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EXPLORING NEW AI-BASED TECHNOLOGIES TO ENHANCE STUDENTS' MOTIVATION

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ABSTRACT

Aim/Purpose	The aim of this study is to propose a teaching approach based on AI-based chatbot agents and to determine whether the use of this approach increases the students' motivation.
Background	Today, chatbots are an integral part of students' lives where they are used in various contexts. Therefore, we are interested in incorporating these tools into our teaching process in order to profit from their benefits, assist and guide students while working with to prevent issues such as plagiarism and mainly to boost students' motivation.
Methodology	Using the proposed approach, new chatbot based learning activities were designed in three different courses for computer science engineering students. A mixed-method experimental study was conducted to evaluate students' impression and satisfaction. Survey results of the students (N=58) who participated in the experiment (experimental group) were compared to the results of the students from the control group (N=60).
Contribution	Trending AI conversational agents can be engaged in daily teaching activities as a learning assistant and coach to boost students motivation and skills development.
Findings	Our study focuses on the impact of chatbots on student's motivation. The study aimed to analyze the benefits and drawbacks associated with these conversational chatbots. Our findings revealed the significant role that chatbots can play in enhancing student motivation and improving teaching practices.
Keywords	AI, chatbots, digital tools, student motivation

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INTRODUCTION

Today, the media is ubiquitous and plays an important role in students' lives. Social media, television, video games and music are just a few examples of media that can capture students' attention. Students often spend long hours in front of screens, whether it is for studying, entertainment or socializing. According to a 2010 study (Rideout et al., 2010), young adults spend an average of about 7 hours a day in front of screens. These media consumption habits have certainly evolved since 2010. Some people may develop a media addiction, which is characterized by excessive and compulsive use. Their attitudes, behaviors and opinions can be influenced by these media. One such emerging tool that has become increasingly popular among students is ChatGPT. With its ability to provide informative and engaging conversations on a wide range of topics, ChatGPT has quickly gained popularity as a way for students to connect and learn in a new way. Media outlets and social media platforms have taken notice of this trend, with many encouraging their audiences to try out ChatGPT for themselves. As a result, ChatGPT has become a topic of conversation among students and educators alike, with many recognizing its potential to revolutionize the way we learn and communicate. Being aware of the emergence of media in students' lives, we thought about engaging them in activities that promote their mental and physical well-being in education.

Artificial Intelligence (AI) has been increasingly used in various industries, including education (Y. Chen et al., 2023; Wollny et al., 2021). In higher education, the use of chatbots as AI conversational partners has been gaining traction. Chatbots are computer programs that simulate human-like conversation through text or speech. They can provide personalized assistance to students, enhance student engagement, and improve learning outcomes. Several recent research studies have explored the potential of chatbots as AI conversational partners in higher education.

For instance, a study by (Essel et al., 2022) investigated the effectiveness of a chatbot in providing academic support to university students. The study found that the chatbot was effective in providing personalized assistance to students, reducing the workload of instructors and enhancing student engagement.

Another study by Thadphoothon (2020) explored the use of chatbots as AI conversational partners in teaching English as a Second Language (ESL) in higher education. The study found that the chatbot was effective in improving students' language skills, with students reporting high levels of engagement and satisfaction with the chatbot-assisted learning approach.

In Kuhail et al. (2023), a comprehensive analysis of 36 papers was conducted to examine, compare and evaluate recent endeavors that employed chatbots in education, considering seven dimensions. The findings indicate that a majority of the chatbots functioned as teaching agents, while a considerable proportion served as peer agents. Furthermore, a majority of the chatbots followed a predetermined conversational path while approximately 25% of the chatbots used a personalized learning approach that catered to individual students' learning requirements.

In Wambsganss et al. (2020), authors created a conversational agent using NLP to determine if its use can improve the quality of responses and the level of enjoyment of participants. The chatbot deployed in a field experiment with 127 students and compared it with a web survey as a baseline. The findings indicate that using conversational agents for evaluations results in higher levels of response quality and level of enjoyment and are therefore, a promising approach to increase the effectiveness of surveys in general.

In (Daud et al., 2020), a chatbot was proposed in order to support students in learning JAVA programming by reducing the time taken to get help from lecturers personally and provide the exact answer for their problem rather than an example of similar code from the web.

Despite the promising results of these studies, there are still challenges on the adoption of chatbots in higher education. For instance, the chatbot's ability to understand natural language, its accuracy in

responses and its integration with the learning management system are critical factors that need to be considered.

