

The Impact of the Use of ChatGPT in Enhancing Students' Engagement and Learning Outcomes in Higher Education: A Review

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Abstract

As a large Artificial Intelligence (AI) language model designed by the OpenAI, ChatGPT is perceived as a 'revolutionary framework in natural language processing' (Haque, 2023). Indeed, ChatGPT greatly influence various social aspects, and in particular, it has tremendous impact on the contemporary educational system globally, in terms of changes in pedagogical approach, teaching and learning method, as well as students' participation and academic outcome. Due to its complicated nature of application, it is necessary to examine if ChatGPT is an appropriate tool for instructors and students during the academic process. Using Reeve's (2013) model, this paper aims at addressing how does the utilisation of ChatGPT may have improved students' engagement and academic outcome in China. This includes evaluation of students' autonomy during learning, motivation for solving questions, critical thinking, as well as overall academic performance. This paper based on a comprehensive literature review that examines students' attitudes and learning outcome through the application of ChatGPT. The review findings suggest that students' learning engagement can be greatly improved through the use of ChatGPT, whereas in some certain situations, the application of certain AI tools may have hindered their academic development. This may include considerations around ethics, academic integrity, as well as reliability. This paper also suggests certain ways to improve these facets, so that ChatGPT can be used in a relatively more effective and appropriate way.

Keywords: ChatGPT, Higher Education, Students' Engagement, Learning Outcome, Chinese University

Introduction

As an artificial intelligence-based natural language processing technology, which is known as Chat Generative Pre-Trained Transformer, ChatGPT is being developed rapidly in a global sense and studied accordingly in different ways. With its brand-new intellectual functions, ChatGPT generates conversations through understanding and learning human language, as well as interacting with the context of the chat, truly communicating like a human and even writing emails, video scripts, copy, translations, code, essays, etc. This is particularly prominent in the context of higher education, which enables learners to accomplish certain academic tasks in a more efficient and effective way. Indeed, through using ChatGPT, students have the opportunities to solve issues and elaborate problems faced during the learning process more efficiently.

ChatGPT has become more and more widely used in Chinese education, with students moving from an initial sense of novelty to an increased reliance on the use of the software. However, the use of ChatGPT in education in China is still in its infancy and requires further optimization and application. In China, ChatGPT is under development in the universities and is mainly being perceived as an aid to teaching and learning (Chi et al., 2023). Teachers have brought the use of ChatGPT into the classroom in order to increase students' learning initiative. Nevertheless, one of the applications of ChatGPT in the field of education has gained a different voice. Students have shown a certain dependence on ChatGPT and an increased motivation to learn, but the phenomenon of academic deception has become more and more serious. ChatGPT has become a problem that needs to be solved in order to be used properly and appropriately.

In the education sector, ChatGPT is being enthusiastically pursued by new age university students, however there are certain challenges with AI in the development of higher education (Cotton et al., 2023). In addition, few research has been done to analyse if the use of ChatGPT may contribute to improvement during teaching and learning. To address this gap, the main objective of this paper is to investigate potential impact of utilisation of ChatGPT in relation to student engagement and learning outcome from a global scope to the context of China. Apart from positive facets, the challenges of ChatGPT for education is still an important research component, which has a significant impact on the motivation of students to participate in class and the authenticity of the presentation of learning outcomes. There is a need to reflect on how the integration of AI use in higher education can be developed in a positive way. As such, the paper aims to discuss the issues as followed

1. To what extent does the use of ChatGPT in higher education impact students' engagement and participation in online learning activities, as compared to traditional forms of instruction?
2. What is the impact of ChatGPT on students' learning outcomes in higher education?
3. What are some potential challenges and barriers in relation to the irregulated use of ChatGPT?

Literature Review

What is the ChatGPT?

