

# INTERNATIONAL JOURNAL on **O D e L**

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- Students' Perceived Learning Acquisition of the Enhanced Course for Digital Communication
- Engendering Agency, Mindfulness, and Critical Thinking in Online Education
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- Evaluation of the UPOU MOOC "Principles of Graphic Design" using Product Variable of Biggs' 3P Model



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### **Mission**

The IJODEL shall publish and disseminate new knowledge and information based on original research, book reviews, critical analyses of ODeL projects and undertakings from various researchers and experts in the Philippines, the ASEAN Region, and the world, and concept articles with the intention of presenting new ideas and innovative approaches to interpreting and implementing best practices in open and distance e-learning as alternative delivery mechanisms for quality education.

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# ChatGPT—A Threat or an Aid in Teaching and Learning

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## Abstract

*The use of artificial intelligence (AI) in education can have a beneficial effect on learners' attitudes and self-assurance toward learning. However, it may also present a danger of substituting teachers and interpersonal interactions that are essential for learners' holistic development. This research investigated the use of AI, specifically the Chat Generative Pre-trained Transformer (ChatGPT), in education and whether it is an ally or a threat to teaching and learning. It discussed and elaborated how AI has changed the traditional practice, principles, culture, and theory in education. Moreover, it identified the advantages and disadvantages of using ChatGPT in education, potential paradigm shifts that may arise from its use, and its impact on science and mathematics education. Furthermore, this study presented an analysis of ChatGPT's responses to standardized marking schemes in science and mathematics and provided valuable insights into how AI can be integrated into the teaching and learning of science and mathematics. This study concluded that a review of the assessment approaches, as well as an open-minded perspective in adapting the curriculum and pedagogies with the incorporation of AI, are needed to maximize the learning outcomes of 21st century learners.*

**Keywords:** *artificial intelligence, ChatGPT, teaching and learning, educational paradigm shift, question analysis*

## Introduction

The influence of technology over education is something that can only be embraced rather than prevented. It plays a crucial role in teaching science which has the potential to either destroy or improve the educational experiences. This paper inquired whether ChatGPT (Generative Pre-trained Transformer) is an ally or a threat to teaching and learning. This is the question that this study aimed to answer.

Artificial intelligence (AI) and machine learning are integral components of Web 3.0, which is the promising concept of the next evolution in web technology (Margarette, 2022). Web 3.0 is a highly open, and free learning environment that has been modifying the practice, culture, and theory in the use of technology

and the internet (Gallardo-Echenique, 2015). The revolution in their learning behavior impacts their learning environment, with such, they can learn not only in the confines of a classroom but in any place where they have access to the internet. Equally, Web 3.0 as their learning environment also contributes to this change of behavior in such a way that they can create their own learning experience based on their preference and interest, by creating their websites or learning from multiple websites, reading, and watching videos, or by learning collaboratively through virtual interactions and video conferences. These behaviors can either reverse or reinforce the person. Thus, Bandura's theory on reciprocal determinism is a basis for understanding the learners of Web 3.0 (Jiang, 2014). This proposition supports that the learners' behavior towards learning is influenced by their interaction with AI, and in turn, the AI's adaptive behavior is influenced by the learner. To wit, Reciprocal determinism, based on Bandura's Social Learning theory, postulates that personalities can both influence and be influenced by behavior and the environment (Bandura, 1986). Hence, this research explores how AI, like ChatGPT, can serve as a conversational tutor, providing explanations and generating responses consistent with the topic being asked and discussed. Moreover, the students' change in behavior is seen in their improved self-confidence in the knowledge that they acquired through a positive reinforcement upon having obtained a quick response they receive from an AI. While instead of collaborating with humans, these learners interact with AI; they become teammates more than just a tool for learning (Seeber, I., et.al, 2020). Thus, the learners' self-confidence is heightened, which further increases their curiosity and interests to continue developing their learning and construct concrete knowledge. This process of constructing knowledge is supported with the Constructivism theory, where learners build their representations by reflecting upon their experiences with the new information and integrating it into their pre-existing knowledge (McLeod, 1970).

The idea that the learner develops a positive behavior towards learning using AI shows that AI can be an aid and has vantage in teaching and learning. On the other hand, the AI's interaction with humans develops the AI's abilities of providing information, therefore can be a threat in replacing human-to-human interaction in education.

Since the new generation of learners are digital natives, it is much easier for them to learn with technology, more so with AI, which students perceive as a way to answer their difficulties in learning (Seo, K., et.al, 2021). Therefore, technology has great influence on the educational experience and thus, this paper inquired whether ChatGPT can be used to greatly enhance the math and science education experience for students, specifically support and extend the work of teachers, which includes other effects circumstantial with the use of the tool.

To begin with, ChatGPT is a conversational tutor or a language processing tool available on the internet that can answer most questions, simple or complex. It can create content and images. It is built to have the ability to understand the context of a conversation and generate feedback and comments that are relevant to the topic being discussed. Moreover, it can provide explanations in



natural language, making it a valuable tool for students learning a new concept. Moreover, the teachers can use this tool to grade essays, give comments and feedback on student writing, or offer suggestions for improvement (Dickinson, 2023).

ChatGPT was framed to cover massive amounts of dataset source from both the internet and interactions, making it an adaptive and flexible AI (Montti, 2023; Hughes, 2023). Everybody can access this tool by visiting chat.openai.com and creating an account. Once signed in using either your email address or your website, one can get a conversation by asking a question or typing a question in an inbox. This time it is free to use because this tool is still in its research stage.

Hence, based on the preceding discussion, the researchers were driven to use a research-based and evidence-informed method to understand deeper the use of AI in teaching and learning. The study also aimed to identify potential educational issues and paradigm shifts that may arise from its use. Additionally, the research comprehensively analyzed AI's responses to conceptual questions in science and mathematics by comparing them with standardized marking schemes.

### **Objectives**

The study sought to: (1) organize existing knowledge into a framework to understand the use of AI in teaching and learning; (2) Assess the generated responses provided by ChatGPT to the IB Organization's past paper questions in comparison with the IB Organization's mark scheme.

This research is a valuable resource for students and researchers seeking to expand their knowledge of artificial intelligence and the use of ChatGPT. It can also benefit curriculum planners by providing insights into how AI and related applications can be integrated into the teaching and learning of science and mathematics.

### **Review of Related Literature**

This section illustrates the relevant literature and studies on the use of ChatGPT in education in general.

#### **Advantages of Using AI for Teaching and Learning**

The use of AI can be beneficial to the learners just like how technology is beneficial to humankind. This portion of the paper presents the advantages that the use of AI in education can offer.

With the use of AI, like ChatGPT, learning can be more customized and adaptive based on the student's intellectual capabilities, own pace, and interests. AI can detect if a student struggles with some tasks or concepts and offers additional tutoring by giving more background information on the topic (Khan, et.al., 2021). On the other hand, AI also detects students who can handle normal learning

tasks easily and additional assignments are offered. In this manner, students are calmer in their learning process, and this makes them progress faster (Seo, et.al, 2021). As learning with AI is adaptive to the capabilities of the learner, the student is challenged enough but not overwhelmed, which gets the learner to be more engaged rather than frustrated.

With ChatGPT, a response is generated quickly in just a span of less than a minute per question (Stein, 2023). With this, the students can get immediate feedback on their work allowing them to act accordingly. Learners can base their responses on the responses from ChatGPT which can help the learners correct their mistakes and improve their learning performance (Bridgeman, Liu, Miller, 2023).

The use of AI in education can be affordable and cost-effective. AI can be a teacher's assistant in administrative tasks such as marking papers, checking grammar and other typing tasks, thus giving some time for the teacher and some more time for personalized interactions with the students (Holmes, et.al., 2022). In the same manner, the time spent for the learners to understand a concept would be faster, as immediate feedback can be given by an AI, thus increasing the learner's confidence in the concept, and can move on to the next tasks that are of higher learning taxonomy (Kay, et.al., 2022).

Lastly, with the use of AI, learning can be accessed anytime, anywhere, which leads to greater access to education (Haleem, et.al., 2022). Through the use of Web 3.0, learning can be done even without having to pay tuition fees. There are multiple prestigious universities, even those in the Ivy League, that are now offering free access to learning, as well as the student has an access to the internet and the interest to learn (Lane, 2023).

### **Disadvantages of Using AI in Teaching and Learning**

The use of AI in teaching and learning has several potential disadvantages, which should be carefully considered. One of the main concerns is the cost. While ChatGPT is currently free to use, once well-educated experts have spent years creating artificial intelligence, the cost of access may become substantial. According to Careerera (2021), research funding and compensation for project participants must be accounted for, and private companies often develop AI tools for profit, requiring consumers to pay for access. This can create a bias in providing AI resources for students who cannot afford them, limiting their access to the same level of education and opportunities as their financially advantaged peers.

Another potential disadvantage is that ChatGPT may reduce students' capacity for thought, specifically their ability to think critically. As noted by Careerera (2021), when students rely heavily on AI systems like ChatGPT, they become less inclined to think for themselves and may not develop the skills necessary to solve complex problems or engage in critical thinking. Additionally, although ChatGPT can provide general knowledge, it may be limited to generating responses to specific expert knowledge beyond what is generally available to the internet or the public. It may not provide detailed answers to questions that

require expertise, and it can only provide a general answer based on its training data.

Furthermore, while ChatGPT can enhance the education experience, it should not be considered a substitute for personal interaction. According to LiveTiles (2022), relying too much on AI to assess or teach may lead to educational lapses in providing adequate educational opportunities or support to students. This can occur at various levels, such as a lack of empathy and personalized feedback. Teachers need to build a positive relationship with the students to provide a rich and meaningful supportive environment. Personalized feedback based on students' strengths, weaknesses, and learning styles can be provided. Teachers can also give emotional support, encouragement, and inspiration, which can help students to maintain their interests and be engaged and motivated in their learning.

Moreover, the communication barrier between computers and humans is still significant (Singh, 2022). Humans communicate using context, not only words but also gestures, facial expressions, and the like, to convey meaning. While AI systems like ChatGPT can recognize and respond to certain contextual cues, they may still have difficulties fully understanding the complexity of human communication. Humans use language in creative and figurative ways, such as humor, poetry, and storytelling. AI systems may lack the capacity to emulate this level of ingenuity and may encounter difficulties comprehending or producing such language.

While the use of AI in teaching and learning has many potential benefits, it also has several potential disadvantages. It is essential to consider these disadvantages to ensure that the use of AI in education is well-informed and well-planned. Proper consideration and implementation can help maximize the benefits of AI in education while minimizing its potential drawbacks.

### **Educational Challenges Arising from the Use of AI in the Classroom**

The application of artificial intelligence in general, and specifically in the field of education, poses serious risks that must be thoroughly investigated. Current generations appear to be more connected to their networks and technological tools, but also more disconnected from their neighbors, families, and even themselves. If we add to these empty classrooms, the absence of human teachers, and contact with robots, and other artificial intelligence instruments, what kind of individual are we forming for the support of the planet and future generations?

Currently, the challenges that pose a threat to quality education include upholding academic integrity and honesty, new access issues concerning subscription fees, increased issues on data privacy, and changes to job markets and skill sets (Elgersma, 2023).

Upholding academic integrity and honesty is the major challenge in education that the use of AI can pose. Students are handling AI-generated essays without proper acknowledgment of their sources. Also, generated responses

from ChatGPT come from a wide variety of sources for which creators are not credited, therefore are not academically ethical. As AI can learn from multiple sources, it can present biases to the correctness of the material (Eaton, 2023).

ChatGPT is currently free of use and also has a paid version. This divides the types of users into the more advantaged and those of the lesser edge, thereby not everyone has equal access to all the benefits that ChatGPT offers (Gates, 2023). Reuters, 2023, reported that ChatGPT is currently the fastest-growing user-based chatbot (Hu, 2023). For every sign-up, ChatGPT warns its users about its data collection and privacy of such, hence, the impact of AI on privacy can be an issue, since data is a hot commodity in this Web era (Eliot, 2023).

Indeed, the use of AI in education poses challenges that are currently shifting the educational paradigm, hence, UNESCO, 2019, has published a working paper that highlighted six main challenges that the education sector needs to address, namely, the lack of a comprehensive policy on AI for sustainable development, ensuring inclusion and equity in AI in education, preparing teachers for AI-empowered education and preparing AI to understand education, developing quality and inclusive data systems, making significant research on AI in education, and ethics and transparency in data collection, use and dissemination (Bin-Mahfooz, 2019).

With these, the main concern that is posed to the education system is the preparation of the students for a world with AI, in which job markets cannot yet quite be imagined, yet the education sector needs to prepare its students for it.

## **Methodology**

The study utilized exploratory and analytical approaches. It delved into the cultural, theoretical, and practical changes brought about by ChatGPT in education, which allowed for an understanding of the nature and characteristics of AI in education and its implications for teaching and learning. A structured educational paradigm that encompasses the entire concept of AI across different aspects of education was developed based on the analysis of the existing literature regarding the advantages and disadvantages of ChatGPT in education and its impact on student learning. Furthermore, this study focused on the application of AI in the area of marking assessments by scrutinizing the responses generated by ChatGPT to standardized questions framed by the IB organization, providing researchers with information to draw their conclusions.

## **Exploratory Approach**

### **Ways to Transform Educational-AI Challenges into an Opportunity**

The use of ChatGPT in education presents both challenges and potential threats. While it has the potential to help improve teaching and learning experiences, there are also potential risks that need to be addressed. The researchers summarized the challenges alongside the opportunities to transform them into great potential.

