Analysis Of Chatgpt And Other AI's Ability To Reduce Anxiety Of Science-Oriented Learners In Academic Engagements

Nanette F. Toribio

nanettetoribio@gmail.com
Zamboanga State College of Marine Sciences and Technology.

Abstract

Integration of AI models has a remarkable promise in enhancing classroom experiences and student outcomes. AI can serve as a valuable aid in idea generation and cognitive expansion. Students can harness AI models to brainstorm ideas, delve into complex concepts, and explore new perspectives. This study explored how AI could help in addressing specific intellectual needs with the potential of AI to revolutionize education by fostering well-rounded, confident, and capable learners. Science-oriented students (n=20) were interviewed about their experience on using AI models as assistant with their academic engagements. The participants were purposively sampled based on specific characteristics e.g., their science-oriented course, frequent use of AI, and at least one year in college. The findings indicated that self-regulated learning with the use of AI models mitigates academic anxiety. AI-guided personalized learning empowers students to take ownership of their education, boosting self-efficacy and fostering a growth mindset. AI's ability to provide step-by-step guidance and comprehensive explanations ensures that students remain on track, minimizing stress associated with meeting academic expectations. As the educational landscape continues to evolve, the strategic incorporation of AI stands poised to revolutionize learning, nurturing well-rounded, capable, and confident learners prepared for the challenges of the future.

Keywords: artificial intelligence, academic anxiety, academic expectations, science-oriented students, productivity.

Introduction

The strategic value of artificial intelligence (AI) in the field of education has been gaining significant attention and recognition in recent years

(Seldon & Abidoye, 2018). AI has the potential to serve as a valuable educational tool, alleviating the challenges faced by both educators and learners (Loeckx, 2016). By leveraging AI, students can benefit from enhanced learning experiences that are both efficient and effective.

The goal of this study was to explore the experiences of science-oriented students on how AI models could alleviate their anxiety in academic engagements. This study delved into the concept of anxiety alleviation and its implications to students' academic life. In essence, this study provided in-depth analysis on what mechanisms do AI models have that influence the perception and self-efficacy of students.

The potential applications of AI in the context of online learning and teaching are extensive (Andersen et al., 2013; Baker, 2016; Roll et al., 2018; Seo et al., 2020, 2021). This includes the individualized learning for students, the automation of regular activities for instructors, and the utilization of artificial intelligence for assessments (Chavez & Lamorinas, 2023; Popenici & Kerr, 2017). AI tutoring systems, for instance, offer individualized guidance, assistance, and feedback by customizing educational materials based on the unique learning patterns and knowledge levels of students (Hwang et al., 2020b).

Several kinds of tools including AI computer processes have been developed by researchers (Yang et al., 2021). Some of these are dynamic taxonomic systems that help students learn about biological chains and the ecosystems (Abbas et al., 2021) and fuzzy network systems to assist in learning mathematics (Hwang et al., 2020a). AI has the potential to revolutionize the landscape of education and shape the future of learning. Nevertheless, the existing understanding of AI among learners remains constrained. Existing research have predominantly focused on examining learners' acceptance of AI, while the actual use of AI in educational settings has received limited attention (Zawacki-Richter et al., 2019).

Considering the use of AI in science-oriented education, this study aims to explore how some AI models, like ChatGPT and Bard, help alleviate students' anxiety in academic engagements. As per review, limited studies were conducted on the context of AI use and how it influences the students' psychological self. Although, it is not new that AI could support students' learning in some situations. For instance, AI has an external means of support to facilitate successful self-regulated learning (SRL) among learners (Molenaar, 2022).

The facilitation of learners' SRL poses significant difficulties due to its multifaceted nature, encompassing metacognitive, cognitive, behavioral, and motivational processes (Lodge et al., 2019). Learners gradually acquire additional knowledge on the dashboards to help them manage how they learn, while AI regulation is lessened. The AI initially supervises learning, and the dashboards improve learners' awareness; eventually, learners regulate themselves, and the AI just watches and assists them to understand their individual behavior (Molenaar, 2022).

