2019) further claim that chatbots are non-moral agents that prevail over fictitious conversations and actions.

## RESEARCH METHODOLOGY

This research used surveys conducted among Electrical Department students at POLIMAS. These are students doing a Diploma in Electrical Engineering (DET), Diploma in Electronic Engineering (Communication) (DEP), and Diploma in Electrical and Electronic Engineering (DEE). Self-structured questionnaires were issued to the students through Google Forms. These questionnaires are flexible for respondents since they can take them on their own time and at their own convenience (Phellas et al., 2011). They are also less expensive when compared to other methods of administering surveys. Each respondent was required to either indicate whether they strongly agree, agree, agree somewhat, disagree, or strongly disagree with the statements outlined in the questionnaires. This way, a Likert Scale data were generated from the survey. Each answer was assigned a number as outlined below:

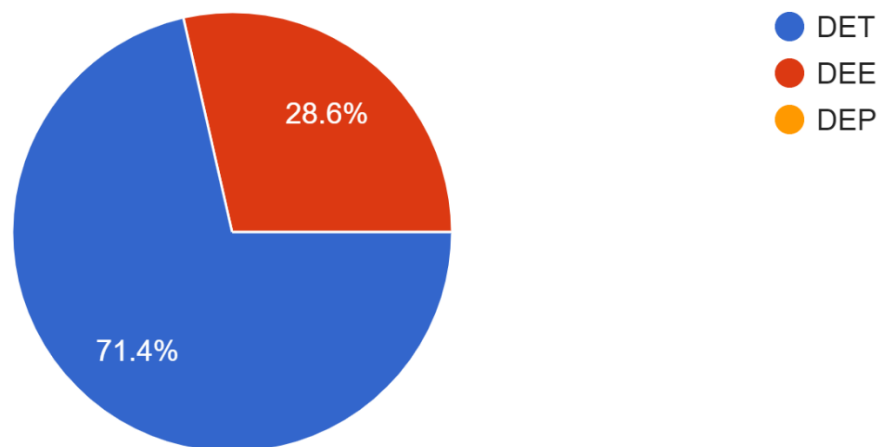
1. Strongly disagree
2. Disagree
3. Disagree somewhat
4. Agree somewhat
5. Agree
6. Strongly agree

The advantage of Likert Scale survey questions is that they allow for simpler responses to the survey questions (Harpe, 2015). It is also easy to draw meaningful conclusions, reports, graphs and results from the data generated (Harpe, 2015).

Participants were assured about the confidentiality and privacy of their information. No participant was required to reveal their personal details, such as phone number, home address or real names. The Google Forms were sent out in encrypted forms to protect them from interference by unauthorized personnel. The email details of the respondents were kept private and confidential. No other party other than the researcher was allowed to access them.

## RESULTS

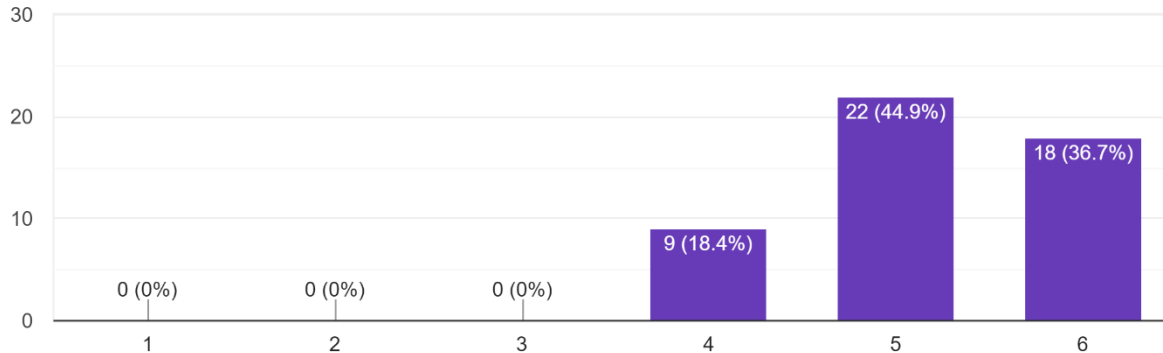
Forty-nine students responded to the survey questions. 71.4% of those who responded were DET students, while 28.6% were DEE students. No DEP students responded since they were not in session. The majority (87.8%) of the students who responded were in their 3<sup>rd</sup> semester.