Academic Integrity and honesty are among the few potential challenges associated with ChatGPT in education (Cullen, W. by C., 2023). This refers to the possibility of students using the technology to cheat and commit plagiarism on assignments, examinations, and other academic requirements (Cullen, W. by C., 2023). As AI-powered tools like ChatGPT can give automated responses that may not be their work, it could undermine the assessment processes that are vital to education. Therefore, it is important to implement a policy and a set of guidelines for the ethical use of ChatGPT in academic settings, more, with the proper and frequent re-orientation of the students on emphasizing academic integrity and honesty. Moreover, developing plagiarism detection tools like Turnitin can also help identify rule breakers. In addition, giving assessments that involve creating diagrams and illustrations would foster creativity among learners while they apply their knowledge whether such are taken from written scripts or ChatGPT, as this AI is not capable of creating one as shown in Figure 1.

## Figure 1

*ChatGPT's answer on creating a diagram of the Calvin cycle*



Create a diagram of the Calvin cycle and the enzymes involved in it.



I'm sorry, as an AI language model, I am not able to create visual diagrams. However, I can describe the Calvin cycle and the enzymes involved in it.

The Calvin cycle, also known as the C<sub>3</sub> cycle, is a set of reactions that takes place in the chloroplasts of photosynthetic organisms such as plants, algae, and cyanobacteria. The cycle is named after its discoverer, Melvin Calvin.

The Calvin cycle is a complex set of chemical reactions that converts carbon dioxide into organic compounds, specifically glucose. The cycle consists of three phases: carbon fixation, reduction, and regeneration.

During the carbon fixation phase, an enzyme called rubisco combines carbon dioxide with a five-carbon sugar called ribulose bisphosphate (RuBP) to form a six-carbon compound that quickly breaks down into two molecules of 3-phosphoglycerate (3-PGA).

During the reduction phase, ATP and NADPH produced by the light-dependent reactions of photosynthesis are used to convert the 3-PGA into a three-carbon sugar called glyceraldehyde 3-phosphate (G3P). This step requires a series of enzymes, including glyceraldehyde 3-phosphate dehydrogenase (GAPDH) and phosphoglycerate kinase (PGK).

Finally, during the regeneration phase, some of the G3P is used to regenerate RuBP, while the rest is used to produce glucose and other organic compounds. This phase requires a number of enzymes, including triose phosphate isomerase (TPI), transketolase, and transaldolase.

Overall, the Calvin cycle is a highly regulated process that is essential for the production of glucose and other organic compounds in photosynthetic organisms.

Ensuring equitable access to AI-empowered education is also a potential challenge that may arise with the use of ChatGPT. This refers to equal opportunities for all students to benefit from the use of AI in education, regardless of geographic location, special socio-economic status, and/or other factors that could otherwise create hindrances to accessing ChatGPT which also includes high-speed internet connectivity and appropriate training, and support to use these tools effectively. Educational entities can also subscribe to a business profile that each of the learners in that institute can use. This can be taken from the “computer fees” that are collected from the students. For less privileged schools, lobbying for assistance from philanthropists can be an option (Fensterwald, 2023).

Another key challenge that must be considered in the use of ChatGPT in education is the issue of data privacy. Given that this technology requires the processing of large amounts of data, including the personal information of the students and teachers, there is also a significant risk of unauthorized access to sensitive data. As a result, an action plan for the use of AI must be put in place and be a government's obligatory requirement for every educational sector. A worldwide policy that involves the end-users, as well as the AI-producing sectors, must also be created (OECD, 2019). Moreover, educational institutions should take steps to protect the privacy of students and teachers, and make sure that everyone is informed about how their personal information is being used. Institutions need to keep personal data safe and use it responsibly and ethically. Otherwise, it could lead to breaches of privacy and damage the institution's reputation.

The need to prepare both teachers and AI for this new paradigm of education is another one of the challenges in the use of ChatGPT in education. This involves providing teachers with the necessary training and skills to effectively use and adapt AI tools into their teaching practice, as well as assisting them to understand how AI can improve the learning experience for their students. More, being actively involved in studies about AI, either being a participant or a researcher. In this way, both the teacher and the AI can learn from each other. Teachers are the deliverers and facilitators of knowledge, hence if AI can learn, then the best to teach AI is an educator, thus humanizing the chatbots (Tilili, et.al., 2023).

### **Could the Use of AI Create a Shift in the Educational Paradigm?**

There has been considerable attention given to the use of ChatGPT in education with many schools around the world having already embraced the use of ChatGPT in their curriculum (Myklebust, 2023). As a matter of fact, the International Baccalaureate Organization (IB) has declared its approval of the use of ChatGPT, as long as its use in papers must uphold academic integrity (Glanville, 2023).

The use of ChatGPT in education is gaining popularity as more schools and universities are incorporating this AI-powered tool into their teaching and learning practices. With the fact that in March 2023, IB has over 5600 affiliated schools in 159 countries worldwide, it can be assumed that ChatGPT is accepted in schools around the world (IBorganization, n.d.). Additionally, top international universities, such as Cambridge University and Oxford University have also expressed their approval of the use of AI in education, for as long as such would not be used for writing exams and other assessed work (Stephens, 2023). This demonstrates that the potential benefits of using ChatGPT in education are recognized by leading educational institutions.

Aside from these organizations, different countries have embraced ChatGPT in their educational system. Vietnam has joined Asia's rush to accept ChatGPT even though the Microsoft-backed AI bot has yet to launch in the country. While some of the biggest organizations in the nation are exploring the potential of a technology that composes emails, essays, code, and even news stories based

on simple user cues, the excitement has given rise to a cottage industry offering accounts that are intended to be free. In Vietnam, dozens of Facebook groups devoted to OpenAI's platform have sprouted up, with one boasting 79,000 members and is far from alone in Asia in its embrace of ChatGPT.

Adopting AI in education brings up new possibilities, difficulties, and opportunities for educational practices, and therefore a shift in the educational paradigm. Ouyang, et.al., 2021 presented three educational paradigms that described the development of AI use in education. At first, it was AI-directed learning where the learner acts as a recipient. This paradigm was based on the learning theory of behaviorism, where carefully arranged sequences of concepts from the AI can lead to the learner's correct performance. The main issue in this paradigm is the inadequate adaptability of the AI to the learner, hence may result in insufficient guidance in knowledge development and skills acquisition. Examples of platforms that use this paradigm are online technology-based tutoring systems like Khan Academy and the like, higher level online calculators like desmos, or chemical formula generators. The second paradigm proposed in that same study was AI-supported, where the learner served as a collaborator, and the AI only acted as a support. This AI-supported paradigm was based on the theory of constructivism, where learning happens from the learner's social interaction with people, information, and technology. The online labs or simulations are examples. The lack of continuous communication or synergetic human-computer interactions was the issue in this paradigm. Immediate feedback on the learner's progress is not considered by the AI. Lastly, AI-empowered learning as a paradigm was deemed more precise, where the learner served as a leader in the learning process. Constructivism, together with the perspective that education is a complex adaptive system, are the theories that govern this paradigm. The learner has total control over the extent of use of the AI based on his needs and interests (Ouyang et al.,2021). To this date, the most recent AI that uses Paradigm 3 is ChatGPT and its soon-to-be-launched version, GPT-4 (Hughes, 2023).With this AI-empowered chatbot, a paradigm shift in the current methods of instruction and delivery is at hand. ChatGPT/GPT-4 is creating reform in education (Zaveria, 2023).

### *Emerging Research Framework*

From these perspectives, the researchers of this study presented the AI-empowered framework. It shows that the shift in the educational paradigm should now include the incorporation of artificial intelligence that overlaps with the realms of pedagogy, the teacher, and the curriculum, yet maintaining the learner as the center of learning.



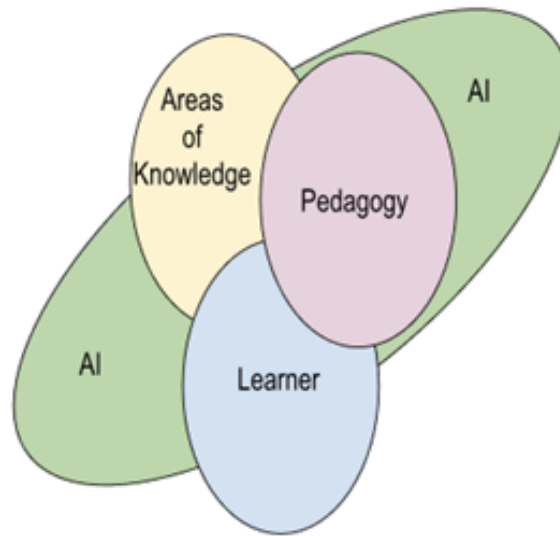
**Figure 2***AI-empowered Educational Framework*

Figure 2 shows an educational framework where the use of AI is incorporated into the aspects of education. The AI, in this case, ChatGPT, should be carefully intertwined with the areas of knowledge, the teaching strategies and methods, and the learner. The education system should upskill itself concerning the competencies and practices that can meet the demands of the new technology. Moreover, ChatGPT fosters new ways of thinking and schematic construction of knowledge, where teachers need to reform the learning environment to cultivate the learner's ways of assembling their knowledge. Embracing technology rather than banning it will prepare learners for the future job market that is yet to show itself (Tilili, et.al., 2023). In the framework shown above, it can be seen that pedagogy is fully engulfed inside AI. This means that the teacher must incorporate the use of technology and chatbots in the classroom, yet with the teacher's constant guidance and facilitation in the learning environment. On the other hand, the areas of knowledge are only halfway enveloped by AI. Written scripts are a more reliable source of information and should not be replaced wholly by AI (Chow & Perrigo, 2023). In the same manner, though the learners of today are digital natives, AI must only be a learning tool rather than the basis of knowledge, since human interaction and direct experience with knowledge in real life are more effective methods of developing a holistic learner (Singh, 2022).

### Analytic Approach

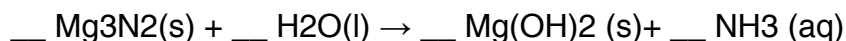
#### Analyzing Sample Answers from ChatGPT in Comparison to a Given Mark Scheme from the IB Organization

To test the reliability and extent of the "intellectual" capabilities of ChatGPT, sample questions from IB's past paper higher level questions from the three sciences, Chemistry, Biology, and Physics, and Math, were asked in ChatGPT. Two sample questions in each science subject were selected in a manner that involved answers in short-essay and calculations, which were furthermore,

categorized based on Bloom's taxonomy. ChatGPT's answers were compared with the markscheme from IB and given a score by the marks allotted for each question. The markings were done by tenured subject teachers of IB.

Firstly, Figure 3 presents a chemistry question that demands merely to balance a chemical equation:

The presence of magnesium nitride can be demonstrated by adding water to the product. It is hydrolyzed to form magnesium hydroxide and ammonia. Calculate coefficients that balance the equation for the following reaction.



The generated answer of ChatGPT is correct, based on IB organization's mark scheme, as shown in Figure 4. In addition, it clearly enumerated the steps carried out to come up with the answer. ChatGPT is proficient in answering this type of question which is categorized in Bloom's taxonomy as understanding as well as applying.

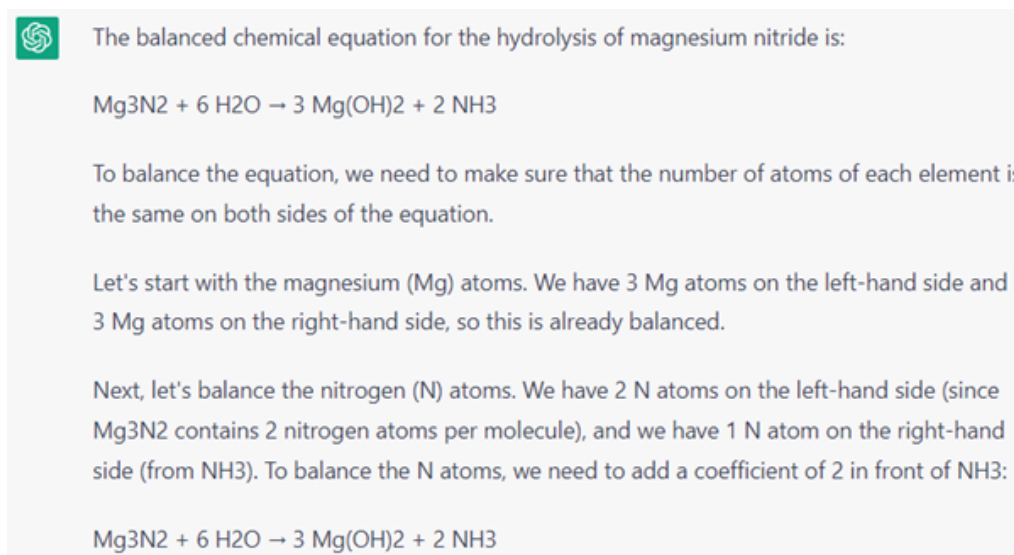
### Figure 3

*IB Organization's answer on Chemistry Question 1*

«1» $\text{Mg}_3\text{N}_2(\text{s}) + 6 \text{H}_2\text{O}(\text{l}) \rightarrow 3 \text{Mg}(\text{OH})_2(\text{s}) + 2 \text{NH}_3(\text{aq})$ ✓		1
--	--	---

### Figure 4

*ChatGPT's answer for Chemistry Question 1*



The balanced chemical equation for the hydrolysis of magnesium nitride is:

$$\text{Mg}_3\text{N}_2 + 6 \text{H}_2\text{O} \rightarrow 3 \text{Mg}(\text{OH})_2 + 2 \text{NH}_3$$

To balance the equation, we need to make sure that the number of atoms of each element is the same on both sides of the equation.