This paper does not aim to present a review on the recent literature on the use of chatbots as AI conversational partners in higher education, but instead it focuses on the effect of using them on the motivation and engagement of students. This paper aims to scope out the role of chatbot as a tool to enhance students' motivation and engagement.

The rest of the paper is structured as follows. The next section, we will discuss some of the most effective methods to enhance students' motivation, including setting clear objectives, personalizing learning, positive reinforcement, and the use of artificial intelligence. The focus will then be on the use of AI, where we highlight the different digital tools that can enhance students' motivation and engagement. The focus in the fourth section will be on new AI-based chatbots and the approach we propose to include them in our learning activities. In the first subsection we include the description of the experiment we conducted on three different courses for computer science engineering students. Then, we present and discuss the results as for the challenges and limits of the implementation. The final section gives conclusions and plans for future work.

ENHANCING STUDENT MOTIVATION

Student motivation is a critical factor in successful learning outcomes, especially in engineering education. As such, there has been a considerable amount of research on techniques to enhance student motivation. We discuss in the following some of the most effective methods.

SETTING CLEAR OBJECTIVES

One of the most effective techniques for enhancing student motivation is setting clear objectives. This involves establishing clear learning goals.

The connection between goals and student motivation has been widely investigated in the research literature such as the studies conducted by Shih and Reynolds (2018) and Moeller et al. (2012). They both found that setting clear objectives can significantly improve student motivation and improve their learning g outcomes. The results showed that students who had clear objectives were more motivated and performed better than those who did not.

PERSONALIZING LEARNING

Personalizing learning involves tailoring the learning experience to meet the individual needs of the student. This technique has been shown to enhance student motivation and engagement in engineering education.

Tetzlaff et al. (2021) provide an overview of personalized and adaptive learning approaches in education. The authors define personalized learning as an approach that tailors instruction and learning experiences to meet the individual needs of learners, while adaptive learning uses technology to adjust the learning experience to the learner's abilities and progress. The article discusses the benefits and challenges of personalized and adaptive learning, including increased student engagement and motivation, better learning outcomes and the need for effective assessment and data analytics to support personalized and adaptive learning. The authors also discuss various approaches and models for implementing personalized and adaptive learning, including competency-based learning, mastery learning and self-directed learning. The article concludes by emphasizing the importance of designing personalized and adaptive learning experiences that are grounded in research and best practices and that prioritize the needs and goals of learners.

Positive Reinforcement

Positive reinforcement involves providing students with positive feedback or rewards for their efforts and achievements. This technique has been shown to enhance student motivation in engineering education. Cho et al. (2021) examine the effectiveness of concept-point-recovery (CPR) teaching sessions in enhancing students' perceptions of learning and performance. The CPR approach involves presenting key concepts in a lecture, followed by a short quiz, and then a review of the quiz questions and answers. The research used a mixed-method approach, combining surveys and interviews to gather data from undergraduate students in an engineering course. The results suggest that students had positive perceptions of the CPR approach, reporting increased engagement, understanding of key concepts and confidence in their ability to apply the concepts. The authors also found a significant positive correlation between the students' perceptions of learning and their actual performance on exams. The study highlights the potential benefits of using the CPR approach in teaching, including increased student engagement, improved learning outcomes, and enhanced confidence in applying key concepts. The authors conclude that the CPR approach could be a useful tool for improving teaching and learning in engineering and other disciplines.

Use of Artificial Intelligence

For years, there have been several AI involvements in education that have contributed to advancements in the field such as Intelligent Tutoring Systems (Nwana, 1990), Computer-Based Training (Bedwell & Salas, 2010), Automated Essay Scoring (Ke & Ng, 2019), Educational Data Mining (Romero & Ventura, 2010), Intelligent Learning Management Systems (Turnbull et al., 2020) and Virtual Reality (Kavanagh et al., 2017) and Augmented Reality (P. Chen et al., 2017). The use of AI as a technique for motivating students is an exciting and rapidly developing area of research in education, with the potential to provide personalized learning experiences that can enhance motivation, engagement and learning outcomes. Recent research has shown promising results for the use of AI in motivating students in various fields, including engineering education. The study of Cho et al. (2021) well examines the current state of the art in the field of AI in education. The review focuses on the use of AI for personalized learning, student performance prediction, plagiarism detection and intelligent tutoring systems. The study found that AI can improve the learning experience for students by personalizing content delivery and providing adaptive feedback. AI can also aid in decision-making by providing insights into student performance and predicting future success. However, there are concerns about the ethical implications of using AI in education, such as data privacy and the potential for algorithmic biases. The authors suggest that there is a need for further research in the field of AI in education, particularly in areas such as the integration of AI with traditional teaching methods, the effectiveness of AI in supporting learning outcomes and the development of ethical guidelines for the use of AI in education.