### Confidence in using the AI chatbot

44% and 36.7% agreed and strongly agreed, respectively, that they felt confident using the e-learning system. None disagreed somewhat, disagreed, or strongly disagreed, indicating a 100% approval of confidence in using the AI chatbot.

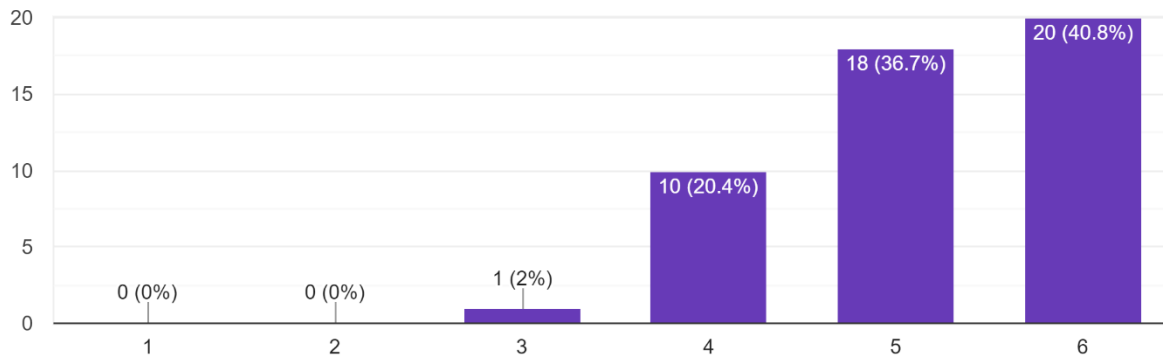
**Figure 1:**  
*Confidence in Using the AI Chatbot*



### Operating e-learning functions and using online learning contents

The same level of confidence was exuded when it comes to e-learning functions. However, 2% of the respondents said that they were somewhat not confident operating the functions. Additionally, 98% were confident about using online learning content, with only 2% expressing a lack of confidence somewhat.

**Figure 2:**  
*Operating e-Learning Functions*



### E-learning satisfaction

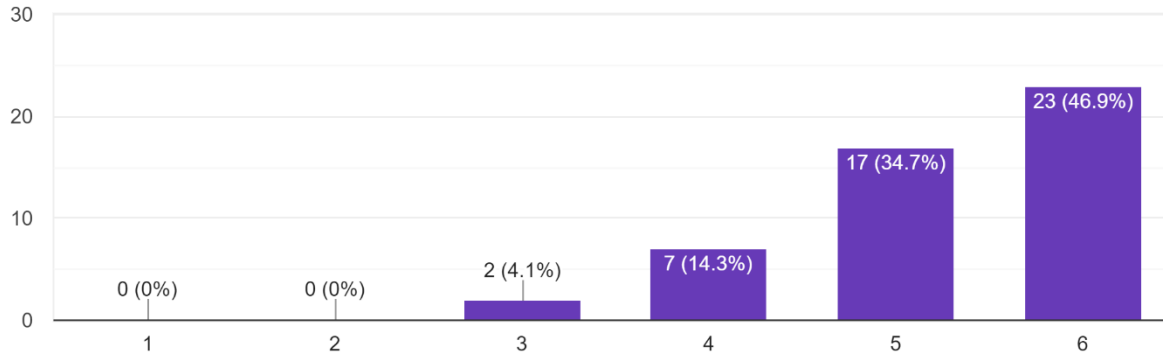
38.8% of the respondents strongly agreed that they were satisfied with using e-learning functions. 40.8% and 16.3% agreed and agreed somewhat, respectively. This is an indication that 95.9% of the respondents are satisfied with e-learning functions. Additionally, 98% respondents agreed that they were satisfied with the learning contents as well as e-learning as a learning assisted tool.

### E-Learning Usefulness

All respondents said they believed the e-learning contents were informative, with 46.9% strongly agreeing. 95.9% believed that e-learning is useful, while 4.1% did not. All respondents believed that e-learning contents are useful.