Let's start with the magnesium (Mg) atoms. We have 3 Mg atoms on the left-hand side and 3 Mg atoms on the right-hand side, so this is already balanced.

Next, let's balance the nitrogen (N) atoms. We have 2 N atoms on the left-hand side (since  $\text{Mg}_3\text{N}_2$  contains 2 nitrogen atoms per molecule), and we have 1 N atom on the right-hand side (from  $\text{NH}_3$ ). To balance the N atoms, we need to add a coefficient of 2 in front of  $\text{NH}_3$ :

$$\text{Mg}_3\text{N}_2 + 6 \text{H}_2\text{O} \rightarrow 3 \text{Mg}(\text{OH})_2 + 2 \text{NH}_3$$

Now, let's balance the hydrogen (H) atoms. We have 12 H atoms on the right-hand side (6 from H<sub>2</sub>O and 6 from Mg(OH)<sub>2</sub>), so we need to add a coefficient of 6 in front of H<sub>2</sub>O:



Finally, let's check if the equation is balanced by counting the atoms of each element:

On the left-hand side, we have: 3 Mg, 2 N, 12 H, and 6 O (from H<sub>2</sub>O).

On the right-hand side, we have: 3 Mg, 2 N, 12 H, and 2 O (from Mg(OH)<sub>2</sub>).

Therefore, the equation is balanced with the coefficients:



The next chemistry question solicits a rationalized identification of the type of chemical reaction that is exhibited in the given scenario:

Deduce, giving reasons, whether the reaction of magnesium nitride with water is an acid-base reaction, a redox reaction, neither, or both.

The expected answer based on the mark scheme is a simple identification of the type of chemical reaction, that it is an acid-base reaction, together with a description of the transfer of cations and anions. The generated response of ChatGPT indicated that it is not an acid-base reaction nor a redox reaction, though it has correctly discussed these two chemical reactions, yet it rationalized hydrolysis as its answer. Its answer is somehow correct but is not on point. Should it be a biology question, it may have garnered a point yet still not a full mark. With this, it can be said that ChatGPT may be proficient in the lower categories of Chemistry questions based on Bloom's Taxonomy, but when it comes to analysis, it still needs to improve.

## Figure 5

### IB Organization's answer on Chemistry Question 2

<p><b>Acid-base:</b> yes <b>AND</b> N<sup>3-</sup> accepts H<sup>+</sup>/donates electron pair«s» <b>OR</b> yes <b>AND</b> H<sub>2</sub>O loses H<sup>+</sup> «to form OH<sup>-</sup>»/accepts electron pair«s» ✓</p> <p><b>Redox:</b> no <b>AND</b> no oxidation states change ✓</p>	<p>Accept "yes <b>AND</b> proton transfer takes place"</p> <p>Accept reference to the oxidation state of specific elements not changing. Accept "not redox as no electrons gained/lost".</p> <p>Award [1 max] for Acid-base: yes <b>AND</b> Redox: no, if no other mark is awarded."</p>	2
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## Figure 6

### ChatGPT's answer on Chemistry Question 2



The reaction of magnesium nitride ( $Mg_3N_2$ ) with water ( $H_2O$ ) is neither an acid-base reaction nor a redox reaction.

An acid-base reaction involves the transfer of a proton ( $H^+$ ) from an acid to a base. However, in this reaction, there are no proton transfers between the reactants, and hence it cannot be an acid-base reaction.

A redox (reduction-oxidation) reaction involves the transfer of electrons between the reactants. In a redox reaction, one reactant is oxidized (loses electrons), and the other reactant is reduced (gains electrons). However, in this reaction, there is no transfer of electrons between the reactants. The oxidation state of magnesium in  $Mg_3N_2$  is +2, and it remains the same in  $Mg(OH)_2$ . Similarly, the oxidation state of nitrogen in  $Mg_3N_2$  is -3, and it remains the same in  $NH_3$ . Therefore, this reaction cannot be classified as a redox reaction.

Instead, this reaction is a hydrolysis reaction, where the magnesium nitride reacts with water to form magnesium hydroxide and ammonia. The hydrolysis reaction involves the breaking of a covalent bond by the addition of a water molecule. In this case, the Mg-N bond in magnesium nitride is broken by the addition of water, and the resulting products are magnesium hydroxide and ammonia.

Secondly, Biology questions were also asked. The first Biology question is about speciation as a result of the processes of isolation and selection. The answer generated by ChatGPT was partially correct, garnering 5 marks out of 7, based on the mark scheme provided by IB organization. Five out of the 13 concepts presented in the marks scheme were not described by ChatGPT, despite its lengthy explanations. The next Biology question is about the electron transport chain in cellular respiration. ChatGPT has extensively answered this question correctly garnering a mark of 7/7. Respectively, these questions were categorized in Bloom's Taxonomy under understanding and analyzing. With regards to Biology, ChatGPT's response shows partial accuracy but it necessitates expanding beyond explicit inquiry as the question demands the application of critical thinking.

Thirdly, the proficiency of ChatGPT in responding to understanding and analysis questions related to Physics subject is demonstrated in its generated answers. The first Physics question is about the application of Newton's laws on the given case. ChatGPT's answer was concise and brief. A style that is best to apply during the time-constrained IB exams. Moreover, the second Physics question is about acceleration that requires calculation. ChatGPT was able to answer this succinctly.

Lastly, Math questions were also asked. Both questions asked were in the category of analyzing and applying in Bloom's Taxonomy, which require calculations. ChatGPT's answers were incorrect for both, despite its lengthy explanation. ChatGPT's answers, as well as its working solutions do not match with the IB mark scheme.

In summary, ChatGPT demonstrates proficiency in some science related questions, where its answers can sometimes be correct or partially correct. In terms of math questions, ChatGPT consistently diverged from expected answers outlined in the mark scheme, which can be seen as a limitation of the chatbot. Table 1 below shows a summary of this.

**Table 1**

*Categorization of questions and ChatGPT answers.*

Subject Area	Question No.	Answer	Bloom's Taxonomy Categorization	Chat-GPT's Score	Comments
Chemistry	1	Figure 4	Understanding/ Applying	1/1	The answer from ChatGPT is more than what is asked for, as it has explained the step-by-step process of coming up with the correct answer.
	2	Figure 6	Analyzing	0/2	Though ChatGPT has correctly explained the concepts encompassed in the question, it did not give the correct answer.
Biology	1	Appendix B	Understanding	5/7	Comparing the answers from both sources, it can be distinguished that the mark scheme letters a, b, k, l, & m were not discussed in the answers of ChatGPT, hence the score of 5/7.
	2	Appendix D	Analyzing	7/7	Most of the statements were clearly described with more details than required.
Physics	1	Appendix F	Analyzing	3/3	ChatGPT has stated all three statements needed for a full mark, as stipulated in the mark-scheme of IB.

Subject Area	Question No.	Answer	Bloom's Taxonomy Categorization	Chat-GPT's Score	Comments
	2	Appendix H	Applying	2/2	The answer given by ChatGPT is extensively explained, where the principle behind the question, as well as the step-by-step process to arrive at the correct answer was made.
Math	1	Appendix J	Understanding/ Applying	1/2	Math is an exact science; therefore, numerical answers must be exact for both answers. A mark of 1 out of 2 was given for the correct explanation of the process.
	2	Appendix L	Analyzing	0/2	The final answers, as well as the working solution, do not match.

### Conclusion

In conclusion, integrating ChatGPT into teaching practices and education offers significant advantages in enhancing students' learning experiences and improving their confidence. However, it is essential to recognize that excessive reliance on AI may risk undermining the crucial teacher-student interaction and relationship, which is essential for holistic student development. Reassessing the use and functionality of AI in education has revealed both its flaws and benefits. While there is ample proof of its potential to transform traditional practices for the better, concerns regarding its negative impact must not be overlooked. By identifying ways to transform challenges into opportunities, teachers can leverage AI to improve teaching and learning outcomes.

Furthermore, examining ChatGPT's performance in subjects like mathematics and science provides insights into its effectiveness in meeting educational standards. This suggests the need to reconsider assessment methods and adapt instructional content with AI assistance. Thus, integrating AI into education, while offering positive effects on learning, requires careful consideration of its advantages and disadvantages. Policymakers, educators, and experts must collaborate to ensure that students are well-prepared to thrive as 21st-century learners.

## Recommendations

Based on the comprehensive analysis of the integration of ChatGPT, several recommendations can be implemented to enhance its benefits while lessening the potential risks and issues associated with its use.

Everyone must embrace AI as a supporting tool rather than a replacement for traditional teaching methods. Introducing ChatGPT into the classroom can indeed enhance learning experiences, providing instant feedback, and stimulating critical thinking. However, it must be used in moderation. It is crucial to maintain a balance between AI-driven instruction and human interactions. Educators and teachers remain the most important people in guiding students in their learning endeavors, facilitating meaningful discussions, and collaborating on activities that promote social, cognitive, and emotional development. By integrating AI as a tool within their pedagogical practices, they can create much more dynamic, responsive, and engaging learning environments that cater to diverse learners' interests and needs. While collaboration among stakeholders is essential for advancing AI-driven educational practices and maximizing learning outcomes, this suggests promoting interdisciplinary partnerships between educators, researchers, technology, and industry experts to cooperate with each other for innovative and relevant solutions that address emerging controversies, challenges, and opportunities in education. When they share their best methods and ideas, they can make the most of AI to help diverse students in a changing digital and technological world. This also ensures that AI is used well and keeps getting better. This way, students can do well in school and beyond, even as technology becomes more important. Moreover, stakeholders in education, such as policymakers, administrators, officials, and curriculum developers, also need to emphasize ethical considerations to ensure responsible AI implementation. This involves addressing concerns related to data privacy, algorithmic bias, and digital literacy. Educators should receive intensive training, workshops, and support to effectively integrate AI tools into their teaching practices while considering ethical usage among students. Additionally, curriculum frameworks and provisions should be modified or revised to include digital citizenship, policies, and AI literacy as essential components of 21st-century education. By fostering a culture of responsible AI usage from an early age, schools can empower students to navigate and handle the complexities of the digital world with confidence and integrity.

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## Appendices

### Appendix A

*IB Organization's answer on Biology assessment question 1: Explain how speciation occurs, including the different processes of isolation and selection*

<p>a. Species is a group of organisms that interbreeds (normally in the wild) and produce fertile offspring;  b. within an interbreeding population there is variety / variation exists;  c. some adaptations favour survival to reproductive age /survival of the fittest / natural selection;  d. alleles for these adaptations become more frequent/are inherited in the population /change with time;  e. speciation is the formation of new species;  f. (speciation) occurs because populations have become reproductively isolated / no longer able to interbreed / exposed to different selection pressures;  g. behavioural isolation involves differences in courtship or mating behaviours;  h. temporal isolation involves differences in the timing of courtship or mating behaviours;  i. geographical isolation / allopatric refers to the physical barriers that exist that keep two populations from mating;  j. polyploidy can lead to reproductive isolation;  k. stabilizing selection is when the two extremes of a trait have lower reproductive fitness (OWTTE) / favours average phenotype;  l. directional selection is when one extreme of the trait has lower reproductive fitness (OWTTE);  m. disruptive/diversifying selection favours both extreme phenotypes / intermediate phenotype has lower fitness;</p>	<p>OWTTE</p>	<p>7 max</p>
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### Appendix B

*ChatGPT's answer on Biology assessment question 1: Explain how speciation occurs, including the different processes of isolation and selection*



Speciation is the process by which new species arise from existing ones.

This occurs through a combination of different processes, including isolation and selection.

Isolation is the process by which populations become separated and no longer interbreed. There are several types of isolation, including:

1. Geographic isolation: This occurs when physical barriers such as mountains, rivers, or oceans separate populations, preventing gene flow between them.
2. Reproductive isolation: This occurs when biological barriers prevent interbreeding between populations. This can be due to differences in mating behaviors, physical characteristics, or reproductive systems.

Selection is the process by which certain traits become more or less common in a population over time. This occurs through natural selection, sexual selection, and artificial selection.

1. Natural selection: This occurs when certain traits are advantageous in a given environment, allowing individuals with those traits to survive and reproduce more successfully than others.
2. Sexual selection: This occurs when certain traits are more attractive to potential mates, leading to increased reproductive success for individuals with those traits.
3. Artificial selection: This occurs when humans intentionally select certain traits in domesticated plants and animals, leading to the development of new varieties and breeds.

Over time, isolation and selection can lead to the accumulation of genetic differences between populations, eventually resulting in the formation of new species. This process can take thousands or even millions of years and is influenced by many factors, including environmental changes, genetic drift, and gene flow.


## Appendix C

*IB Organization's answer on Biology assessment question 2: Explain the role of the electron transport chain in the generation of ATP by cell respiration.*

<p>a. electron transport chain performs chemiosmosis / chemiosmosis generates ATP;                  b. receives energy/electrons from oxidation reactions/from Krebs cycle/glycolysis;                  c. receives electrons from reduced NAD/NADH/reduced FAD/FADH;                  d. energy released as electrons pass from carrier to carrier (in the chain);                  e. release of energy (from electron flow) coupled to proton pumping;                  f. protons pumped into intermembrane space;                  g. creates proton gradient;                  h. protons diffuse back/move down the concentration gradient (across membrane);                  i. protons pass through ATP synthase;                  j. protons return to the matrix;                  k. flow of protons provides energy for generating ATP;                  l. electrons transferred to oxygen at end of electron transport chain;</p>		<p><b>7 max</b></p>
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## Appendix D

*ChatGPT's answer on Biology assessment question 2: Explain the role of the electron transport chain in the generation of ATP by cell respiration.*



The electron transport chain (ETC) plays a crucial role in the generation of ATP by cellular respiration. It is a series of protein complexes and electron carriers located in the inner mitochondrial membrane in eukaryotes or the plasma membrane in prokaryotes.