ChatGPT is a powerful language model that has gained a large number of users in a very short period of time. It closely mimics the ability to write in human language and its ability to carry out multiple ongoing conversations and is a versatile tool that can be used by providing

personalised support, guidance, and feedback to self-learning learners (Biswas, 2023). Based on the analysis proposed by Haque (2023), ChatGPT (Generating Pre-Training) is mainly developed by the Open AI, whose main job purpose is to make available tools and materials that facilitate the application of AI by researchers. The main objective of ChatGPT is to allow users to access information and necessary resources in a more efficient way. By asking questions electronically, ChatGPT accomplished tasks through providing quick and accurate responses to the users (Haque, 2023). The responses that are generated through ChatGPT is similar to how a real person may reply (Haque, 2023). Similar views were also suggested by Opara (2023), who perceived ChatGPT as an AI tool that simulate human-like interactions, and it can be used in a great variety of daily tasks. As a large language model, ChatGPT can efficiently accomplish numerous daily and professional missions, this includes natural language processing, content creation, customer service, translation, as well as data analysis (Haque, 2023). In the contemporary society, with its huge database of 175 billion parameters, ChatGPT is widely used in various fields and situations (Haque, 2023).

ChatGPT and Higher Education

The use of technology has always been discussed in relation to its functions and effectiveness in the context of higher education. Although ChatGPT is initially developed to address users' daily usages, Kengam (2020) proposed that artificial intelligence is being greatly integrated to the context of higher education. ChatGPT exhibits a great capacity to result in significant impact on higher education across different aspects (Chukwuere, 2023). In particular, the use of ChatGPT poses great challenges on the traditional forms of education (Chukwuere, 2023). Conventional teaching places teachers in the dominant position, which enables educators to become information providers or examiners of students' learning process (Ameliana, 2017; Arif et al., 2019; Lim et al., 2021; Nair & Yunus, 2021). As such, students are normally perceived as passive receiver of information and knowledge and teachers have limited motivation for innovation (Ameliana, 2017). With an effective use of ChatGPT, it enables students to learn through effective and innovative ways. Different forms of AI have greatly contributed to better teaching and learning experience. Therefore, the present Artificial intelligence in education (AIED) is an expanding filed of analysis based on its effective functioning (Kengam, 2020). Indeed, based on the research conducted by Chukwuere (2023), although ChatGPT is normally seen as a disruption to the normal higher education process, it still brings a great variety of benefits and advantages to educators and learners. ChatGPT can increase the independence and autonomy of self-learning learners, while being both practical and adaptable. By providing personalised support, guidance and feedback, Chat GPT has the potential to increase self-directed learners' motivation and engagement (Firat, 2023).

However, as stated by Opara (2023), the usage of artificial intelligence is still an unknown topic for some educators, in terms of its functions in pedagogical curriculum on a larger scale and how AI may impact on teaching and learning experience in higher education. Researchers proposed that while most individuals hold favourable attitudes about AI, numerous concerns are revealed for the future development of higher education (Opara, 2023). Indeed, there are some challenges to its use (e.g., generating incorrect or false information and bypassing plagiarism detectors). Immediate action should be taken to update assessment methods and institutional policies in schools and universities. Teacher training and student education are also essential to address the impact of ChatGPT on the educational environment (Lo, 2023).

What is Student Engagement and Learning Outcomes in Higher Education?

Based on Reeve's (2013) theoretical framework of student engagement, it refers to students' active involvement in 'educationally effective practices and their commitment to educational goals and learning (Chiu, 2021). Student engagement is generally perceived as a major factor in evaluating students' academic outcome and learning performance (Chiu, 2021). From Reeve's multidimensional model of student's engagement, it mainly consists of 4 aspects: behavioural, cognitive, emotional, and agentic.