In the next section we delve into the use of digital tools and especially those based on artificial intelligence and their role in motivating and engaging students.

Digital Tools to Enhance Student Motivation and Engagement

Feeling competent, autonomous, and socially integrated; these are the three basic needs of students that must be met if they want to learn effectively. With the outbreak of the COVID-19 pandemic, educational institutions worldwide have adopted technology to ensure continuous learning for students. In this section, we will introduce various digital tools and explore how they can facilitate students' engagement in the learning process.

Learning Management System Platforms

Learning Management Systems (LMS) or Digital Learning Environments (DLE) are software platforms designed for remote education. These systems help manage learning paths, monitor student progress and deliver digital content. Some LMSs prioritize content management, known as Learning Content Management Systems (LCMS), while others emphasize skills management. LMSs typically provide centralized competency management, allowing for the creation of a comprehensive student profile. LCMSs, on the other hand, tend to focus on competencies acquired during a particular course.

Numerous studies have explored the application of Learning Management Systems in education, examining both their opportunities and challenges (Henninger & Kutter, 2010; Kulshrestha & Kant, 2013; Snoussi, 2019). In Habeeb (2019), the author delved into the advantages and disadvantages of LMS.

Additional studies have explored the creation and implementation of e-learning systems utilizing Learning Management Systems in education (Govindasamy, 2001; Rabiman et al., 2020). In Kasim and Khalid (2016), researchers provide an overview of the benefits and challenges associated with LMS usage, as well as evaluating various LMSs based on criteria such as functionality, user interface, and compatibility with institutional objectives.

In this part, we present two examples of LMS adapted by our establishment, namely:

Blackboard: The use of Blackboard helps to improve student motivation thanks to the flexibility, convenience and availability of the platform to access lessons and assignments. In Kaid Mohammed Ali (2017), the study conducted showed that students reported an increase in class participation and better interaction with teachers and peers with the use of Blackboard (Boléguin et al., 2019).

Moodle: The Moodle digital educational platform, whose acronym stands for "Modular Object-Oriented Dynamic LEarning", is one of the technical digital solutions for distance or hybrid learning. This platform allows building courses, creating activities, making resources available, creating interactions with content and between actors (teachers and learners) and monitoring students in the framework of a constructivist and social constructivist approach to training, for example by promoting collaborative work.

Several studies have used Moodle LMS to engage learners and foster skill development while helping students manage their learning goals and encouraging sustained effort with rewards (Redondo et al., 2022; Waheed et al., 2013). In Aikina and Bolsunovskaya (2020) authors projected motivating and demotivating factors in the design and use of the platform to maximize student motivation.

The Online Collaboration Tools

Digital tools are now a key component of the education system. They overcome barriers to learning by making it more accessible to all students while enhancing their ability to learn independently in an inclusive pedagogy. In Boling et al. (2014), the authors project the challenges and benefits encountered by teachers when using tools for their online learning. They also reflect how these tools can best be used to improve the quality of online learning.

Given the importance of student feedback regarding the application of online tools, a study was conducted in Buraga (2019) in which positive perspectives on the integration of these online collaboration tools for learning were announced. The tools allowed for more collaborative interaction and easier access to information. However, some students also raised concerns about the reliability and security of these tools.

Quizzes and Assessment

Online quizzes and assessments allow respondents to reach a deeper understanding of their knowledge and develop a stronger sense of competence. Students can assess their own performance and get real-time feedback, which can motivate them to learn. In Audet (2011), the author projects online assessment practices and the challenges teachers face in applying this approach to assess their students. The author argues that online assessment can offer many benefits, such as flexibility for students and teachers, speed of delivery of results and the ability to track student progress in real time. However, the author also lists challenges associated with online assessment, such as the quality and reliability of questions, protecting the confidentiality of responses and dealing with cheaters.