During cellular respiration, glucose is broken down into pyruvate in the cytoplasm through glycolysis. Pyruvate is then transported into the mitochondria where it is converted into acetyl CoA through the process of the Krebs cycle. The high-energy electrons produced from these reactions are then carried by NADH and FADH<sub>2</sub> to the ETC.

The ETC consists of four protein complexes (complexes I-IV) and two electron carriers (ubiquinone and cytochrome c) that are arranged in order of increasing electronegativity. As electrons are passed along the chain, energy is released and used to pump protons (H<sup>+</sup>) from the mitochondrial matrix to the intermembrane space, creating a proton gradient.

This proton gradient is then used by ATP synthase to produce ATP through the process of oxidative phosphorylation. ATP synthase is a complex enzyme that uses the energy from the proton gradient to add a phosphate group to ADP, forming ATP.

Overall, the ETC plays a crucial role in generating ATP by cellular respiration by using the high-energy electrons from the breakdown of glucose to create a proton gradient, which is then used by ATP synthase to produce ATP.

## Appendix E

*IB Organization's answer on Physics assessment question 1: Airboats are used for transport across a river. To move the boat forward, the air is propelled from the back of the boat by a fan blade. An airboat has a fan blade of a radius of 1.8m. This fan can propel air with a maximum speed relative to the boat of 20ms<sup>-1</sup>. The density of air is 1.2kg/m<sup>3</sup>. Outline why a force acts on the airboat due to the fan blade.*

<p><b>ALTERNATIVE 1</b>                  there is a force «by the fan» on the air / air is accelerated «to the rear» ✓                  by Newton 3 ✓                  there is an «equal and» opposite force on the boat ✓</p> <p><b>ALTERNATIVE 2</b>                  air gains momentum «backward» ✓                  by conservation of momentum / force is rate of change in momentum ✓                  boat gains momentum in the opposite direction ✓</p>	<p>Accept a reference to Newton's third law, e.g. N<sup>3</sup>, or any correct statement of it for MP2 in ALT 1.</p> <p>Allow any reasonable choice of object where the force of the air is acting on, e.g., fan or blades.</p>	<p>3</p>
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## Appendix F

*ChatGPT's answer on Physics assessment question 1: Airboats are used for transport across a river. To move the boat forward, the air is propelled from the back of the boat by a fan blade. An airboat has a fan blade of a radius of 1.8m. This fan can propel air with a maximum speed relative to the boat of 20ms<sup>-1</sup>. The density of air is 1.2kg/m<sup>3</sup>. Outline why a force acts on the airboat due to the fan blade.*



When the air is propelled by the fan blade, it is pushed backward in the opposite direction to the desired motion of the boat. According to Newton's third law, for every action, there is an equal and opposite reaction. Therefore, as the air is pushed backward, it exerts a forward force on the fan blade and the airboat. This forward force is what propels the airboat forward. In other words, the fan blade generates a force by accelerating the air backward, which in turn generates an equal and opposite force on the boat, propelling it forward.

## Appendix G

*IB Organization's answer on Physics assessment question 2: In a test, the airboat is tied to the river bank with a rope normal to the bank. The fan propels the air at its maximum speed. There is no wind. Show that a mass of about 240 kg of air moves through the fan every second.*

$\pi R^2$ OR «mass of air through system per unit time $\Rightarrow Av\rho$ seen ✓ 244 «kg s <sup>-1</sup> » ✓	Accept use of Energy of air per second $= 0.5 \rho Av^3 = 0.5 m^3$ for MP1.	2
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## Appendix H

ChatGPT's answer on Physics assessment question 2: In a test, the airboat is tied to the river bank with a rope normal to the bank. The fan propels the air at its maximum speed. There is no wind. Show that a mass of about 240 kg of air moves through the fan every second.



We can use the principle of conservation of mass to calculate the mass of air that moves through the fan every second. The mass of air entering the fan must be equal to the mass of air leaving the fan.

Let's assume that the airboat is at rest and the fan is turned on. The fan propels the air with a maximum speed relative to the boat of 20 m/s. Therefore, the air enters the fan at 20 m/s. The area of the fan blade is  $A = \pi r^2 = \pi(1.8 \text{ m})^2 \approx 10.18 \text{ m}^2$ .

The volume of air passing through the fan every second is given by the formula:

$$\text{Volume} = \text{Area} \times \text{Speed}$$

$$\text{Volume} = 10.18 \text{ m}^2 \times 20 \text{ m/s} = 203.6 \text{ m}^3/\text{s}$$

The density of air is  $\rho = 1.2 \text{ kg/m}^3$ . Therefore, the mass of air passing through the fan every second is:

$$\text{Mass} = \text{Density} \times \text{Volume}$$

$$\text{Mass} = 1.2 \text{ kg/m}^3 \times 203.6 \text{ m}^3/\text{s} \approx 244.3 \text{ kg/s}$$

Therefore, the mass of air moving through the fan every second is about 240 kg (rounded to the nearest 10 kg), as calculated above.

## Appendix I

IB Organization's answer on Math assessment question 1: It is known that the weights of male Persian cats are normally distributed with a mean of 6.1kg and a variance of  $0.5^2 \text{ kg}^2$ . Find the proportion of male Persian cats weighing between 5.5kg and 6.5kg.

$$X \sim N(6.1, 0.5^2)$$

$$P(5.5 < X < 6.5) \text{ OR labelled sketch of region}$$

$$= 0.673 \text{ (0.673074...)}$$

(M1)

A1

[2 marks]

## Appendix J

ChatGPT's answer on Math assessment question 1: It is known that the weights of male Persian cats are normally distributed with a mean of 6.1kg and a variance of  $0.5^2 \text{ kg}^2$ . Find the proportion of male Persian cats weighing between 5.5kg and 6.5kg.



We can solve this problem by standardizing the weights of male Persian cats using the standard normal distribution, which has a mean of 0 and a variance of 1. To do this, we use the following formula:

$$z = (x - \mu) / \sigma$$

where  $z$  is the standardized score,  $x$  is the weight of the cat,  $\mu$  is the mean weight, and  $\sigma$  is the standard deviation.

We want to find the proportion of male Persian cats weighing between 5.5kg and 6.5kg, so we need to standardize these weights:

$$z_1 = (5.5 - 6.1) / 0.5 = -1.2$$

$$z_2 = (6.5 - 6.1) / 0.5 = 0.8$$

Now, we can use a standard normal distribution table or calculator to find the area under the curve between these two standardized scores:

$$P(-1.2 < z < 0.8) \approx 0.7838 - 0.1151 \approx 0.6687$$

Therefore, approximately 66.87% of male Persian cats weigh between 5.5kg and 6.5kg.

## Appendix K

IB Organization's answer on Math assessment question 2: In a small village there are two doctors' clinics, one owned by Doctor Black and the other owned by Doctor Green. It was noted after each year that 3.5% of Doctor Black's patients moved to Doctor Green's clinic and 5% of Doctor Green's patients moved to Doctor Black's clinic. All additional losses and gains of patients by the clinics may be ignored. At the start of a particular year, it was noted that Doctor Black had 2100 patients on their register, compared to Doctor Green's 3500 patients. Find a prediction for the ratio of the number of patients Doctor Black will have, compared to Doctor Green, after two years.

<p>(b) <math>\begin{pmatrix} 0.965 &amp; 0.05 \\ 0.035 &amp; 0.95 \end{pmatrix}^2 \begin{pmatrix} 2100 \\ 3500 \end{pmatrix}</math></p> <p><math>= \begin{pmatrix} 2294 \\ 3306 \end{pmatrix}</math></p> <p>so ratio is 2294 : 3306 (=1147 : 1653, 0.693889...)</p>	<p>(M1)</p> <p>A1</p> <p>[2 marks]</p>
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## Appendix L

*ChatGPT's answer on Math assessment question 2: In a small village there are two doctors' clinics, one owned by Doctor Black and the other owned by Doctor Green. It was noted after each year that 3.5% of Doctor Black's patients moved to Doctor Green's clinic and 5% of Doctor Green's patients moved to Doctor Black's clinic. All additional losses and gains of patients by the clinics may be ignored. At the start of a particular year, it was noted that Doctor Black had 2100 patients on their register, compared to Doctor Green's 3500 patients. Find a prediction for the ratio of the number of patients Doctor Black will have, compared to Doctor Green, after two years.*



We can solve this problem by using a system of linear equations to model the flow of patients between the two clinics over two years.

Let  $x$  be the number of patients on Doctor Black's register after two years, and let  $y$  be the number of patients on Doctor Green's register after two years. Then, we have:

$$\begin{aligned}x &= 0.965(2100) + 0.05(3500 - y) \\y &= 0.965(3500) + 0.035(2100 - x)\end{aligned}$$

The first equation represents the number of patients that Doctor Black will have after two years, which includes the 3.5% of patients who moved to Doctor Green's clinic and the 5% of patients who moved to Doctor Black's clinic. The second equation represents the number of patients that Doctor Green will have after two years, which includes the 3.5% of patients who moved to Doctor Black's clinic and the 5% of patients who moved to Doctor Green's clinic.

The first equation represents the number of patients that Doctor Black will have after two years, which includes the 3.5% of patients who moved to Doctor Green's clinic and the 5% of patients who moved to Doctor Black's clinic. The second equation represents the number of patients that Doctor Green will have after two years, which includes the 3.5% of patients who moved to Doctor Black's clinic and the 5% of patients who moved to Doctor Green's clinic.

Simplifying the equations, we get:

$$\begin{aligned}x &= 2009.5 + 0.05y \\y &= 3322.75 + 0.03225x\end{aligned}$$

Substituting the first equation into the second equation, we get:

$$\begin{aligned}y &= 3322.75 + 0.03225(2009.5 + 0.05y) \\y &= 3322.75 + 64.86125 + 0.03225y \\0.96775y &= 3387.61125 \\y &= 3499.743\end{aligned}$$

Substituting  $y$  back into the first equation, we get:

$$\begin{aligned}x &= 2009.5 + 0.05(3499.743) \\x &= 2184.985\end{aligned}$$

# Students' Perceived Learning Acquisition of the Enhanced Course for Digital Communication

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## Abstract

*The inevitable rapid transformation of technology has instantly defined the way of life people have today, particularly in the education sector, where academic experts are compelling to realign the curriculum and instructions with the existing technological trends. The study of the enhanced course for Digital Communication is presented in this undertaking to address the digital technology learning needs of Liberal Arts students in the new normal phenomena. Specifically, it examines the influence of students' perceived prior digital technology knowledge on their perceived cognitive learning and explores the differences in students' perceived learning acquisition. Data were generated from one hundred fifty-two (152) first-year Liberal Arts students of Rajamangala University of Technology Rattanakosin. Cronbach's Alpha coefficient confirmed the high internal consistency of the personalized and partly adopted questionnaire. The finding reveals that students' perceived prior digital technology knowledge has significantly influenced their perceived cognitive learning acquisition. The diminished data variability strengthens the evidence that students' performance has dramatically improved in hybrid and blended learning. Correspondingly, the three groups of respondents highly favored affective learning acquisition over cognitive and psychomotor. It conveys that learners profoundly engage with others using digital technologies as they grasp the meaning of the subject matter. This paper, therefore, substantiates that the enhanced course for Digital Communication was designed ergonomically for effective learning.*

**Keywords:** *digital technology, students' perceived learning acquisition, enhanced course for digital communication, ergonomic design for effective learning*

## Introduction

Technological advancement regularly happens year after year. This is common to digital natives and migrants, especially people whose work is highly engaged in Information and Communication Technology. Education 4.0 was promulgated by the World Economic Forum (2020) and has been adopted by the education sector worldwide for the "innovation of leveraging pedagogies." The health emergency fast-tracked the transformation process due to the high demand for

safety and security issues of the Internet of Things for online communication, backlog in health services, e-commerce issues, and problems in public and privately run industries, including the vulnerable education sector. The latter account resonated with the concern of Dhawan (2020, in Plummer et al., 2021), underpinning "that learning with technology was the future, but the pandemic accelerated the process." As a result, information becomes more accessible while constantly changing in response to current events (Kingkaew et al., 2023). As reiterated by Snelling (2022, in Snezhana, 2022), the education sector, specifically at the tertiary level, will continue to progress, adapting to the future demands of lecturers and students, where digitalization has been a vehicle for achieving ergonomic outcomes.

The technological phenomenon has indeed instantly transformed various sectors, having their system upgraded and realigned with the existing technological trends. In the education sector, academic experts are driven to sustain the quality of curriculum and instructions with redefined goals and innovative design. One of these was Snezhana's (2022) proposal that lecturers should acquire expertise in virtual facilitation to "keep the sessions balanced for diverse learners." Similarly, Belessova et al. (2023) defended the idea of the suitability of information technologies in "psychological and pedagogical training," suggesting the development of a "digital ecosystem" in the current era. While, Subedi et al. (2020, in Pereira et al., 2023) reiterated that digital technologies are becoming common to maximize work and production efficacy. Lopez-Reyes et al. (2022) further stated how digital technology plays a crucial role as a learning medium to scaffold students' acquisition of new ideas and skills.