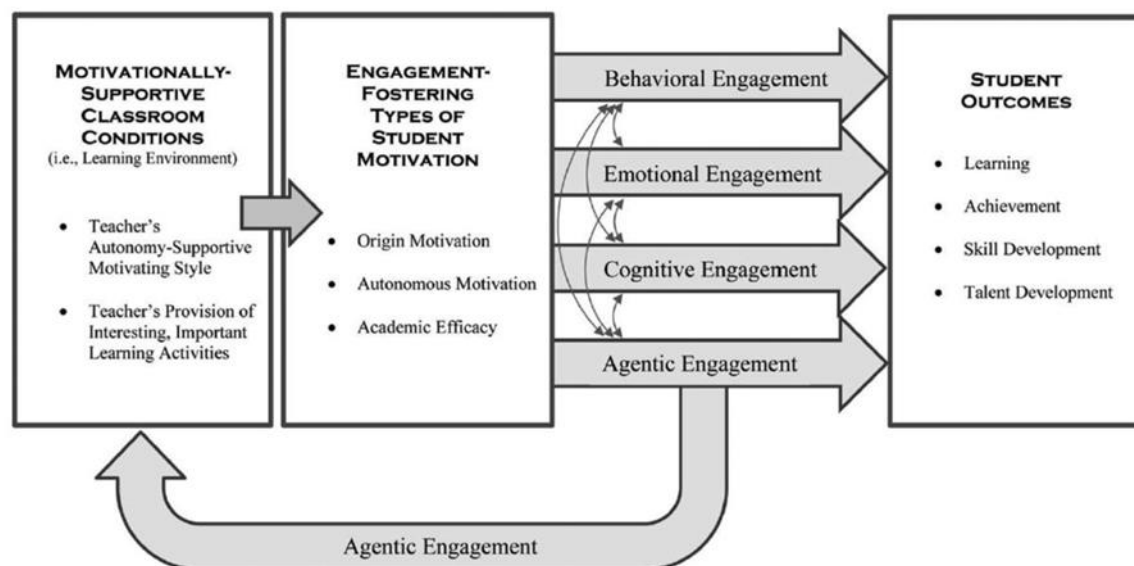


Figure 1. Four interrelated dimensions of student engagement, adapted from Reeve (2013).

Behavioural Engagement can be referred as students' active physical participation, visual or mental attention, persistence, and autonomous learning. Emotional engagement is the attitudes possessed by students towards their classmates, educators, academic activities, as well as school experience (Chiu, 2021). Cognitive engagement refers to the efforts students contribute to various academic tasks, particularly those requires excessive amount of time and contributions. The last one is agentic engagement, which is comprehended as the 'act of taking measures that contribute to teaching and learning' (Chiu cited in Reeve, 2013). Four types of engagements are interrelated and can be normally improved through motivationally supportive classroom conditions and engagement-fostering types of student motivation. That is, different types of motivations are an energy source that encourages students to be engaged in the learning process (Chiu, 2021). Through promoting 4 types of engagement, students' learning outcome, including academic achievement, critical skills, and talents can be greatly developed and enhance. The discussion below will be based on Reeve's model of students' engagement, which prioritises how the use of ChatGPT may significantly improve students' autonomous motivation, academic efficacy, as well as their skills' development.

Discussion

In general, research indicates that the use of ChatGPT can assist students in accomplishing various forms of academic tasks, including research, and writing tasks (Kasneji et al., 2023). Apart from that, students' academic skills can be greatly improved through AI technology, such as team collaboration, critical thinking, and problem-solving skills. Nevertheless, the

effectiveness of ChatGPT on students' engagement and learning outcome has been constantly argued and questioned by the scholars. As such, the below discussion will examine viewpoints from both sides based on Reeve's educational model of students' engagement and academic outcome.

Effective Implementation of ChatGPT in Higher Education

Support for Autodidactic Experiences

From Reeve's (2013) educational model of students' engagement and outcome, one essential element in engagement-fostering types of student motivation is autonomous motivation. That is, students' 4 types of engagement can be greatly promoted through improving students' autonomous motivation (Reeve, 2013). In Reeve's (2013) research, autonomous motivations can be perceived as willingness to learn or accomplish certain academic tasks by oneself instead of being guided by others. The reasons of why non-autonomous learning experience may hinder students' class engagement is – traditional classrooms with no technological integration or other traditional teaching methods still place educators in the dominant position (Precintha et al., 2019; Yunus et al., 2014). As such, students are normally perceived as passive receiver of information and knowledge and teachers have limited motivation for innovation (Ameliana, 2017). Indeed, under the ordinary pedagogical approach and teaching strategies, students are facing difficulties in participating into collaboration, team cooperation, and different other forms of effective learning activities. Therefore, in China, there has been strong needs in integrating innovative technological tools to enhance students' learning experience. These tools may enable students to become independent learners in various fields of study, so that they can be relatively more engaged in the classroom.