Serious Games for Learning

The primary aim of incorporating serious games into education is to leverage their benefits and utilize them in pedagogy to enhance learners' motivation. In 2012, Prog&Play (Muratet et al., 2012), a game-based work environment was established to increase student engagement in learning programming fundamentals. Other studies have similarly emphasized the importance of integrating games into education through gamification. Tools like Kahoot (Benhadj et al., 2019; Yuruk, 2020) and Duolingo (Syahputra, 2019) have been utilized for this purpose.

Using Augmented and Virtual Reality for Education

Nowadays, learning with augmented and virtual reality is practical in many institutions. This type of learning represents a great opportunity for learners and teachers to make learning more interactive and immersive, which can enhance student motivation and engagement. Several works have treated the use of these two techniques in education while projecting the advantages and disadvantages that they present. In Kaur et al. (2020), the authors explore the use of augmented reality (AR) to improve engineering students' motivation and engagement. The paper describes a study conducted with a group of engineering students while using augmented reality applications to view interactive 3D models during their courses. The results showed that the use of augmented reality promoted student motivation and engagement, as well as an improvement in their understanding and retention of engineering concepts. Students also reported a preference for using augmented reality over traditional teaching methods. The use of augmented reality to improve student performance in science has proven to be successful also with the work done in Ziden et al. (2022). Results of the student-led study showed that using AR had a positive effect on their performance. Students using AR scored higher grades and expressed a greater interest in learning science. Students also reported that using AR improved their understanding of science concepts.

Chatbots

Several research studies have examined the use of chatbots as a tool to enhance students' motivation. According to the article by Chaiprasurt et al. (2022), chatbots can play an important role in motivating and engaging students in their learning. The study found that the use of a chatbot in blended learning significantly increased students' motivation, which in turn improved their learning achievement. The chatbot provided personalized feedback and encouragement to students, helping them to stay focused and motivated throughout their learning journey. Additionally, the chatbot allowed for instant communication and support, reducing the sense of isolation that students may experience in online learning environments. Overall, the article highlights the potential of chatbots to enhance student motivation and engagement, ultimately leading to improved learning outcomes.

Another study by Chiu et al. (2023) found that the use of an AI-based chatbot not only improved student motivation but also positively impacted the teacher's ability to provide support and feedback to students. The chatbot was able to provide instant feedback and assistance to students, freeing up

the teacher's time and allowing for more personalized support. This, in turn, allowed teachers to focus on building relationships with students and providing individualized support where needed.

OUR APPROACH

The central hypothesis of this study is that adopting emerging digital technologies in the classroom will significantly increase the students' intrinsic and extrinsic motivation. The learning environment should help the students to build their own knowledge by motivating them to actively engage in some meaningful and creative activities. In our approach, learning chatbots motivates the students to build their knowledge in an enjoyable and creative way. Students should be able to tackle the challenges with an appropriate level of help from the chatbots.

Today, Artificial intelligence has the potential to address some of the biggest challenges in education; develop innovative teaching and learning practices and ultimately accelerate progress toward the fourth and eighth sustainable development goals which are the quality of education and decent work and economic growth.

EXPERIMENTS

With the proliferation of online AI based chatbots like ChatGPT, students are increasingly relying on it for writing essays, assignments, projects, and reports, and this trend appears to be unstoppable. Rather than attempting to prohibit the use of this technology, it may be more productive to leverage it as a pedagogical resource, engaging students in higher-order thinking tasks that involve critical thinking and analysis. One approach might be to assign tasks that require students to use chatbot-generated responses as a starting point, then evaluate, critique, and adapt those results to develop more sophisticated solutions. Additionally, instructors can modify their problem-solving methodologies by presenting ill structures problems to encourage students to develop a deeper understanding of the problem situation and formulate appropriate questions that lead to effective solutions. By adopting these strategies, we can effectively manage the use of those emerging and widely used chatbots in education and foster more productive learning outcomes for students.

In order to achieve the main goal of this study, Three courses of different types were selected.

- Procedural Programming course: This course is dedicated to the first year students in computer science engineering. It is an 84 hours course divided into 42 hours of course sessions based on the flipped classroom and 42 hours of Problem Based Learning session (Ziadi et al., 2022).
- Language and automata theory course: This is a 42 hours course, taught to students enrolled in the 3rd year of the engineering degree program. It is an integrated course that deals with the design, implementation, analysis, characterization, and classification of formal languages called programming languages.
- C Project course: A 42 hours project taught also to the first year students in computer science engineering. As its name implies, it is a tutored project based on project based learning where students work in groups on the development of a platform game based on C language .