Pertinent to the existing digital education trends and recent studies, the current undertaking has not been scrutinized by other authors; thus, this study was conducted to investigate the design of the enhanced course for digital communication addressing the needs of Liberal Arts students in the new normal phenomena where hybrid and blended learning are intensively offered.

### **Objectives**

This study was conducted to scrutinize the ergonomic design of the enhanced course for digital communication. Specifically, the following objectives have been put forward to:

1. Examine the influence of students' perceived prior digital technology knowledge on their perceived cognitive learning; and
2. Explore the differences among the enhanced English, Chinese, and Japanese Digital Communication Courses with respect to the students' perceived learning acquisition.

### **Theoretical Framework**

Denoting the course design, Faustmann et al. (2019) corroborated that "a digital learning platform has to be developed individually based on the participants' backgrounds, needs, and behavior for a successful learning outcome".

Consistently, Joosten et al. (2020) emphasized that the crucial part of alleviating e-learning is integrating relevant media to harness and promote interactive participation. Instructors with better-informing abilities should be involved in designing courses to help students succeed and improve learning (Joosten et al., 2020). Equally, Kintu et al. (2017) proposed that students' attributes and learning outcomes should be considered when designing a curriculum. At the same time, Snezhana (2022) promoted the integration of microlearning to attain its maximum effectiveness. Likewise, Sailer and Homner (2020, in Okariz et al. 2023) affirmed the importance of incorporating gamification in designing procedural learning, for it equips students with several advantages (Lo & Hew, 2020, in Okariz et al., 2023), including the internalization of a lesson and learning empowerment.

Originally, the digital communication course was designed for English communication to further the four macro skills learned by Thai college students. It was likewise aligned with the modern technology of the pre-COVID-19 era, wherein the use of digital technology encompassing digital learning platforms, synchronous learning, asynchronous learning, hybrid or blended learning, assistive technology, and digital production were just options for teachers and students. In that case, students were more likely to engage with theoretical knowledge and information alone, while the applied learning and practical experience were compromised. This paper explains the course for digital communication and its enhanced features. The latter includes applied digital learning to obtain practical digital experience while sustaining students' engagement with theoretical knowledge and information. Edgar Dale's Cone of Learning highlighted that students remember 90% of what they do and 70% when they speak or write, whereas only 10% are absorbed in reading and 20% in listening alone (Gove Group, n.d.).

### Figure 1

*The Paradigm of the Enhanced Course for Digital Communication*

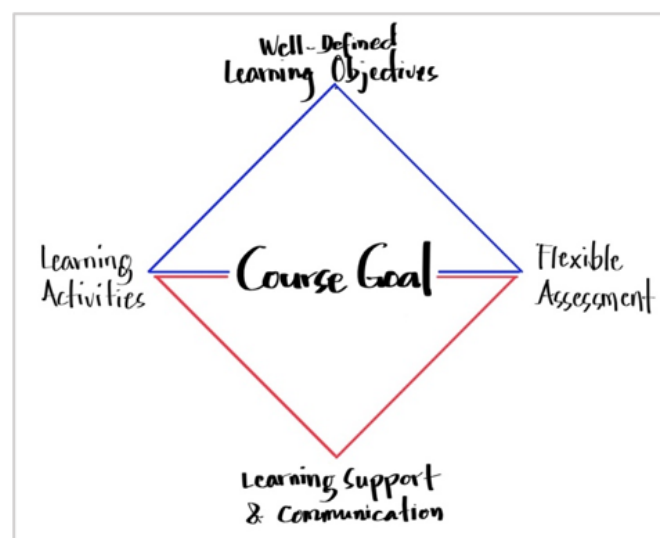


Figure 1 describes the Enhanced Course for Digital Communication paradigm.

The course model highlights an ambitious course goal to direct and guide students to possible future careers, interests, and daily life experiences along with digital technologies. Having well-defined and clear learning objectives could scaffold the classroom managers and curriculum and instruction designers to achieve learning activities that encompass relevant digital learning content, active and learner-centered, and constructive (Duke Learning Innovation, (n.d.). Panigrahi et al. (2018) stated that the most important factor in digital learning success is the availability of learning content.

Furthermore, well-defined and clear learning objectives could corroborate flexible assessment, leading students to realize its theoretical and practical applications in real life. Furthermore, a course goal could be achieved with learning support and consistent communication. To support the acquisition of learning activities and flexible assessment, access to learning materials is maximized using available digital technologies, free assistive technologies, and engaging printed materials. Also, there are in-class consultations and outside-the-schedule consultations for tutorials, inquiries, and personal concerns. The latter statement can be done on-site or asynchronously.

To distinguish the measurement of the ergonomic design of the course, the use of students' perceptions has been manifested in the study of Bahrami et al. (2023). Similarly, Boud and Molloy (2013) further substantiated the students' feedback as a sustainable source of real assessment for course delivery. Additionally, Boud and Molloy (2013) highlighted that learners should be given the opportunities to get involved as judges of their learning. Also, Aroonsrimarakot et al. (2022) discovered that the strategies suggested by student respondents could contribute to the possible resolution of e-learning problems.

Moreover, several experts unfolded their notions on the controversy of gender stereotypes in adopting technology. Nonetheless, a recent study by Okariz et al. (2023) on "the effects of gender and course acquisition on student satisfaction revealed no effects." Likewise, Korlat et al. (2021) found that male and female students "exhibited the same competence beliefs regarding digital learning." A parallel study by Yu and Deng (2022) affirmed that "e-learning outcomes" are comparable for both male and female students. In the same manner, Basak and Manna (2020) concluded that both male and female respondents had the same perception of e-learning. Hendawi and Nosair (2020) conducted a similar study on students' technological awareness, depicting "no differences in all dimensions." Flores et al. (2019) also corroborated the absence of a "distinction" between male and female participants using the gamified xMOOCs. Similar finding was verified by Quino and Potane (2023) in "post-pandemic digital self-efficacy and online learning readiness." Contrarily, Liu et al. (2021) divulged that "females outperformed males in terms of online self-study." Benvenuti (2023) further corroborated the latter attestation in terms of "internet use." Moreover, Chin (2020) revealed that females better understand digital technology safety and "security practices than their male counterparts." The latter likewise exhibits a good implication for gender equality and the acquisition of digital technology education. Additionally, the equal perceptions posed by both genders in their learning acquisition suggest that they are comparable in understanding, appreciation, and execution of learning tasks.

Employing this learning acquisition was originally grounded in Bloom's taxonomy of learning domains (Vikaspedia, 2020). These are focused on students' cognitive learning acquisition, affective learning, and psychomotor learning. Cognitive learning acquisition (Bloom, 1956, in Ruhl, 2024) reflects on learners' ability to "recall information, understand the meaning, troubleshoot in logical deduction, put parts together, and value ideas." On the other hand, affective learning acquisition (Krathwohl et al., 1964, in Ruhl, 2024) resonates with students' "willingness to listen, active participation, confidence and acceptance of diversity, self-reliance, and cooperation." Whereas, the psychomotor learning acquisition (Simpson, 1972, in Ruhl, 2024) echoes students' "guided response, mechanism, adaptation, and origination."

The aforementioned idea has been noticed in the studies of Bahrami et al. (2023) and Pereira et al. (2023), anchored to the affective learning domain focusing on teamwork and interaction. In comparison, Kingkaew et al. (2023) concentrated on cognitive learning alone. Contrarily, López-Reyes, et al. (2022) provided a broader avenue for active learning and digital technologies by employing the three learning domains.

In these latter years, the learning phenomena of Thai students enrolled in English, Chinese, and Japanese programs are more inclined to go online. Thus, digital technology "supplements their formal classroom learning that caters to their needs through supportive communities" (Quilt. AI, 2022).

Bogart (2014) concluded that utilizing LINE in learning English as a Foreign Language has effectively made students improve as digitally cognitive learners. Similarly, Chotipaktanasook (2014) affirmed that the willingness of students to communicate in English appeared to be enhanced by partaking in social media because it caters to them in a less stressful environment. Meanwhile, Guo and Lertlit (2021) attested that mobile-assisted language learning enhanced students' performance as it helped them to learn the Chinese language freely and actively through collaboration. Moreover, Thanwanon (2018) found that most Thai students learn the Japanese language more satisfactorily from online media than from books.

## **Methodology**

This quantitative study employs a two-pronged approach: (1) a causal research design to determine the influence of prior digital technology knowledge on learning acquisition and (2) a comparative design to determine if there are significant differences among the three groups on perceived knowledge acquisition.

The data were generated using the digital survey questionnaire administered with guidance during the face-to-face classes and were completed in the last week of February Academic Year 2022. The survey questionnaire consists of four (4) parts: (a) perceived prior digital technology knowledge – adopted from John's (2015) study, (b) perceived cognitive learning acquisition, (c) perceived affective learning acquisition, and (d) perceived psychomotor learning acquisition. Each part consisted of five (5) questions patterned to a five-point Likert scale. The

perceived prior digital technology knowledge has a Likert scale range of 1 as Poor, 2 as Fair, 3 as Good, 4 as Very Good, and 5 as Excellent. Equally, the perceived learning acquisition has a Likert scale range of 1 as Strong Disagree, 2 as Disagree, 3 as Neutral, 4 as Agree, and 5 as Strongly Agree.

Each part has the possible highest total scores of 21 – 25, indicating students' excellent perceived prior digital technology knowledge. Moreover, each question was designed according to its indicator (*see Appendices D, E, F, and G*).

Respondents consisted of first-year students from the Faculty of Liberal Arts. Thirty-eight (38) students have responded from the English Program, fifty-seven (57) from the Chinese Program, and another fifty-seven (57) from the Japanese Program, for a total of one hundred and fifty-two (152). The target respondents of this study were chosen because they were characterized as novice digital resilient (*see Appendix C*).

Data were analyzed using the Microsoft Excel Analysis ToolPack. The t-test for two sample means was used to examine the influence of students' prior digital technology knowledge on their digital learning acquisition. Subsequently, One-way ANOVA was employed and run separately for each group of respondents to determine the differences in their perceived learning acquisition. Likewise, the z-test for two sample means was applied to verify the Analysis of Variance result.

Cronbach's Alpha (0.804) confirmed a high internal consistency of the twenty-item survey questions on Students' Perceived Learning Acquisition. The questions are personalized and partly adopted from one of John's (2015) exploration tools. The aforesaid survey questionnaire was validated by the RMUTR-Liberal Arts research experts to further verify its credibility. It was pilot-tested right after the approval and disseminated to the target respondents in the last week of February 2023.

## Results and Discussions

### Significant influence of students' perceived prior digital technology knowledge on their perceived cognitive learning

The findings in Table 1 reveal that the respondents' perceived prior digital technology knowledge statistically significantly influences their perceived cognitive learning acquisition ( $p < 0.05$ ). This stipulates that their improved hybrid and blended learning performance in their perceived cognitive learning acquisition was significantly influenced by their perceived prior digital technology knowledge as evidence of diminished data variability.

The perceived prior digital knowledge of three groups of respondents showed a very good average for two indicators: understanding internet connection on Wi-Fi or mobile data ( $\mu=4.46$ ) and awareness and management of social media, online gaming, and other related applications ( $\mu=4.05$ ) (*see Appendix D*). Respondents' very good understanding of those indicators forced them to acquire very good results on their perceived cognitive learning acquisition,

including knowledge of synchronous and asynchronous communications ( $\mu=4.01$ ) and awareness of refresh rate and browsing management ( $\mu=4.13$ ) (see Appendix E). Additionally, their acquired ability to read and understand English commands on online portals, proper management of personal digital technology devices, and acquired knowledge of connectivity and internet bandwidth resulted from having a good prior knowledge of computer basics and storage management (see Appendices D and E).

A similar finding was revealed in the study of Feng et al. (2023), affirming the "positive impact of students' ICT self-efficacy in online English learning." Possessing a quality background in understanding digital technology gave the students concrete advantages to adapt to standardized digital learning. Further, Sayaf et al. (2021) anchored to students' digital learning sustainability wherein language familiarization played an essential role as their scaffold for acquiring more advanced knowledge while adapting to the fast-changing digital society.

**Table 1**

*t-Test of Students' Perceived Prior Knowledge of Digital Technology and Perceived Cognitive Learning*

	EIC			CHI			JAP		
	Mean	Variance	P-value	Mean	Variance	P-value	Mean	Variance	P-value
<b>Prior KTD</b>	18.24	9.43	0.014***	17.65	10.48	0.023***	17.05	15.02	0.000***
<b>COGNITIVE</b>	19.50	5.28		18.79	8.88		19.07	7.99	

\*\*\*Influence is significant at  $p < 0.05$  level

### Differences in the students' perceived learning acquisition

The result in Table 2 depicts statistically significant differences between the cognitive, affective, and psychomotor learning perceived by the EIC group ( $F=3.73$ ,  $p=0.027$ ), CHI group ( $F=3.403$ ,  $p=0.036$ ), and JAP group ( $F=4.714$ ,  $p=0.010$ ). The significant differences are explicated and verified in Table 3, entailing that all three groups of respondents favored their affective learning acquisition, showing a relatively high score of 20.02 (see Appendix A).