**Figure 3:**

*e-learning as a useful tool*

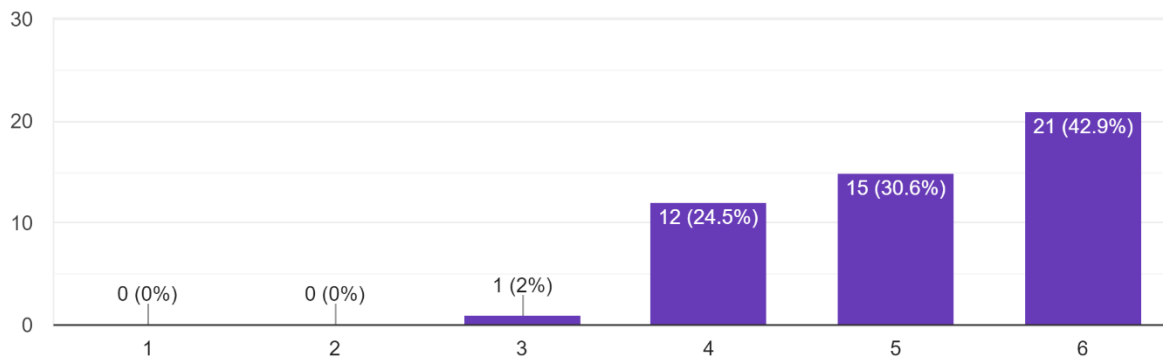


**Behavioral Intentions**

All respondents showed positive indications that they would be using e-learning tools for learning. 98% indicated that they would be using e-learning content to assist their learning, while all intended to use e-learning as an autonomous learning tool.

**Figure 4:**

*Intention to use e-learning tools for learning*

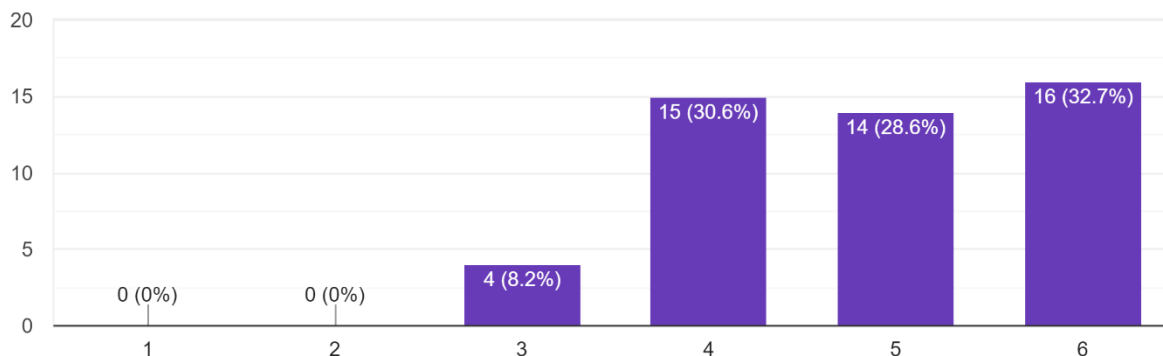


**System Quality**

91.9% of the respondents indicated that they were satisfied with the internet speed associated with e-learning functions. However, the rate of satisfaction was not strong. All the respondents indicated that they were pleased with the e-learning content, while 97.9% indicated that they were satisfied with the UI.

**Figure 5:**

*Satisfaction with internet speed*

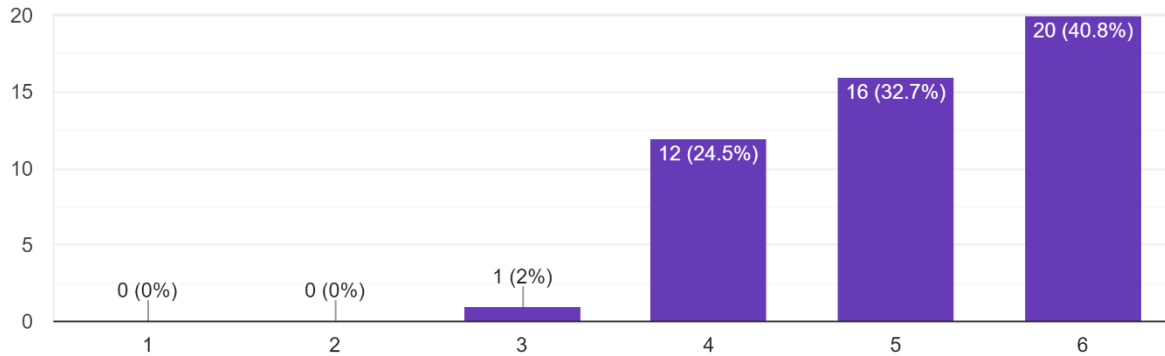


### E-Learning Effectiveness

98% believed that e-learning is effective when it comes to improving learning efficiency. 93.8% believe e-learning can assist in the performance after learning. 97.9% believe e-learning can improve learner motivation.