These three courses were chosen for the variety of the adopted learning approaches, problem based learning, flipped classroom, classical approach and project based learning.

New activities using chatbots are designed in each course to increase the students' engagement and motivation. All additional activities were carefully designed and introduced to the flow of course activities taking into account the specificities of each course content.

The effectiveness of the proposed approach was evaluated using a comparative study. During the study, the same teachers managed the course for both the control and the experimental groups. The

same lecture content was used for both groups, the difference was in the activities that were included in the course learning design for the experimental group.

A mixed-method study is used in this experiment. We will present the results of feed-back survey designed to evaluate their impressions, the degree of their involvement and motivation.

The first experiment was in a procedural programming course. During the lesson, a problem situation was proposed to the students where they were invited to solve it. The classical approach to problem solving in this course is illustrated in Figure 1.

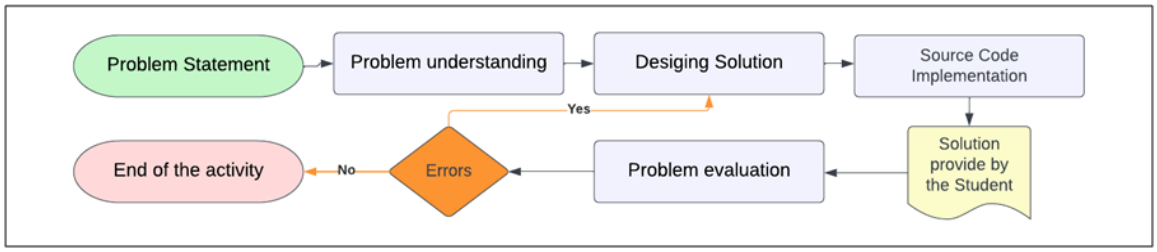

Figure 1. Classical problem solving

Students engage in a systematic process for addressing complex problems. Initially, students must carefully read and analyze the problem statement, taking time for reflection to clarify and define the problem. In the next phase, students apply their problem-solving skills to deduce an algorithmic solution that can effectively address the problem. Finally, students must convert their algorithmic solution into actual source code, utilizing an integrated work environment to test the results of their coding efforts. Through this iterative problem-solving process, students develop analytical skills, and gain proficiency in algorithmic development and coding.

The steps followed with the second part of the class; those who used the chatbot are presented in Figure 2. Students read and analyze the problem statement then they ask well-formulated questions to the chatbot. Students need now to adapt the results provided according to our module requirements. In the last step, students run and test the code and propose other questions to the chatbot to identify how to solve the errors or to further explain their needs.

The experimental group students follow a structured process, as illustrated in Figure 2. After reading and analyzing the problem statement, students formulate well-constructed questions to the chatbot. The responses generated by the chatbot are then adapted to meet the specific requirements of the problem module. In the final step, students run and test their code, seeking clarification and additional information from the chatbot as needed to identify and resolve errors or refine their problem-solving approaches. By leveraging the chatbot in this manner, students develop critical thinking skills, problem-solving abilities, and technical proficiency, while also gaining experience in interacting with AI technologies.

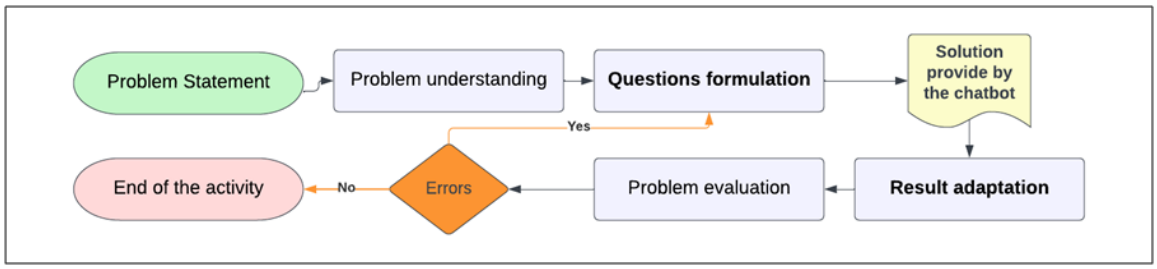

Figure 2. Problem solving approach of using ChatBot

The second experiment was conducted in the context of a language and automata theory course, comparing the effectiveness of group discussion and use case studies (the control group) with the

use of a chatbot to explore new concepts (the experimental group). Both groups were presented with the same set of questions related to the new course material, but the experimental group was asked to utilize the chatbot for generating answers. Following the generation of responses by the chatbot, students in the experimental group engaged in a discussion that was informed by the instructor's feedback on their synthesized answers. Based on the discussion, students were able to reformulate additional questions for the chatbot.