To address this need, the development of AI tools like ChatGPT has the potential to change how students may approach their academic tasks and other aspects of higher education (Pham & Sampson, 2022). Through providing tailored and individualistic assistance to students, ChatGPT can greatly improve students' learning experience and their participation in online courses (Firat, 2023). By providing specific and interactive help, the use of ChatGPT may strongly encourage independence and independent study of autodidactic learners (Firat, 2023). That is because, university students' individual and academic needs may vary across different fields of study. ChatGPT may address these needs through responding unique but individualistic answers to the questions given. From Firat's research (2023), he proposed several ways that ChatGPT may encourage self-directed learning. Initially, ChatGPT may provide personalised support to those who may not have access to offline classes or physical mentoring (Firat, 2023). The use of AI may fill that gap particularly in some remote areas. Secondly, the utilisation of ChatGPT would provide real-time feedback and guidance (Firat, 2023). Autodidactic and self-directed learners can receive proper and quick response through the learning process of course resources. This would solve any potential academic problems in a more effective way. Thirdly, the use of ChatGPT would significantly promote accessibility for those with limited access to traditional educational materials (Firat, 2023). Students may use ChatGPT in a variety of ways, including websites, apps, or any other messaging devices. Apart from that, using ChatGPT allows students to have full flexibility in the learning process (Firat, 2023). For instance, students would ask for help whenever they experience academic issues, and they may talk to AI whenever they need. Lastly, the use of ChatGPT enables students to access to open education resources (Firat,

2023). That is, ChatGPT allows independent and self-directed users to utilise open education materials without limits or barriers. From these effective functioning, ChatGPT encourages independent and autodidactic learning, followed by promoting students' learning outcomes, including academic achievement and skills development (Reeve, 2013).

Development of University Students' Academic Skills

From Reeve's (2013) model, students' engagement in the university is significantly linked to their academic performance and critical skills development. These skills can greatly contribute to effective learning and teaching in the classroom. This section will elaborate this potential skills development, in relation to the use of ChatGPT during the academic process.

For university students, as a large language model, ChatGPT can greatly assist students to accomplish reading and writing tasks (Kasneci et al., 2023). The use of AI instrument can provide specific, accurate, and immediate response to numerous forms of problems met during the accomplishment process (Rajendran & Yunus, 2021; Said et al. 2013; Yunus & Salehi, 2012). This is particularly obvious during the language learning process (Hong, 2023). Although chatbots are usually applied as tools to chat for fun purposes, language learners at various levels of language proficiency may perceive and benefit from different aspects (Hong, 2023). In China, as university students are required to take college English sessions, the use of ChatGPT assists learners to acquire four skills (speaking, listening, reading, and writing), as well as significant improvement in grammar accuracy, vocabulary size, and formulaic sequence (Hong, 2023). During this process, ChatGPT is used to lead to changes in learner motivation, as well as confidence in language-using confidence and language aptitude (Hong, 2023). For the writing tasks, ChatGPT is frequently utilised to generate summaries and outlines of texts, which would assist students to quickly comprehend the clear meanings of a complicated paragraph, followed by organizing their thoughts for essay writing (Kasneci et al., 2023). The development of these academic skills will lead to a better cognitive engagement, which refers to the efforts students contribute to various academic tasks (Reeve, 2013). As such, the use of ChatGPT may significantly improve students' language-related tasks and learning outcomes.