**Figure 6:**

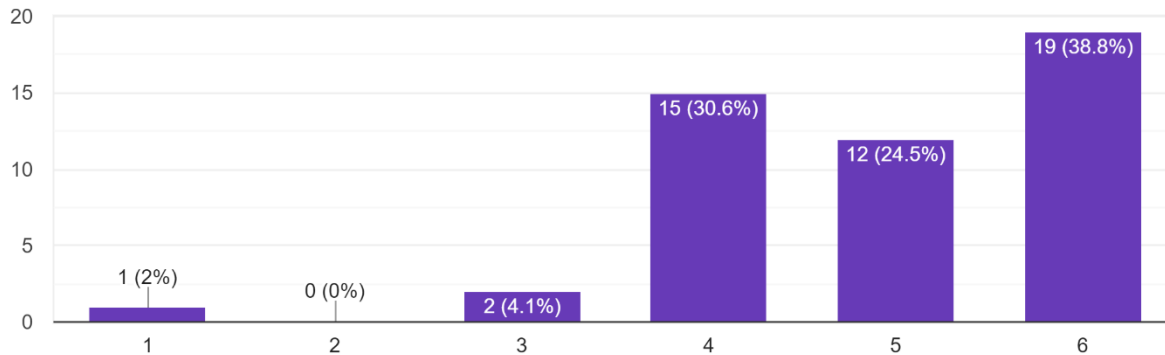
*Effectiveness of e-learning*



When asked about multimedia instruction, 93.9% indicated they liked to use voice media instruction. 2% strongly expressed their dislike for this approach. 95.9% indicated they liked to use video media instruction, while 4.1% expressed dislike. 95.9% expressed a preference for multimedia instruction against 4.1% who did not show positive indications.