**Table 2***ANOVA of Three Groups of Students and Their Perceived Learning Acquisition*

	Source of Variation	SS	df	MS	F	P-value	F crit
EIC	Between Groups	42.54	2	21.27	3.73	0.027	3.08
	Within Groups	632.47	111	5.70			
	Total	675.02	113				
CHI	Between Groups	61.56	2	30.778	3.403	0.036	3.050
	Within Groups	1519.61	168	9.045			
	Total	1581.17	170				
JAP	Between Groups	68.53	2	34.263	4.714	0.010	3.050
	Within Groups	1221.16	168	7.269			
	Total	1289.68	170				

\*\*\*Difference is significant at  $p < 0.05$  level**Table 3***z-Test of Students' Perceived Learning Acquisition*

	Mean	Variance	P-value
Cognitive	19.07	7.63	0.079
Psychomotor	18.62	8.13	
Cognitive	19.07	7.63	0.001
Affective	20.02	6.99	
Psychomotor	18.62	8.13	0.000
Affective	20.02	6.99	

\*\*\*Difference is significant at  $p < 0.05$  level

Though cognitive and psychomotor learning were likewise perceived with favorable scores, all groups of respondents were inclined more toward their affective learning. This infers that learners could profoundly collaborate with peers or friends while completing learning tasks ( $\mu=4.2$ ). Noticeably, respondents showed appreciation of their learned digital citizenship behaviors and their importance ( $\mu=4.5$ ). Their observed netiquette and confidence in using digital technologies, such as the Internet of Things and various English signature applications, likewise aided them in easily grasping the meaning of the subject matter in producing precise task output. This further insinuates that students were confident, motivated, collaborative, and observant in acquiring new and additional information on digital technology and communication (see *Appendix F*).

As a result, the respondents, first-year Liberal Arts students of the Academic Year 2022, were undoubtedly considered to be novice digital resilient. This implies that students could become independent as first-time distance and online learners to survive and progress their student status during the confinement period. The difficult situations have shaped them into tough, self-regulated digital learners of the post-pandemic. These students were the first batch of learners to spend their first university experience on-site after two years of remote learning. That means most of them have adopted the mechanism of digital learning.

Several recent studies were found parallel to this present research. These include learning strategies visualization, and digital literacy support (Chiu, 2021; Wijaya et al., 2021; Yusoff et al., 2021). Also, aside from the pedagogical impact, the perceived ease of use of digital technologies was found to positively influence students' behavior in digital learning, which shaped them to be digitally resilient (Belda-Medina, 2021; Kintu et al., 2017; Lang and Sorgo, 2023; Li, 2023).

## **Conclusions and Recommendations**

### **Conclusions**

The students' perceived prior digital technology knowledge has significantly influenced their perceived cognitive learning acquisition. Therefore, students with prior knowledge of digital technology better understand the course concepts, leading them to operate on their digital devices easily and precisely.

The JAP, CHI, and EIC groups of respondents highly favored affective learning acquisition over cognitive and psychomotor, which conveys that learners were profoundly engaged with others using digital technologies as they grasped the meaning of the subject matter.

This means the course learning activities were designed with relevant content for active and constructive learning, aligned with well-defined objectives and learning support and communication. Therefore, it substantiates that the enhanced course for digital communication has been equipped with ergonomic design with clear goals and objectives.

### **Recommendations**

Based on the findings of the study, current and future researchers must employ qualitative methods to delve into a more profound discussion of the results of this study. It is further recommended that a prerequisite course in computer basics must be offered to students upon taking the Enhanced Course for Digital Communication to harness their cognitive computer skills and build more confidence in using digital technologies.

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## Appendices

### Appendix A

#### *Descriptive Statistics of Students' Perceived Learning Acquisition Scores*

	COGNITIVE	AFFECTIVE	PSYCHOMOTOR
Sample	152	152	152
Mean	19.07	20.02	18.62
Standard Error	0.22	0.21	0.23
Median	19.5	20	19
Mode	21	21	18
Standard Deviation	2.76	2.64	2.85
Variance	7.63	6.99	8.13
Kurtosis	0.24	1.03	0.11
Skewness	-0.56	-0.74	-0.31
Range	14	14	14
Minimum	11	11	11
Maximum	25	25	25
Sum	2899	3043	2830
Confidence Level(95.0%)	0.443	0.424	0.457

### Appendix B

#### *Descriptive Statistics of Students' Perceived Learning Scores per Group*

	PRIOR DTK			COGNITIVE			AFFECTIVE			PSYCHOMOTOR		
	EIC	CHI	JAP	EIC	CHI	JAP	EIC	CHI	JAP	EIC	CHI	JAP
Sample	38	57	57	38	57	57	38	57	57	38	57	57
Mean	18.24	17.65	17.05	19.5	18.79	19.07	20.55	20.09	19.60	19.11	18.84	18.07
Standard Error	0.50	0.43	0.51	0.37	0.39	0.37	0.35	0.40	0.33	0.44	0.40	0.36
Median	18	18	18	20	19	20	20.5	21	20	19	19	18
Mode	18	18	15	21	20	21	20	21	21	19	18	19
Standard Deviation	3.07	3.24	3.87	2.30	2.98	2.83	2.14	3.02	2.51	2.69	3.02	2.74
Variance	9.43	10.48	15.02	5.28	8.88	7.99	4.58	9.12	6.32	7.23	9.14	7.49
Kurtosis	0.46	-0.44	-1.10	-0.68	0.25	0.40	0.29	0.57	1.57	1.17	-0.12	0.00
Skewness	-0.82	-0.45	0.06	-0.46	-0.29	-0.80	-0.25	-0.74	-0.91	-0.29	-0.32	-0.38
Range	12	11	12	9	14	13	9	14	13	13	14	13
Minimum	10	11	11	14	11	11	16	11	11	11	11	11
Maximum	22	22	23	23	25	24	25	25	24	24	25	24
Sum	693	1006	972	741	1071	1087	781	1145	1117	726	1074	1030
Count	38	57	57	38	57	57	38	57	57	38	57	57
Confidence (95.0%)	1.01	0.86	1.03	0.76	0.79	0.75	0.70	0.80	0.67	0.88	0.80	0.73

## Appendix C

### *Distribution of Independent Variables*

Variable	Frequency	Percent
Gender		
Male	38	25
Female	114	75
Degree / Major		
English	38	25
Chinese	57	37.5
Japanese	57	37.5
Total	152	100

## Appendix D

### *Perceived Prior Digital Technology Knowledge Average Scores*

INDICATORS	EIC	CHI	JAP	AVE.
1. Knowledge of computer basics and storage management	3.45	3.67	3.79	3.63
2. Understand internet connection on Wi-Fi and mobile data	4.16	4.61	4.61	4.46
3. Knowledge of internet surfing and web browsing	3.29	3.09	2.58	2.99
4. Awareness and management of social media, online gaming, and other related apps	4.95	3.70	3.51	4.05
5. Ability to use email tools	2.39	2.58	2.56	2.51



## Appendix E

### *Perceived Cognitive Learning Acquisition Average Scores*

INDICATORS	EIC	CHI	JAP	AVE.
1. Ability to read and understand English commands on the web or applications	3.68	3.51	3.42	3.54
2. Knowledge of synchronous and asynchronous communications	4.05	3.93	4.05	4.01
3. Proper management of personal digital technology devices	3.92	3.81	3.95	3.89
4. Knowledge of connectivity and internet bandwidth	3.53	3.54	3.56	3.54
5. Awareness of refresh rate and browsing management	4.32	4	4.09	4.13

## Appendix F

### *Perceived Affective Learning Acquisition Average Scores*

INDICATORS	EIC	CHI	JAP	AVE.
1. Confidence in navigating and browsing various learning platforms	3.92	3.82	4.05	3.93
2. Eagerness to learn beyond	3.63	3.68	3.25	3.52
3. Observance of Netiquette in hybrid and blended learning	3.97	4.02	3.81	3.93
4. Proufoundly collaborate with peers/ friends on learning tasks	4.34	4.09	4.16	4.20
5. Appreciation of learned digital citizenship behaviors and their importance	4.68	4.47	4.33	4.50

## Appendix G

### *Perceived Psychomotor Learning Acquisition Average Scores*

INDICATORS	EIC	CHI	JAP	AVE.
1. Independently initiate and access digital learning	3.89	3.79	3.91	3.87
2. Operate on digital devices in English language procedures	3.61	3.58	3.32	3.50
3. Work efficiently with assistive technology	3.87	4.04	3.58	3.83
4. Go safely online	4.13	3.91	3.70	3.92
5. Skilled in compressing and saving files	3.61	3.53	3.56	3.56

## Appendix H

### *t-Test of Students' Perceived Prior Knowledge of Digital Technology and Perceived Learning Acquisition of Enhanced Digital Communication Course*

		Prior DTK	COGNITIVE	AFFECTIVE	PSYCHOM
EIC	Mean	18.24	19.50	20.55	19.11
	Variance	9.43	5.28	4.58	7.23
	Pearson Corre		0.232	0.342	0.295
	P-value		0.014***	0.000***	0.064
CHI	Mean	17.65	18.79	20.09	18.84
	Variance	10.48	8.88	9.12	9.14
	Pearson Corre		0.083	0.226	0.252
	P-value		0.023***	0.000***	0.011***
JAP	Mean	17.05	19.07	19.60	18.07
	Variance	15.02	7.99	6.32	7.49
	Pearson Corre		0.277	0.345	0.274
	P-value		0.000***	0.033***	0.000***

*\*\*\*Influence is significant at 0.05 level*

# Engendering Agency, Mindfulness, and Critical Thinking in Online Education

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## Abstract

*Challenges remain in the conduct of graduate education even when Philippine society has already begun its so-called post pandemic recovery. Such challenges include but are not limited to shifting work arrangements, perturbations in personal and family priorities, and everyday socio-economic realities such as the traffic problem and the rising cost of living. Given this backdrop of hard realities and increasing pressure on the individual's mental space, in which learners attempt to negotiate the pursuit of graduate studies, I draw on my lived experience in teaching graduate students at the Asian Center, University of the Philippines Diliman and problematize the issues in engendering agency, mindfulness, and critical thinking as desired states of being in an empowered, student-centered learning setting. Utilizing phenomenography, the study probes the approaches that were effective in teaching and learning as well as their challenges and the attendant contexts. I hope to contribute to the academic discourse on rethinking graduate education pedagogy.*

**Keywords:** *higher education pedagogy, online education, learning competencies*

## Introduction

Even when the University of the Philippines (UP) Diliman partially resumed in-person classes in the 2nd Semester of Academic Year 2022-2023, the conduct of graduate education was left to the determination of the academic units. While the general preference of undergraduates was a resumption of in-person classes, the seeming preference of students at the Asian Center (AC), UP Diliman, which offers graduate programs only, was the online modality. This holds notwithstanding learning challenges in using the platforms as experienced by both students and teachers. Since most AC graduate students are working professionals, continuing to learn online became a viable option that allowed them to manage their studies given increasing pressures from the workplace and the lack of improvement in the proverbial traffic situation in Manila, more responsibilities in the household, and shifting family employment. The conduct of classes at the AC, therefore, remained online-dominant. While the online modality presented opportunities, concerns on whether teaching and learning challenges that existed before would be exacerbated. Particularly, would effectuating agency, mindfulness, and critical thinking be more difficult

given the intertwining effects of the pandemic interacting with the introduction of the online modality?

The study seeks to (1) examine the motivations for change in the teaching and learning environment towards a student-centered pedagogy that emphasizes agency, mindfulness, and critical thinking; (2) elucidate the design of interventions in improving student engagement in online learning in the graduate level by inculcating agency, mindfulness, and critical thinking in class discussions; and (3) appraise the challenges in operationalizing such interventions given various individual and social dimensions.

## **Approach**

### **Conceptualizing Agency, Mindfulness, and Critical Thinking**

The framework I applied in this paper (which is likewise applied in my course packs) is three-pronged, which relates critical thinking with agency and mindfulness as a skill that is necessary in carrying out the course activities. As a subject matter, critical thinking is widely debated contingent on disciplinary orientation (Moore, 2011) and frameworks of learning outcomes (Liu et al., 2014). Progressive perspectives question why education institutions must even teach students how to think (Fahim & Masouleh, 2012). In this paper, critical thinking is framed as a competency that covers the latter three higher-order thinking skills in the 2001 version of Bloom's taxonomy: analyzing, evaluating, and creating (Krathwohl, 2002), with their corresponding cognitive processes. Agency relates with critical thinking as it refers to the student's exercise of choice and independent thinking, following Manyukhina and Wyse (2019). On the other hand, although it is widely associated in the literature with the context of clarity and focus in thinking (soliemanifar et al., 2022; Noone & Hogan, 2018), I framed mindfulness as the metacognition or the consciousness of one's learning choices. These competencies are explained to students as necessary states of being and elements in an ontology of learning as both precursors and results of the learning process.

### **Method and Scope**

In this paper, I shed light on the motivation or need for teaching and learning interventions, the design and structuration of my interventions, and the experience of students with these interventions. In analyzing the interventions for student-led discussions and learner responses, my paper draws on the epistemological tradition of phenomenography, which is concerned with describing how individuals experience a phenomenon as opposed to having phenomenological descriptions of different facets of that phenomenon to elucidate its workings (Marton, 1981; Giorgi, 1999; Larsson and Holmström, 2007). While both traditions have lived experiences as sources of analysis, the conceptual bent is not synonymous. With the interpretivist and constructivist approach in this paper, I am narrator, researcher, and participant in describing and evaluating the experiences of both myself and my students based on observation and reflexive articulations in class. Student feedback is considered in light of narrative inquiry. These particular methods are adopted in aid of

unpacking the nature and process of knowledge creation while understanding the positionalities of participants (Gruppetta, 2004; Svensson, 1997; Marton, 1981).