In addition to basic literacy development, there are also other forms of skills development that are closely associated with students' cognitive and behavioural engagements (Reeve, 2013). Initially, researchers proposed that the functioning of ChatGPT and other large language models can help develop students' academic research skills (Kasneci et al., 2023). Indeed, the use of ChatGPT provides students with information and resources on a particular topic and hinting at unexplored aspects (Kasneci et al., 2023). This is particularly effective when university students are approaching unfamiliar or some innovative current research topics (Kasneci et al., 2023). Apart from research skills, the use of ChatGPT can greatly contribute to collaborative and cooperative learning. Collaborative learning refers to the involvement of groups of learners working altogether to accomplish tasks or solve problems (Kuhail et al., 2023). As stated by Kuhail and his colleagues (2023), chatbots may interact with students individually or support collaborative learning activities. This cooperative form of learning is closely linked to students' cognitive engagements as they have the opportunities to share and internalize academic knowledge in a group-work basis (Kuhail et al., 2023). In addition to this, as being enhanced by ChatGPT, collaborative learning can lead to a better development of critical thinking and argumentation (Kuhail et al., 2023). Open AI provides students with a great variety of resources and materials to consider and

internalise, which enables them to hold critical and objective perspectives when elaborating various research topics.

Ineffective Facets of ChatGPT in Relation to Student Engagement & Outcomes

Even if ChatGPT has received a lot of attention from the society and is currently being enthusiastically pursued by the new generation of university students, it is still challenging with some potential problems in the development of higher education (Cotton et al., 2023). In the classroom using ChatGPT, there were some issues with student feedback and the presentation of learning outcomes. The challenges of ChatGPT for education will be discussed in terms of student engagement in the classroom and the authenticity of the presentation of learning outcomes.

The Challenges of ChatGPT in a General Sense

ChatGPT is Open AI's powerful language model that has gained a large number of users in a very short period of time. It closely mimics the ability to write in human language and its ability to carry out multiple ongoing conversations (Biswas, 2023), and it can increase the independence and autonomy of self-learning learners, while being both practical and adaptable. By providing personalised support, guidance, and feedback, ChatGPT has the potential to increase self-directed learners' motivation and engagement (Firat, 2023).

However, larger issues arise in terms of motivation in student classroom participation and the authenticity of student learning outcomes demonstrated. Teachers need to develop clear strategies and explicit pedagogical approaches within the education system that focus on critical thinking and fact-checking strategies in order to integrate and make full use of large language models in the learning environment and teaching curriculum. Other challenges such as potential bias in output, the need for continuous manual supervision and the potential for misuse are not unique to the use of AI in education (Kasneci et al., 2023).

Challenges of ChatGPT in Students' In-Class Engagement

ChatGPT increases students' initiative and motivation to learn, followed by providing students with educational resources such as study guides and classroom lectures to help students better understand the material (Cotton et al., 2023). Nevertheless, this may create the illusion of increased student motivation in the classroom. As the current educational approach is still dominated by the teacher-centered approach the students, the emergence and use of ChatGPT may upset the balance of the traditional lecture style by cutting off direct contact and interactive communication between the teacher and the students. Indeed, conventional teaching places teachers in the dominant position, which enables educators to become information providers or examiners of students' learning process (Ameliana, 2017). Although some research still suggests that traditional teacher-centered and the so-called 'one-size-fits-all' approach may hinder students' engagement, superficially emphasizing the use of OpenAI and other forms of online technology may result in students' isolation and limited physical class engagement (Rasul et al., 2023; Yunus et al., 2019; Zakaria et al., 2016).

In some situations, it is the AI that interacts with the students in the exchange of knowledge and ideas instead of the educators. With the assistance of ChatGPT, this makes it easier for students to gain knowledge and to get accurate answers with explanation to certain questions. In this sense, students are no longer willing to engage in class cooperation and different other forms of activities (Chukwuere, 2023). That is because, as perceived by

learners, the interaction between educators and students may not be as effective as using ChatGPT during the learning process. As compared to face-to-face learning approach, utilising ChatGPT may be recognised by students as a relatively more direct and easy way to gain necessary academic resources (Chukwuere, 2023). By means of real-time feedback, ChatGPT may result in the construction of an illusion of immediacy, and may thus unwilling to engage in classroom activities (Chukwuere, 2023). In this case, it is worth considering whether students can still participate actively in the classroom.