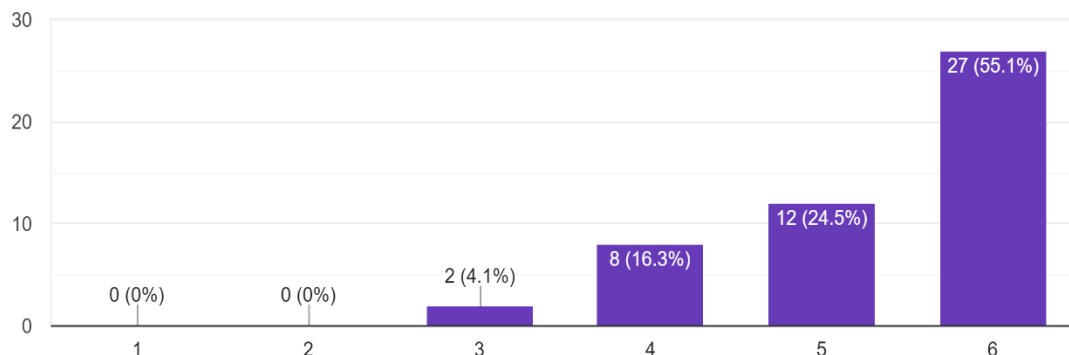
**Figure 7:**

*Voice media instruction preference*



**Figure 8:**

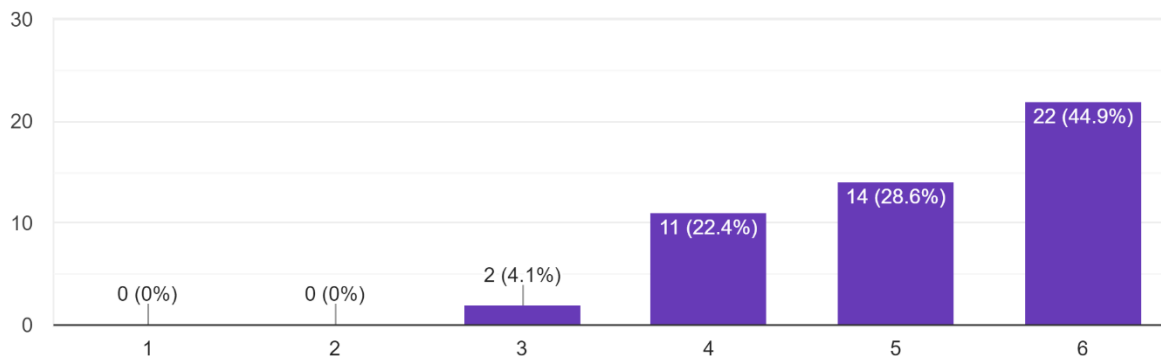
*Video media instruction preference*



**Figure 9:**



### Multimedia instruction preference



## DISCUSSIONS

The findings from this research paper significantly add to the existing research regarding the role of chatbots and their effectiveness as complements of e-learning. Based on the findings, it is evident that students who rely on e-learning find chatbots highly satisfactory to the extent that they become confident using them as part of their e-learning experience. The high level of confidence could be attributed to the fact that chatbots are more efficient and effective as they provide highly responsive actions in real-time (Winkler & Sollner, 2018). For instance, those equipped with machine learning techniques can answer student questions fast and sufficiently by quickly scanning through the stored or learned data. This makes the e-learning experience in AutoCAD fast and very efficient.

Furthermore, this research brings into perspective new insights regarding the effectiveness of chatbots when integrated with complex learning components like AutoCAD. AutoCAD systems have been using non-interactive platforms that make it difficult to achieve a satisfactory learning process for students (El-Midany & El-Baz, 2021). In most instances, learning AutoCAD has always required close monitoring from a supervisor that is highly knowledgeable about the software. Consequentially, the effectiveness of learning has been poor due to lack of personalized experience. Integration of chatbots in complex software like AutoCAD will enable students to complement what they learn from their supervisors by personalizing the learning experience. Students will be able to perform searches, ask questions and receive personalized responses in real-time. User experience will, in turn, increase significantly.

Additionally, the integration of chatbots with AutoCAD components eliminates the simplistic association of chatbots as a high-functioning tool utilized in basic educational settings and confirms that they can be useful in highly complex systems. The reception of chatbots among students who use e-learning platforms is already good, as evidenced by the reactions of the respondents. However, there is more that needs to be done to ensure 100% acceptance and appreciation of the chatbots as components of e-learning. For instance, there is a section of people who are yet to develop confidence in using e-learning. This group should not be ignored since they pose a considerable threat to the seamless integration of e-learning in mainstream education. The group essentially challenges developers and policymakers in education to come up with strategies that will ensure there is a 100% transition of users to e-learning platforms. Things such as sensitization and widespread training can increase the confidence levels of users. This way, applications like Chatbots can effectively improve the learning experience among students using AutoCAD.

Additionally, there are some students that are not yet satisfied with operating e-learning functions. The sources of dissatisfaction may originate from various factors, including lack of positive attitude, poor technical knowledge, lack of sufficient background, and improper orientation (Tirziu & Vrabie, 2015). All these factors should be examined critically to achieve the optimum level of satisfaction and positive attitude towards using e-learning. This way, many people will begin to see the usefulness of e-learning platforms, particularly chatbots and other complements. The good thing is that an overwhelming majority of users are willing to use e-learning tools. This is a positive indication of the good reception of chatbots as learning tools in AutoCAD. For this to work, there is a need to improve other components of e-learning, mainly the internet speed. The internet speed impacts the responsiveness and overall UI of e-learning tools.

## CONCLUSION

Overall, chatbots are effective e-learning tools, particularly when it comes to complex systems such as AutoCAD. There is a good reception of e-learning tools in POLIMAS, with many students considering them highly satisfactory in both the functionality and contents offered. This is a good indication that chatbots can be highly accepted and generate satisfactory results for students learning AutoCAD. The willingness to use e-learning tools is also high, an indication that technology is fast gaining momentum in the education sector. These trends are predictions of the bright future of tech in the dissemination of learning across all sectors in education. However, this research challenges other researchers to consider the ethical issues behind chatbots in the educational landscape. This is important for a holistic approach to e-learning.



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