In the third experiment, we aimed to investigate the effectiveness of using chatbots as a learning assistant to provide feedback and guidance to students in their first-year computer science engineering course. Specifically, we focused on the task of conceiving and implementing in the C project, which is a challenging topic for many students.

The experiment was conducted with a sample of first-year students who were enrolled in the course. The students were randomly assigned to either an experimental group, where they received feedback and guidance from the chatbot, or a control group, where they did not have access to the chatbot.

The students in both groups were given the same C project tasks to complete during the course sessions. The experimental group had access to the chatbot, which they could use to ask questions and receive feedback on their work. The chatbot was trained on a large corpus of C programming examples and could provide personalized feedback to each student based on their specific code and errors.

RESULTS AND DISCUSSION

The three instructors noted a significant increase in student motivation and observed a sense of competition between the two groups in the class - one using chatbots and the other using traditional methods. They were particularly impressed by the students' interest in learning how to effectively integrate chatbots into their learning strategies.

The feed-back survey was administered to 58 students of computer science engineering studies 74.13% first year students and 25.86 third year students. The goal is to assess the effectiveness of using the chatbot in the classroom and study the students' perspective of this tool. The survey consisted of five close questions related to the students' experiment, including its usefulness in providing feedback on their tasks and its impact on their overall learning experience. Participants were asked to rate their agreement with each question on a 5-point Likert scale, with 1 indicating strong disagreement and 5 indicating strong agreement. It also contains three open questions about the advantages and disadvantages of chatbots in the classroom. The survey was administered online and participation was voluntary and anonymous. The internal consistency of the survey items was assessed using Cronbach's Alpha, which yielded a value of 0.86, indicating a high level of internal consistency among the items.

Results from the survey showed that the majority of students (mean = 4.2, SD = 0.8) found the chatbot to be a useful learning assistant in their course, with 47 out of 58 students indicating agreement or strong agreement with this statement. Similarly, most students (mean = 4.1, SD = 0.7) reported that the chatbot provided helpful feedback on their tasks, with 40 out of 58 students indicating agreement or strong agreement. In addition, students reported a positive impact on their overall learning experience when using chatbots (mean = 4.0, SD = 0.6).

These results suggest that the use of chatbots as a learning assistant can have a positive impact on students' learning experiences.

The students' responses to the question in the survey about the advantages of working with a ChatBot were more positive than the responses to the question about the disadvantages. The most common advantages mentioned were rapidity and time-saving as illustrated in Figure 3. This indicates that users appreciate the efficiency of ChatBots in providing quick solutions to their problems.

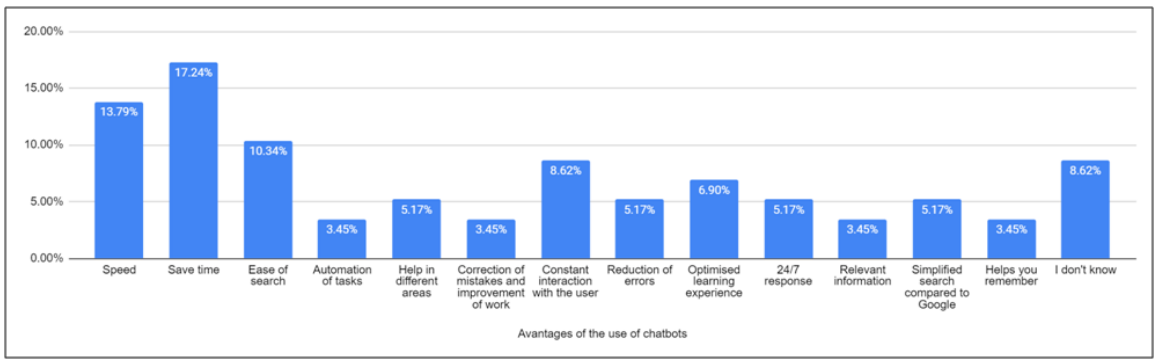

Figure 3. What are the advantages of working with a ChatBot?

Another frequently mentioned advantage was the ease of research. This suggests that ChatBots are seen as a useful tool in simplifying the research process for users. Additionally, 5.7% of students mentioned that ChatBots provide a constant interaction with users, which can enhance user engagement and satisfaction.