In their study, Woolf et al. (2010) AI assistant augmenting student motivation which offers emotional support to students who are experiencing slower-than-anticipated learning progress. Additionally, it provides recommendations pertaining to attainable goals that can aid students in pursuing their desired career trajectory. Given the application of AI in supporting students to learn, this study aims to expand the literatures by delving into the concept of anxiety alleviation.

This study assumed that when students feel supported and at ease when using AI models, it alleviates their anxiety about self-regulated learning and to be academically productive. Limited studies were conducted in this concept. This study explored the experiences, ideas, and reflections from students who frequently use AI in their academic engagements and analyze its psychological and intellectual implications to them.

Research Questions

This study aims to explore the use of AI in reducing the anxiety of science-oriented learners in academic engagements. Below are the objectives sought to be answered in this study.

1. Determine in what academic engagements can ChatGPT and AIs reduce the anxiety of science-oriented learners.
2. Determine how ChatGPT and AIs can reduce the anxiety of science-oriented learners in Academic Engagements.

Literature Review

Schools encourage students to learn independently using the resources that are available to them. SRL involves cognitive, metacognitive, and motivational strategies that students utilize in order to effectively manage their own learning processes (Jin et al., 2023; Panadero, 2017). These strategies are employed by learners to enhance their understanding, retention, and application of knowledge. SRL encompasses a range of activities, such as setting

goals, planning and organizing tasks, monitoring one's progress, and adapting strategies as needed (Zimmerman, 2008).

Metacognitive strategies are a set of cognitive processes that learners employ to effectively utilize their cognitive strategies to accomplish their targets (Pintrich, 2014). These strategies encompass various activities such as establishing goals, monitoring the progress of learning, seeking assistance when needed, and engaging in reflective thinking to evaluate the efficacy of the strategies employed in attaining the desired outcome (Zimmerman, 2008).

When using AI, students were able to harness its program in developing and making academic tasks. The utilization of AI-guided personalized learning strategies enables them to have responsibility for their own educational journey. This, in turn, could enhance their self-efficacy, or belief in their own abilities to succeed academically, and cultivate a growth mindset, which is characterized by a willingness to embrace challenges and persist in the face of obstacles. Along with that, Zawacki-Richter et al. (2019) emphasized the necessity of further investigation into the pedagogical and psychological factors that learners perceive as crucial to facilitate the optimal design of AI applications within educational contexts.

This study defines anxiety alleviation in learning as the process of aiding the ones' concerns, worries, and insecurities when exposed to academic pressures. Several theoretical foundations relate to this concept such as self-efficacy and motivation. Individuals who possess higher levels of self-efficacy tend to exhibit more effective and proficient use of digital systems (Ulfert et al., 2022). The concept involves a confluence of knowledge, which pertains to the understanding of use, functioning, and assessment of digital systems, skills encompassing the ability to employ, access, filter, evaluate, create, program, and disseminate digital content, and the capacity to safeguard information, material, and electronic identities with remarkable attitudes that involve the reflective and careful managing of these systems (Carretero et al., 2017; Directorate-General for Education, 2019; Ulfert-Blank & Schmidt, 2022).

Using AI models in learning requires self-regulation and control. When students use AI to assist them and develop more their ideas, it could significantly influence their productivity and performance. In a recent study conducted by Somasundaram et al. (2020), an innovative AI-based plan organizer was introduced. This tool aims to assist students in effectively setting learning goals, devising action plans, and receiving personalized study tips. It also provides a plan organizer for tailored   recommendations   to   enhance   students'   academic

progress and success. For most students, ChatGPT is widely used because it is free and accessible to them (Adetayo, 2023; Taecharungroj, 2023).