Apart from that, the texts generated through the functioning of ChatGPT may include factual biases due to biased training data, which may perpetuate misconception held by learners (Rasul et al., 2023). Accordingly, fully relying upon and interact primarily with the use of ChatGPT may result in inadequate engagement in collaborative learning and discussion. In Reeve's model (2013), students' engagement is the prerequisite of critical evaluation of information and knowledge. The false and biased information and references produced by ChatGPT would potentially mislead students, which may further hinder students' skills development (Hsu & Thompson, 2023). As such, it is essential for students to fact-check all ChatGPT output during interaction with the system, in order to identify potential biases or inaccuracies to build up an accurate understanding of the academic area (Rasul et al., 2023).

ChatGPT Presents an Important Challenge to the Authenticity of the Presentation of Learning Outcomes

ChatGPT may also has a negative impact on certain forms of academic outcome, especially the writing of research papers. Indeed, as proposed by Sullivan and his colleagues (2023), the use of ChatGPT has raised significant academic integrity concerns in higher education institutions. In a recent study, it was found that 63% of fake articles were created by using ChatGPT, which is a form of serious academic misconduct (Thorp, 2023). Due to limited research capability and well-developed Open AI software, plagiarism is a growing concern in higher education as more and more students turn to the internet for academic resources (Cotton et al., 2023). For instance, AI essay-writing platforms are designed to generate essays based on a series of parameters or prompts (Cotton et al., 2023). This function may enable students to cheat on their essays by submitting papers that are not their own work (Cotton et al., 2023). As the very purpose of the higher education is to challenge and educate students, the utilisation of ChatGPT may significantly devalue university degrees (Cotton et al., 2023).

With the availability of a vast amount of easily accessible online information, it is increasingly easy for students to copy and paste from other sources without sufficient self-reflection. This has led to an increase incident of plagiarism, which can have serious consequences for students, including failed academic outcome, expulsion, and potential damage to their professional reputation (King, 2013). Through relying fully on the use of ChatGPT, many students do not have to go through the mental work to obtain a piece of scholarship. In fact, ChatGPT is not eligible to be listed as an author of a scientific article unless the ICMJE/COPE guidelines are revised or amended (Crawford et al., 2023). If ChatGPT could replace the human brain for scholarship, then the development of education for people would no longer make traditional sense.

Conclusion and Recommendation

To sum up, ChatGPT enhances students' initiative and motivation to learn, and it can contribute to education as an effective learning tool. This has been discussed in terms of

students' self-directed and autodidactic learning, as well as their potential skills development during the learning process. However, students' over-reliance on it and its inappropriate use can lead to classroom participation problems and serious consequences of academic misconduct. For future implementation, researchers need to develop clear strategies and explicit pedagogical approaches within the education system, focusing on critical thinking and fact-checking strategies, in order to integrate and make full use of large language models in learning environments and teaching curricula. Furthermore, this research paper is to inform students early on about the potential social biases, criticality, and risks of AI applications, followed by encouraging students to use these models in a responsible and ethical way.

In order for ChatGPT to be used more appropriately and wisely in the context of higher education, educators should focus more on how to guide students around the proper use of ChatGPT as learning tool during classroom interactions and how to avoid academic misconduct caused by inappropriate use of ChatGPT by students. In addition, it is important to confront the educational challenges and address the potential issues, so that ChatGPT can better fulfil its potential in the development of higher education. This conceptual research still possesses certain forms of limitations, including a lack of research basis in the field, the difficulty in measuring student engagement in the classroom and the accuracy of student feedback, as well as the need to quantify the authenticity of students' academic presentations in order to conduct a more accurate and comprehensive analysis.

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