Based on the responses provided, it is clear that there are several potential drawbacks to working with a ChatBot as illustrated in Figure 4. The most common issue mentioned is the lack of emotions, which could make the experience less personal and engaging for users. Additionally, a few users noted that the ChatBot's level of learning may not always be sufficient, potentially leading to errors or incorrect responses.

Other issues mentioned include the risk of giving false information, the need to be very precise with questions in order to avoid errors, and the potential for the ChatBot to replace the skills and critical thinking required for effective problem-solving by engineers.

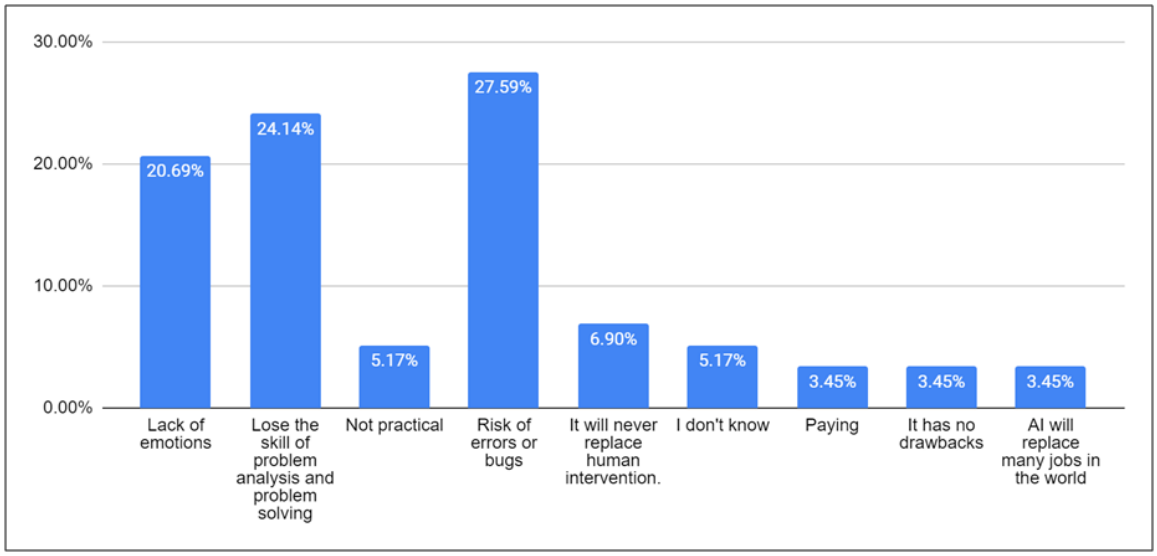

Figure 4. What are the disadvantages of working with a ChatBot?

As instructors, we can deduce from our own experimentation the advantages and disadvantages of using a chatbot in teaching. Used wisely, a chatbot enhances students' motivation and stimulates their commitment in their learning process. They promote student autonomy as they are the actors of their own learning. They also reinforce the experience-based pedagogy and learning by trial and error. The students' learning reached the last level of Bloom's taxonomy, i.e. the level of evaluation due to the adaptation of the results provided by the chatbot, the selection of the relevant information, the degree of measurement of the good solutions, and the justification of their choices. Learning with

chatbots is adaptable since they can assess the skill levels of student profiles and at their own rhythm. Conversational agents are also very useful as mentors, experts, tutors and coaches for learners. Since this type of AI is always available and accessible, they can assist and help students, guaranteeing inclusive learning.

The conclusion drawn at the end of this experience and based on previous experiences conducted by (Ali et al., 2023; Muñoz et al., 2023; Zhou & Li, 2023), and which reinforce our contribution, is that using a chatbot enhanced the students' motivation and pushed all of them to discover each new concept. Taking the instructor's feedback into consideration, they compete with each other; each one tries to find the key words and rephrase his question to find the right answer before his colleagues. However, we have noticed that the assistance of an instructor is essential particularly when dealing with new concepts.

LIMITS AND CHALLENGES

While chatbots offer many advantages, it's important to recognize and prevent their limits.

Lack of Emotional Intelligence: While Chatbots can provide rational answers, it lacks emotional intelligence, which is critical for many learning situations. Students may require emotional support or encouragement, especially when dealing with difficult concepts, and a chatbot may not be able to provide the necessary emotional connection.