When an individual's cognitive and emotional capacities are subjected to demanding circumstances and perceived threats, a state of stress is likely to follow (Liao, 2017). Stress can manifest in a range of emotional reactions, encompassing both physiological and psychological dimensions. Notably, anxiety, tension, and frustration emerge as prevalent and frequently reported experiences in such situations (Yang & Yang, 2022).

This study believed that because AI models help students with their academic tasks, it makes them feel less anxious in learning. Recent studies indicated that ChatGPT could be a support system for students assisting them with their academic tasks (Haleem et al., 2022) this also improves the motivation of students to learn (Fauzi et al., 2022). In productivity, ChatGPT has the potential to enhance the efficacy and proficiency of person's time management (George & George, 2023; Sallam, 2023). These studies, however, mainly focused on the use of ChatGPT to students, but were not able to describe how it could alleviate their anxiety. Essentially, AI could allow psychological stimulation to students that improve their psychological capital in relieving their stress and anxiety. Psychological capital constitutes self-efficacy, optimism, resilience to challenges, and hope (Luthans & Youssef, 2004).

As students engage with AI tools, they experience a reduction in stress and anxiety, driven by the ability to access accurate information, personalized guidance, and enhanced productivity. The alleviation of anxiety is intricately linked to the concept of psychological capital, encompassing elements such as self-efficacy, optimism, resilience, and hope. The utilization of AI models facilitates the development of these psychological resources, equipping students with the emotional and cognitive tools to navigate challenges and uncertainties.

Methods

Research Design

This study is qualitative research that explores the experiences of science-oriented learners on how AI could reduce anxiety in academic engagements. The study design provided the framework for academic direction. Exploratory research is designed to seek information based on experiences, ideas, opinions, and attitudes of the participants.

Exploratory research is a qualitative approach that seeks to explore and gain a deeper understanding of a relatively unexplored or complex phenomenon, often with limited existing knowledge or prior research (Chavez, 2020). It is characterized by its flexibility, open-ended nature, and focus on generating insights and hypotheses rather than confirming existing theories. The open-ended nature of exploratory research allows for a comprehensive exploration of participants' experiences, emotions, and perceptions (Chavez, 2020) regarding anxiety and AI interventions in academic engagements, offering an opportunity to uncover nuanced insights that quantitative methods might overlook.

Participants and Sampling Technique

The participants of the study involved science-oriented learners e.g., engineering, mathematics-related, and computer courses. The participants were purposively sampled and selected based on specific characteristics such as their course, science-based units/subjects, at least one year in college.

Table 1.0 Participants of the Study

Courses	n
Engineering (e.g., civil, electrical, marine, geodetic)	13
Math-based (e.g., statistics, mathematics, education major in math)	5
Computer (e.g., computer science, information technology)	2

Purposive sampling, also known as selective sampling, involves deliberately selecting participants who possess certain characteristics, experiences, or expertise that are relevant to the research focus (Chavez, 2022). Purposive sampling enables the inclusion of a diverse range of participants with varying degrees of familiarity and exposure to AI interventions, including ChatGPT. By intentionally selecting participants from different academic levels, anxiety levels, and familiarity with AI, the study can capture a comprehensive spectrum of perspectives, experiences, and insights related to the use of AI in reducing anxiety.

Research Instrument

This study developed interview guide questions that served as the instrument. The interview guide questions aimed to extract value-rich information from the participants. The questions allowed probing questions that delved into the ideas, expressions, perspectives, and experiences of the students.

Table 2.0 Interview Guide Questions

Objectives	Interview Questions	n
1. Determine in what academic engagements can ChatGPT and AIs can reduce the anxiety of science-oriented learners.	a. In your experience, what academic engagements can the ChatGPT and AIs reduce anxiety? Elaborate more about it.	20
2. Determine how ChatGPT and AIs can reduce the anxiety of science-oriented Learners in Academic Engagements.	b. How can ChatGPT and AIs reduce the anxiety of science-oriented learners in doing their course-specific tasks? c. How can ChatGPT and AIs reduce the anxiety of science-oriented learners in doing performance-based tasks?	20

Data Gathering Procedure

A formal request was submitted to the school administration, outlining the purpose, scope, and methodology of the study, along with the assurance of data confidentiality and anonymity. Once approval was obtained, informed consent was sought from the participating students or their legal guardians, clearly explaining the study's objectives, procedures, potential benefits, and the voluntary nature of participation.