The scope of analysis covers the interventions I introduced in my online teaching to engender agency, mindfulness, and critical thinking in graduate pedagogy at the AC, particularly in the course Asian Studies 230 Seminar on Northeast Asia during Academic Year (AY) 2020-2021 until 2021-2022. It was the only course I taught for four straight semesters during the pandemic, which also had the most students relative to other Northeast Asia courses, allowing for thicker observations. Enrollees are mostly Master students in the thesis and non-thesis tracks at the AC, taking Asian Studies with country specializations in Northeast Asia, i.e., China, Korea, and Japan. The cohort of 38 graduate students includes a few cross-enrollees from outside the Northeast Asia specialization who took the course as an elective or cognate. The student activity considered in the scope is the Discussion Program (DP), the structure of which will be elaborated later on. Taking stock of how students led discussions, the articulations and interactions by students and myself, I analyzed agency, mindfulness, and critical thinking by students in the DPs. In other words, the DPs during class meetings and in context of their larger social domains, were the sites of rumination. Applying anonymity, observations on student performance and learner feedback cannot be traced to any particular person.

### **Tension Points for Change**

At the AC, the intended approach in courses is discursive and deliberative. While the dialogic nature of class meetings is expected, agency, mindfulness and critical thinking are not automatic outcomes. Graduate students are used to seminar-type discussions where course materials, which are primarily readings supplemented by audio and visual material, are assigned to students. They then report on the material, usually using presentation slides (e.g., done through PowerPoint or Canva), and an open discussion follows. Student presenters tend to share their ideas without the burden of whether others learned or not while non-presenters listen passively. These have become routinized and habitual. Meanwhile, life challenges were increasing such as workplace pressures and the difficulty of traveling from work to classes, making studying harder for graduate students. In this light, reconfiguring student-led discussions became one of my interventions in the classroom. I also started using online platforms such as Google Classroom and other applications that facilitated online class exchanges during inclement weather and other difficulties. In other words, a pedagogical shift already started before the pandemic, but the latter facilitated an acutely deeper shift.

Upon the lockdown in March 2020, an immediate adoption of online education was carried out. At the AC, this consisted of both synchronous and asynchronous aspects. The pandemic also spotlighted issues whose resolution were long overdue as well as opportunities to re-imagine higher education given global developments regarding the role of specialized knowledge (Guo et al., 2020; Neuwirth et al., 2021; Marmolejo and Groccia, 2022). In many ways, the pandemic and online education were jolts against the inertia of routine, providing

opportunities as well as challenges in engendering agency, mindfulness, and critical thinking.

### **Reimagining Student-Led Discussions and Observed Outcomes**

I have framed discussions through what I refer to as a Discussion Program (DP) with the vision of teaching students “in a deeply relational, reciprocal and educative practice” (Grice et al., 2023, p. 104). The significant departure of the DP from the usual/traditional student reporting of course materials is in operationalizing critical thinking and learner-centeredness with the objective of facilitating meaningful engagement by all students in the course, hewing closely to the corresponding learning resources.<sup>1</sup> Agency is encouraged because DP leaders need to make choices to not only demonstrate mastery of the subject as learners but also create an environment that is conducive for the learning of others. This puts an emphasis on the necessary sensitivity to participant reception and engagement which in turn demonstrates mindfulness. Active learning is expected (Coulter and Onufer, 2021).

Through an online learning management system and video conferencing applications in synchronous and asynchronous modes, they curate content visually through a variety of options including presentation slides, videos, photos, websites; provoke a critical analysis through modalities such as structured and moderated discussion boards with guide questions, break out groups, pre-class individual and group work, and games; and synthesize ideas after the discussion.

In the four semesters of online learning and teaching considered in this study, I observed that the “new” experience with the DP positively affected learning albeit in varying degrees. This held even when the parameters of the DP were adjusted according to the contexts of the students in every semester. For DP leaders, the most noteworthy outcome is that “learning by teaching” catalyzed mastery of the subject matter faster. Students were able to appreciate the basic principle that leading others in a discussion presupposes mastery. Other outcomes were more active engagement with the learning resources from both DP leaders and participants, deeper community-building as students had to relate with each other and give inputs in a *primus inter pares* setting where non-DP leaders were expected to offer meaningful contributions as equals. Where DPs were organized by groups of students, I observed group solidarity and friendly competition among groups. Students were challenged to be creative as they explored their own approach to the DP. Drawing on Vygotsky (2004), this indicates that when the framework of learning is made inherently creative, students are then prodded to “disturb” themselves and others in order to re-imagine problems, answers, and meanings.

### **Challenges in Operationalization**

Discourses on difficulties in using the online modality in higher education are rife.

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<sup>1</sup>Students are encouraged to relate readings to popular discourses and current events and use other resources. However, I establish at the beginning that mastering the assigned resources is primary.

Student issues include the unequal access to devices and the internet, the lack of adequate physical learning space for distance education, the pedagogical implications on certain disciplines that require physical meetings, and psycho-emotional effects of not meeting together physically (Baticulon et al., 2021; Gocotano et al., 2021; Castro & Tumibay, 2021). These difficulties have already existed even without attempting to encourage agency, mindfulness, and critical thinking in the classroom. When they all interact, the predicament becomes more challenging. Despite the positive effects of the DP in general as discussed in the preceding section, it is still important to consider particular issues and varied learner experiences in aid of continuously improving the interventions.

### **Understanding the Framework**

While students found course outcomes straightforward targets toward which they should strive, practicing agency, mindfulness, and critical thinking was intuitive in the notional level but harder to actualize consciously. This is due to strongly ingrained ontologies of learning that they had gotten used to. In general, uneven pre-pandemic exposure and experience with ICT affected but did not impede higher education students from participating per se in class using devices and the internet (Zarei and Mohammadi, 2022). However, learner control or the practice of agency in studying was another challenge altogether (Reyes et al., 2021). These issues can be minimized by spending more time at the beginning of the course in explaining the correspondence of the competencies with sample activities and the character of peer engagement. The challenge of students internalizing the framework applies to both face-to-face and online contexts but the latter adds another layer of challenge in the sense that the relational component of the framework seems to require more motivation in a distance education setting where one only sees small boxes of people on a laptop screen or none at all when students keep their video cameras turned off.

### **Leading Discussions and Engaging Peers**

In some cases, DP leaders demonstrated mastery of the material through a dynamic presentation but participation by peers was only given a few minutes during an open forum at the end. A few DP leaders were sometimes fixated on peer participation per se, resulting in overemphasizing convivial and entertaining activities. Improving substantive peer engagement should then involve encouraging deeper appreciation of the framework and better preparation. The former cannot be underestimated as pedagogical change occurs in both the level of practice and belief (Antunes et al., 2021). On the other hand, students ascribe the lack of preparation to increased job responsibilities amid more multitasking and the lack of work-life boundaries in online work. Students also intimated that they had to negotiate study time with escalating responsibilities in the household and financial burdens as affected by the shifting structure in family employment caused by the pandemic. With fatigue to deal with, which they often expressed, reverting to traditional reporting (e.g., sharing the content of the learning resources through PowerPoint slides) seemed mentally easier than learning a new approach, which entailed managing the features of the Zoom application for the discussion, using the learning management system

for posts, and using online games and break out rooms. Nevertheless, students still exerted effort to raise questions and seek answers and participation from the rest of the class.

In a few other cases, perhaps due to normative beliefs on the exercise of authority owing to ingrained pedagogical leadership focused away from students (Grice et al., 2023), DP leaders appeared taciturn about calling on peers to provide inputs. This challenged discussion facilitation. Parallel to what was mentioned in the previous subsection, the distance aspect in online education also required more effort to overcome what seemed to be an inherent ease for disengagement. Finally, technology-related issues exacerbated the difficulties in leading. When the quality of devices and internet access was compromised, implementing a DP proved to be difficult. Videos and other visuals would not load well and a sluggish internet connection, especially during inclement weather, hampered activities and necessary interaction.

### **Participating Actively**

Kahu (2013) looks at impediments to student engagement and points to a confluence of behavioral, institutional, psychological, political, societal factors. Having a specific pandemic context, Baticulon et al. (2021) categorize factors as related to technology, personal circumstances, and domestic, community, and institutional contexts. The reasons for students' lack of study time mentioned in the previous subsection also applied to the rest of the participants. Likewise, graduate student participation in my courses was influenced by a mix of all these.

Some students had to get used to a question-and-answer framework (Q&A) such that when questions were raised, some students could not respond immediately. A Q&A format is useful for training students to cover the material through questions in an "outcome-leading" approach in the fashion of the Socratic method (Golding, 2011, p. 366), but the Q&A can be designed to do even more and inculcate a "thinking-encouraging" approach (Golding, 2011, p. 365). The first approach trains students to reach pre-determined answers while the second approach leads students to delve into how they process the subject matter and how they arrive at answers by analyzing, appraising, and creating meanings. In both cases, some students took time to acclimatize to this structure. Again, these issues were further exacerbated by technology-related difficulties. Some students' internet connections kept getting cut off and some skipped the session and instead just posted their ideas on the learning management system. This affected the intended social epistemology effect of the discussions. When students only had access to mobile phones, they were unable to do certain things online that would have been easier if a laptop was used.

Student challenges in Q&A participation may also relate to individual reading time not being attuned to answering questions or problem solving. In this light, the introductory session can also be more attentive in explaining how critical discussion inputs begin with critical reading (Wallace & Wray, 2021). There were times when students could not read adequately, citing workplace



and household distractions. When reading is insufficient, it is exhibited in how inputs editorialize stock knowledge in lieu of the higher-order thinking skill of evaluating the assigned course materials. It must be emphasized that exercising higher-order thinking skills requires that one does not jump, for example, to evaluating, without reading and understanding the material first, which are basic competencies. While the time needed to manage graduate reading has always been present in both face-to-face and online modalities, and students are used to getting the set of readings through online folders, the pandemic made almost all activities online, heightening fatigue towards online tasks including reading, which mostly involved electronic material viz. print-outs. Many students expressed that they had to manage the disorientation of migrating to an online life while having to read critically in inadequate home spaces.

### Conclusion

Online education in graduate pedagogy is here to stay—whether it pervades an entire course or is a component of a hybrid approach. The preceding sections provide a glimpse of the multifaceted challenges of designing an empowered pedagogy in online higher education. It is necessary for teachers to consider the evolving nuances and milieu in student engagement in aid of improving teaching and learning. Engendering agency, mindfulness, and critical thinking in the classroom should be approached with an iterative process of pedagogical design, reflections on learner responses, and ensuing adjustments. This interrogation is a first step in larger work that seeks to look at sustainable pedagogy, which includes the contexts of learners, teachers, and their environments. Finally, further work can consider the utility of phenomenography in qualitative research to improve learner-centered interventions in the graduate classroom.

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## Student Engagement in an Online Class

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### Abstract

*The present study used descriptive research design to assess student engagement in an online class of a city college in Southern Philippines. It underscored the critical role of student engagement in shaping the various educational outcomes in an online learning environment. A sample of 239 college students were randomly selected to respond to a researcher-made questionnaire, which was pilot-tested and passed the test of validity and reliability. With at least two years' experience of attending online classes that started during the COVID-19 era, the students' Internet profile was characterized as having used cellphones and phone Internet to attend online classes and having spent more than 2 to 4 hours daily on the Internet for non-academic purposes. The findings of this study have further shown that the students are engaged in the cognitive, affective, and behavioral domains of online learning. Using the Kruskal-Wallis test for Likert-scale data, no significant difference was found in student engagement in an online class when grouped according to access to Internet, time use of Internet for non-academic purpose, and types of gadgets used. Based on these findings, the study has recommended the following: a) the use and mastery of teaching strategies that promote active listening, asking direct questions to the teachers, greater talking time of the students, and more interaction between teacher and students; and b) the use of breakout rooms in an online classroom for small group discussions and greater collaborative learning among students.*

**Keywords:** *student engagement, cognitive domain, affective domain, behavioral domain, online learning*

### Introduction

Student engagement in an online class is a critical component towards the achievement of important educational outcomes. Literature abounds with a good number of studies showing various student outcomes of the use of online technology in a school's delivery of educational content. Some of these studies reported positive student outcomes of attending an online class like increased satisfaction of learning needs, more convenience, and greater interest to learn

(Sayem et al., 2017; Wang et al., 2018; Agarwal & Kaushik, 2020). However, other studies revealed otherwise. In these studies, college students reported that online learning experiences were not engaging and satisfying (Tang et al., 2020; Herman, 2020) and that such learning modality has spawned some social and affective challenges resulting to increased stress, anxiety, and difficulty to concentrate among online students (Lemay et al., 2021).

In the Philippines, a mixed methods study showed the quantitative outcomes indicating moderate to high levels of online learning fatigue among student respondents and the qualitative outcomes relating online learning fatigue with the students' decreased energy to perform academic tasks and absorb lessons taught (Dacillo et al., 2022). However, a local study reported a positive finding of students' high level of course satisfaction and engagement with the online learning delivery (Baloran et al., 2021).