Limited Understanding of Context: Chatbots rely on keywords and algorithms to provide answers, and may struggle to understand the context of a question. This can lead to inaccurate or incomplete answers, which may confuse or frustrate students.

Difficulty with Unstructured Data: New IA based Chatbots are trained on a vast amount of structured data, which means it may struggle with unstructured data, such as handwritten notes or incomplete sentences. This can limit its ability to provide accurate and helpful responses.

Technical Issues: As with any technology, Chatbots can be affected by technical issues such as network connection and server traffic, which can impact its availability and response time.

Maintenance and Updating: Chatbots require ongoing maintenance and updates to ensure that it is providing accurate and up-to-date information. This can be time-consuming and costly and may require dedicated personnel to manage.

Overall, while chatbots can be a valuable learning assistant in the classroom, it is important to recognize its limits and ensure that it is used appropriately and effectively to enhance the learning experience for students.

RECOMMENDATIONS

Our research experiment involving the integration of chatbots as a tool to motivate and engage students has yielded promising outcomes. The utilization of AI conversational chatbots in the classroom offers numerous benefits, complementing traditional instruction and providing personalized learning experiences. By adhering to the following recommendations, teachers can effectively harness the potential of AI chatbots:

- Clearly communicate the purpose of using chatbots to students, emphasizing their role as supplementary learning tools.
- Select safe and age-appropriate chatbot platforms that prioritize privacy and security.
- Establish guidelines for proper interaction, promoting respectful communication and appropriate language.
- Leverage chatbots to facilitate differentiated learning, tailoring feedback, explanations, and resources to individual student needs.

- Encourage critical thinking by prompting students to evaluate chatbot responses, compare information from multiple sources, and engage in independent problem-solving.
- Monitor student progress through chatbot data, using it as a valuable formative assessment tool.
- Maintain a balance between human interaction and chatbot use, emphasizing that the latter should supplement rather than replace human support.
- Encourage ethical use of AI by discussing privacy, data security, and responsible chatbot interaction with students.
- Provide professional development opportunities for teachers to ensure their familiarity and proficiency in integrating chatbots into instruction effectively.
- Regularly evaluate the effectiveness of chatbots in the classroom, collecting feedback from students and teachers. Make necessary adaptations based on this feedback to optimize the learning experience.

By adhering to these recommendations, teachers can create a dynamic and engaging learning environment that fosters student motivation and achievement. The integration of AI chatbots as educational tools has the potential to revolutionize the learning process, providing personalized support and enhancing students' love for learning.

CONCLUSION

Chatbots play a crucial role in education through the personalization of learning, improving the quality and the efficiency and the equity of education. As chatbots and other AI technologies are increasingly being used in education, it's necessary for both teachers and students to learn how to use them properly. Our goal in this study was to use chatbots as AI-based technologies to boost students' motivation and increase their engagement. A mixed-method experimental study was conducted on three different courses using chatbots as assistants, coaches and experts.

Student participants were invited to fill in a consistent feedback survey, according to Cronbach's alpha criteria. We notice that using chatbots as a learning assistant in the classroom can have several benefits, such as providing immediate feedback to students, assisting them in finding relevant information and improving their engagement with the learning material.

However, there are also limitations and challenges that need to be considered. First, chatbots can skew the results of complex queries and may struggle to provide personalized answers. That's why it's important for teachers to assist students while working with chatbots. Second, chatbots are tools designed to provide rational answers, so they are devoid of emotions unlike human interventions. Third, chatbots accessibility can be affected by technical issues such as network connection and server traffic, so they are not always available.

The incorporation of artificial intelligence technologies, such as teacher-assisted chatbots, is an innovative and effective practice that can enhance the education experience for students. One potential application is using chatbots to promote deeper learning before flipped classroom sessions. Additionally, chatbots can play a valuable role in project-based courses or courses with work groups, acting as a virtual team member to manage groups with no equitable number. By leveraging chatbots in these ways, teachers can more effectively support student learning and engagement while also optimizing the use of their own time and resources.

Another perspective on using chatbots in the classroom is that designing a chatbot specifically for each course can improve the learning experience for students. By tailoring the chatbot to the course content and learning objectives, students can receive more personalized support and feedback that is directly relevant to what they're learning. Additionally, designing a chatbot for each course can help to mitigate concerns about accuracy and bias, since the chatbot can be trained specifically on the course material and checked for accuracy by the teacher. However, this approach may require more time and

resources on the part of the teacher or institution to develop and maintain the chatbots for each course.

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