During the interviews, participants were asked open-ended questions about their experiences with anxiety in academic engagements and their perceptions of AI as a tool to alleviate anxiety. All interviews were audio-recorded with participants' consent and subsequently transcribed for analysis. Confidentiality was maintained by assigning unique identifiers to each participant, ensuring that their responses cannot be linked to their identities. The gathered data was analyzed through thematic analysis to identify patterns, trends, and insights related to the effectiveness of AI in reducing anxiety among science-oriented learners in academic settings.

Data Analysis

The data analysis process started with data familiarization, wherein the researchers immersed themselves in the interview transcripts to gain a comprehensive understanding of the participant's responses. Subsequently, initial codes were generated by systematically labeling essential components of the data related to the research objectives, such as instances where participants discussed their anxiety experiences and perceptions of AI assistance.

The initial codes were then organized into potential themes through an iterative process. Themes emerged as the researchers identified recurring patterns and concepts across the dataset. Careful consideration was given to the relationships between codes and their relevance to the research objectives. The identified themes were reviewed and refined to ensure their internal coherence and alignment with the research purpose.

Results

Objective 1: Determine in what academic engagements can ChatGPT and AIs reduce the anxiety of science-oriented learners.

Most of the participants (n=18) gave some academic engagements with assistance from AI models. The narratives from participants explained what circumstances of academic engagements they used AI models. The narratives revealed that science-oriented students used AI models in generating ideas, seek technical knowledge, and ask for instructional guides. They expressed that AI models are generally helpful to students in generating and polishing their ideas, making explanations and understanding technical concepts, and making guided processes for them.

Theme 1: Generating Ideas

"When using AI, making ideas is very easy. It is very convenient for students to do their tasks with AI. It's not being very dependent, or it badly affects your creativity, but it can enhance how you can do your tasks." [Participant 13]

"Let's put the situation of the students. They are having academic engagements in their major subjects. When you use AI, it can help you generate ideas." [Participant 6]

"In my experience, I can use AI to develop more about what I initially think. It can help me make ideas that I can extend to and integrate my thoughts about it." [Participant 2]]

Theme 2: Technical Knowledge

"I am using AI in mathematics. I use it to define some mathematical concepts that I find very difficult to understand. It can give me very easy-to-understand explanations." [Participant 8]

"Something that AI helped my academic engagement is when it can give you common knowledge about your course. It can give you an explanation to certain topics like algebra." [Participant 1]

"It is a help for students to use AI in doing activities that require technical skills." [Participant 16]

Theme 3: Instructional Guide

"Sometimes, what our teachers give to us we are not familiar with it. AI can help us by making process or step-by-step guides in doing it like lab experiments." [Participant 15]

"AI is very helpful in terms of giving you instructions and guidelines about how to make something, like 3D designs, presentations." [Participant 4]

Objective 2: Determine how ChatGPT and AIs can reduce the anxiety of science-oriented earners in academic engagements.

Two major themes emerged in the concept of anxiety reduction when using AI models. The majority of the students (n=16) explained that the use of AI assists them do their requirements, which in turn makes them feel less anxious about doing them as compared to thinking independently. In contrast, some students (n=6) discussed more how AI models make them feel less anxious by perceiving improved performance. Some students explained that using AI in doing requirements makes them feel they did well and have better results as compared to doing their activities alone or independently.

Theme 1: Assistance

"Example in research, the students feel stressed about it. When they use AI, I believe, it can somehow reduce their anxiety and stress because they can ask assistance from it." [Participant 17]

"I have experience using AI in doing lab experiments. It can give you instructions and all. It can reduce one's anxiety because it guides you on what to do, how to do it." [Participant 10]

Theme 2: Value-added Performance

"Using AI could also improve your performance as a student. When AI assists you with your activities, you also feel that you are intellectually prepared for your performance." [Participant 5]

"With AI, you think that your output is refined and well-constructed which also could improve your overall performance." [Participant 7]

Discussion

Objective 1: Determine in what academic engagements can ChatGPT and AIs can reduce the anxiety of science-oriented learners.

The findings of this study indicated that some students used AI models in generating ideas, seek technical knowledge, and ask for instructional guidance. AI models helped them in conceptualizing ideas, generate performance-based reports and outputs, and seek specific instructions for experiments, presentations, and designs.

The interaction was the foundation of AI use among students because it can give them valuable information. The exchange of information and knowledge of students occurs through interactive processes, facilitating the construction of new knowledge (Jou et al., 2016; Seo et al., 2021). In this context, using AI enabled the students to interact with the model and generate ideas from them. Students engaged in the process of learning possess distinct learning contexts that are shaped by their pre-existing knowledge pertaining to the subject matter, their social background, their economic status, and their emotional well-being (Chaudhry & Kazim, 2022; Ma et al., 2014). Essentially, the interaction with AI models is "very convenient for students" [Participant 13] and further helps them "develop more about what [they] initially think" [Participant 2].

This interaction not only enabled students to conveniently access valuable information but also supported the construction of new knowledge, allowing them to expand upon their initial thoughts and ideas. When interaction takes place, students used AI to their advantage and for specific purposes. For instance, AI models facilitate the development of PowerPoint presentations and graphical displays, with the aim of enhancing students' understanding of topics (Holmes et al., 2023). In general, the use of AI can be attributed to the development of students, from their cognitive and formative skills (Anyim, 2021; Tere et al., 2020) to their problem-solving skills and software use competence (Chen et al., 2020a, 2020b; Holmes et al., 2023). This explains why students used AI models because it gives "very easy to understand explanations" [Participant 8], could make a "process or step-by-step guide in doing...lab experiments" [Participant 15] and give "instructions and guidelines about how to make something, like 3D designs, presentations" [Participant 4].

AI holds an opportunity to enhance the customization of learning, facilitate the provision of effective learning experiences,

empower students to uncover their unique talents, foster the development of their creative capacities, and alleviate the burden placed upon educators (Gocen & Aydemir, 2021; Haseneki, 2019). Similarly, as one student argued, AI use "…is not being very dependent, or it badly affects your creativity, but it can enhance how you can do your tasks" [Participant 13]. AI offers opportunities to customize learning journeys, provide effective educational encounters, and empower students to discover their unique strengths and creative capacities.

The study suggests that AI models contribute significantly to students' learning contexts, enhancing their cognitive and formative skills, problem-solving abilities, and software proficiency. The ease of understanding provided by AI, along with its ability to offer step-by-step guidance, emerged as pivotal factors driving its adoption among students.

Analysis indicated that AI could adapt educational content and pacing to match individual student needs, strengths, and learning styles. Theoretically, this personalized approach reduces anxiety by ensuring that students are not overwhelmed by overly challenging material or held back by content that is too easy, fostering a sense of competence and achievement. These resources empower students to reinforce their understanding of challenging concepts independently, thus boosting their confidence and reducing anxiety about falling behind.

Objective 2: Determine how ChatGPT and AIs can reduce the anxiety of science-oriented learners in academic engagements.

Science-oriented students revealed that they feel less anxious when they use AI models in their academic engagements. Some explained that because AI models made them easy to generate ideas and expand their thoughts, they feel more academically productive. This implication of AI use among students highlights the concept of AI for a specific purpose in aiding the intellectual needs of students.

Theoretically, the concept of how AI models could reduce anxiety of students can be explained by self-efficacy, motivation, and perceived value. When a student said that "[AI] can somehow reduce their anxiety and stress because they can ask assistance from it" [Participant 17], this represents the value of using AI models and how students perceived its use in their academic engagements. Essentially, perceived value of a particular entity refers to the comprehensive evaluation made by a person regarding the usefulness or desirability of a product based on their perceptions of the benefits they receive

from it (Sánchez-Fernández & Iniesta-Bonillo, 2007; Tellis & Gaeth, 1990; Zeithaml, 1988). Recent studies on the use of AI models in education, students think that it is convenient for them to use it in making their activities which in turn, "can reduce one's anxiety" [Participant 10] because they feel less burned in doing their requirements.

AI models enhance students' perceived self-efficacy, a belief in their ability to achieve desired outcomes. Through the utilization of AI, students become more confident and motivated in their academic endeavors, which in turn influences their cognitive processes, emotions, and behaviors.

When the students' output expectations are met, it makes them feel good about themselves. As one explains, "using AI could also improve your performance…you also feel that you are intellectually prepared about your performance" [Participant 5]. Human behavior is governed by a cognitive process of forethought, which involves the formulation of goals that are consciously recognized (Bandura, 1989). In a similar concept, self-efficacy has been found to exert a significant influence on various aspects of human experience, including emotions, cognition, behavior, and motivation (Zulkosky, 2009). When students use AI models in academic engagements, it influences them to think that what they did is better than doing the requirements alone. Seeking assistance from AI models caused them to feel at ease and settled on the output they created. This explains why students think that "your output is refined and well-constructed which also could improve your overall performance" [Participant 7]. By providing a platform for easy idea generation and thought expansion, AI models contribute to a sense of academic ease and accomplishment.

In the case of academic performance, students feel productive and competent when they use AI models because it gives them assurance about the quality of their outputs. Previous studies (e.g., Honicke & Broadbent, 2016; Meral et al., 2012; Yokoyama, 2019) were able to correlate self-efficacy with academic performance. Using AI makes students feel that their academic objectives are easy to achieve. The impact of self-efficacy on academic performance is moderated by several aspects, including personality traits, prior academic achievements, and self-regulatory learning mechanisms (Coutinho & Neuman, 2008; Hsieh et al., 2012; Yokoyama, 2019). In this study, science-oriented students feel less anxious and be more productive to what they do. They feel motivated, confident, and self-efficient when they seek assistance from AI models.

AI models serve as valuable tools that alleviate anxiety, enhance productivity, and boost self-efficacy among students. This implication aligns with the broader concept of AI's role in fulfilling specific intellectual needs, showcasing its potential to shape educational experiences positively. Students perceive AI as an asset, allowing them to seek assistance and streamline their academic pursuits, ultimately leading to reduced stress and burnout. This insight delves into the intricate interplay between technology, cognition, and emotions, highlighting how AI can act as a buffer against the pressures of academic demands.

Conclusion

The interaction between students and AI models serves as a cornerstone for anxiety reduction, allowing students to access valuable information, generate ideas, and expand their thoughts. This process of interaction not only simplifies complex concepts but also promotes the construction of new knowledge, thus serving as a catalyst for academic growth. AI improves students' capacity to accomplish requirements efficiently while not restricting their creativity. It gives students the ability to take charge of their learning experience, allowing them to acquire problem-solving skills, software competency, and cognitive capacities. AI becomes a beneficial companion for academic greatness by giving clear explanations, step-by-step coaching, and customizable learning routes, considerably reducing anxiety and boosting students' academic well-being.

AI models serve as a mechanism for facilitating and enriching academic engagements. By enabling easy idea generation and expanding students' thoughts, AI models foster a sense of accomplishment and productivity. By harnessing AI's guidance, students not only meet their output expectations but also cultivate a sense of intellectual readiness. This finding resonates with the emerging concept of AI serving specific intellectual needs, emphasizing its capacity to act as a supportive tool that complements and augments students' capabilities.

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