The ambivalent results of the above literature show a need to replicate this kind of research in other places. Furthermore, with the present age of information, online learning is now an increasingly popular way forward in the delivery of educational content preferred by many schools and universities all over the world. Thus, there is an ongoing need to assess the extent of student engagement in an online class. Viewed from this lens, the researchers were challenged to conduct a similar study among college students from a premier institute of higher learning in Southern Philippines with the objective of assessing their extent of learning engagement in an online environment. Findings of the present study would inform important stakeholders of the college—especially the parents of online students—about how their students learn well in an online environment and how the college perform well in an online delivery of the educational content. Aside from contributing to the existing body of knowledge, the findings of this present study may also provide a basis in designing better lesson plans for online classes and crafting effective online curricular offerings which the college may offer with its existing Internet infrastructure and wealth of online teaching experiences of its staff.

### **Objectives**

This study aimed to describe the learning engagement of college students in the online classes of a city college. Specifically, it sought to address the following questions:

1. What is the students' Internet profile according to access to Internet, time use on the Internet for non-academic purpose, and types of gadgets?
2. What is the level of learning engagement of the students in an online class according to cognitive domain, affective domain, and behavioral domain?
3. Is there a significant difference in the learning engagement of the students in an online class when grouped according to access to the Internet, time spent using the Internet for non-academic purpose, and types of gadgets?

## Conceptual Framework

Student engagement is the level of attention, interest, curiosity, and passion of a student in the learning process. As conceptualized by Fredricks et al. (2004), student engagement has embraced three domains namely the cognitive, affective, and behavioral domains. The affective domain refers to a sense of belonging in the classroom as well as one's interest, curiosity, or enthusiasm on a specific task or topic (Fredricks & McColsky, 2012). Moreover, behavioral engagement consists of time-on-task and active participation in class activities (Fredricks, 2013) while cognitive engagement covers the use of metacognitive and self-regulated strategies (Parsons et al., 2014).

Internet users are characterized by the types of gadgets used, non-academic use of the Internet, and access to the Internet. Ellore et al. (2014) found cellphones as the main device learners use to access the Internet. With an ever-increasing technological capacity, there is a growing student use of mobile devices like cellphones and tablets (Chaffey, 2017; Chang et al., 2018). The devices and how they are being used are fast becoming providers of almost seamless continuity of formal learning for the growing population of mobile learners (Ally & Wark, 2018). Some studies suggest that mobile learning can enhance the online learning experience (Pawluk et al., 2018; Philip, 2017) while another study shows that student users of mobile phones may experience learning difficulties and distraction from their online classes, and struggle to meet mobile data expense (Giewrdowski, 2021; May & Elder, 2018). Moreover, Heflin et al. (2017) found that students who used computer keyboards were better critical thinkers than those who used mobile devices in the construction of paragraphs. The study of Dello Stritto & Linder (2018) also revealed that a large majority of American college students (73.1%) preferred laptops for their learning management system (LMS) homepage, and a miniscule 4.3% preferred cellphones for the same purpose.

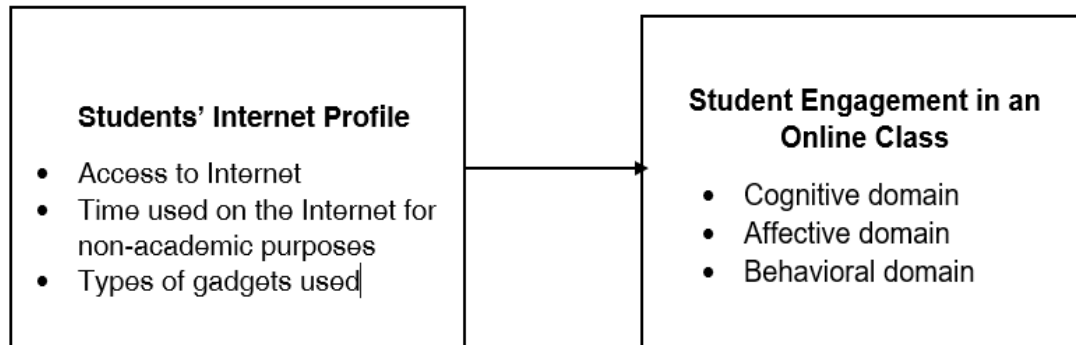
The use of the Internet for non-academic purposes has impacted student outcomes. The prolonged use of the Internet has adversely affected student learning outcomes, and encouraged sedentary and unhealthy lifestyles (Kolbar et al., 2021; Bekalu et al., 2019; Melchevik et al., 2015; Hameed, 2022). In contrast, Zarzycka et al. (2021) reported that students increasingly used social media like Facebook for academic discussion and collaboration in their distant learning courses. Moreover, the use of the Internet for electronic games was found to have detrimental effects on academic performance of adolescents, among others (Lawrence et al., 2016). But Internet and electronic games had also been viewed as a positive determinant not only of academic outcomes but also of self-expression, sociability, creativity, and entertainment for children and adolescents (Yu & Baxter, 2016).

In the conceptual framework, the student engagement in an online class was assessed based on the domain approach of Frederick et al. (2004). This approach consisted of assessing student engagement in the cognitive domain, affective domain, and behavioral domain. The Internet profile of the respondents of the present study were considered as variables that could create differences in the levels of student engagement in an online class when respondents were

grouped according to access to Internet, time used on the Internet for non-academic purposes, and types of gadgets. Figure 1 shows the framework below.

**Figure 1**

*Conceptual Framework of the Study*



### Methodology

This section presents the research design of the study, as well as its respondents, measures, ethical considerations, data gathering procedure and data analysis.

#### Research Design

This study used descriptive research design. In this study, the quantitative method was used to characterize the respondents in terms of their Internet profile, determine the levels of student engagement in an online class, and to evaluate any significant differences in the levels of student engagement based on the students' Internet profile.

#### Respondents

The respondents of the study were taken from a sample of college students enrolled in the Business Entrepreneurship and Teacher Education Programs of a city college. They had at least two years' experience of attending online classes which started during the COVID pandemic era in 2019. Based on the Slovin formula, the sample size, with .05 margin of error, consisted of 239 college students. The sample came from students randomly selected from a population stratified by enrolled program and year level. As presented in Table 1, 66 percent of the respondents came from the Accountancy and Business Entrepreneurship Program and 34 percent from the Teacher Education Program. By year levels of both programs, 53 percent were senior students, 11 percent junior students, 13 percent sophomore students, and 22 percent were freshman students.

**Table 1***Distribution of Respondents According to Academic Program and Year Level*

Academic Profile	F	%
Business Education Program		
First year	19	8.0
Second year	20	8.0
Third year	16	7.0
Fourth year	103	43.0
Sub-total	158	66.0
Teacher Education Program		
First year	34	14.0
Second year	12	5.0
Third year	10	4.0
Fourth year	25	10.0
Sub-total	81	34.0
Grand total	239	100.00

## Measures

This study used a researcher-made self-questionnaire described as “Student Learning Engagement Inventory.” It is a 32-item, closed-ended questionnaire, with subscales on the cognitive domain, affective domain, and behavioral domain. The questionnaire was pilot-tested for content validity and reliability. As the pilot group, 31 college students, enrolled in the College of Accountancy and Business Entrepreneurship (CABE), were asked to respond to the questionnaire and identify words or phrases which were confusing or difficult to understand. None were identified by the pilot group as difficult or confusing words or phrases. The test for Cronbach’s alpha was used to measure the reliability of the questionnaire. A reliability coefficient of 0.70 or higher for Cronbach’s alpha indicates an internal consistency of responses between items (Salkind, 2015). The computation of the study showed a reliability coefficient of 0.89, indicating a good internal consistency of the 32-item questionnaire. Each item on the questionnaire was measured on a five-point Likert scale with the following rating scales: always (5), usually (4), sometimes (3), rarely (2), and never (1). These rating scales correspond to intervals and descriptive interpretations for an overall learner (*see Appendix A*) as well as for learners based on the 3 domains (*see Appendix B*).

## Data Gathering Procedure

The data gathering procedure involved the following steps:

1. Secured an ethical clearance from the Research Ethics Committee of the college.
2. Sent a letter of permission and request to the Deans of the College of Accountancy and Business Entrepreneurship and College of Education and Arts and Sciences to conduct research among students enrolled in the



programs under their colleges and requested for email addresses of these respondents.

3. Emailed the questionnaires to the respondents of the study.
4. Retrieved these questionnaires a week after sending these questionnaires.
5. Talled these results for analysis.

### **Data Analysis**

Data analysis included the use of frequency tables, percentages, mean scores, and the Kruskal-Wallis test. The frequency tables and percentages were used to characterize the respondents according to their Internet use profiles. The levels of student engagement in the three domains were established by the mean scores. For the three independent samples measured on an ordinal scale, the Kruskal-Wallis test was used to determine any significant differences in the medians of three or more independent samples (Akrong Hesse et al., 2018). This was used by the study to determine any significant differences in the medians of the three independent samples when grouped according to the Internet use profiles.

### **Ethical Considerations**

In the conduct of this study, the researchers complied with all the requirements for ethical considerations. These were the following requirements:

*Anonymity.* The participants of the study were given an option not to write their names when providing responses to a closed-ended questionnaire. Should they opted to write their names, they were assured that such names would not appear in any part of the final report and that the questionnaires will be kept securely from any possible leak.

*Confidentiality.* The privacy of the participants shall always be respected, and the confidentiality of the information they provided in the questionnaire shall be strictly maintained. Toward this end, the first statement on the close-ended questionnaire is a confidentiality clause declaring any response to the various questionnaire items will be treated with utmost confidentiality.

*Informed Consent.* The participation of the college students in this research undertaking was done on a voluntary basis. They were informed of their right to quit at any time during the research period should they feel that their participation does more harm than good to them. Also, the participants were informed of the benefits as well as the risks involved in taking part in this research.

## **Results and Discussion**

This section presents the quantitative results based on the objectives of the study with corresponding discussions.

### **Students' Internet Profile**

Table 2 shows the Internet profile of the respondents. In terms of Internet

access, the largest proportion of the respondents, 50 percent, had Internet access through data SIM installed in their cellphones. The second largest group of respondents, 46 percent, were the home Internet users. At the tail end were student users of the school Internet at less than 1 percent.

**Table 2**

*Respondents by Internet Access, Time Used on the Internet for Non-Academic Purposes, and Types of Gadgets Used*

Students' Internet Profile			
Internet Access	f	%	
Home Internet	110	46.0	
Phone Internet	120	50.2	
School Internet	2	0.8	
Others	7	2.9	
Total	239	100.00	
Daily Time spent using the Internet for Non-Academic Purpose			
	f	%	
2 hours or less	56	23.4	
More than 2 hours – 4 hours	91	38.1	
More than 4 hours	92	38.5	
Total	239	100	
Types of Gadgets Used			
	f	%	
Personal Computers & others	9	3.8	
Laptop	50	20.9	
Cellphone	180	75.3	
Tablet	0	0	
Total	239	100	

The present study shows that 50 percent of the respondents have Internet access through data SIM installed in their cellphones. This result is similar to the finding of Ellore et al. (2014) that showed most of the students had Internet access on their cellphones. Some studies have offered reasons on the preferred use of mobile devices (i.e., cellphones and tablets) which included the following: Internet accessibility of the device (Ellore et al., 2014), millennials being supportive of mobile devices for online courses (Wiley University Services, 2023), and the economic ability of low-income families to access the Internet only through these mobile devices (Adetunji, 2016).

Student users of the school Internet numbered less than 1 percent. As observed, the very low usage of the school Internet among the respondents can be explained by the following factors: first, respondents stayed at home and used their home Internet or phone Internet to attend all classes delivered online during the COVID pandemic era, and second, the Internet connectivity

of the school was not enough to service the demands of both students and teachers.

Table 2 displays the distribution of respondents by time spent using the Internet for non-academic purposes on a daily basis. A minority, 23 percent, spent 2 hours or less on the Internet for non-academic purposes. Next to the minority were 38 percent of the respondents with the time use ranging from more than 2 hours to 4 hours. Another 39 percent spent more than 4 hours for the same purpose.

By comparison, the time spent using the Internet for non-academic purposes of the 38 percent of the respondents of this study closely approximated the average daily time spent by Filipinos on the Internet for social media at 3.4 hours (Statista Research Department, 2021). There were also other activities of Filipino Internet users like watching television and listening to music streaming services. As of the third quarter of 2021, a large segment of the Filipino population was accessing the two most popular social media platforms—Facebook and Instagram with Tik Tok (Statista Research Department, 2021). Thus, it can be said that the greater non-academic use of the Internet by the respondents of the study was also accessing these highly popular social media platforms to connect with family and friends, listen to news, stream video content, or to find products and services for purchase. Moreover, a plurality of respondents, 39 percent, spent more than 4 hours on the Internet for non-academic use. This group may be susceptible to having difficulties in performing their academic tasks. According to Kolhar et al. (2021), longer Internet use for social media would have a negative impact on student learning outcomes. Other studies reported that prolonged use on social media adversely affected academic progress (Bekalu et al., 2019) and led to sedentary and unhealthy lifestyles (Melchevik et al., 2015).

By types of gadgets used, Table 2 shows that a large majority of the respondents, 75 percent, preferred cellphones as mobile devices for online learning. This is followed by 21 percent who used laptops to access their online classes. A minuscule 4 percent used personal computers for online learning and nobody used tablets for the same purpose.

The use of cellphones as the dominant technological device for online learning is supported by studies which found an increasing student use of sophisticated mobile devices, such as smartphones and tablets (Chaffey, 2017; Chang et al., 2018) and how these devices are fast evolving as tools for formal learning for the increasingly mobile learner (Ally & Wark, 2018). Worth noting in Table 2 was the respondents' non-use of tablets, which was found by other studies to have a greater number of users (Ally & Wark, 2018; Stritto & Linder, 2018).

### **Cognitive Domain**

Table 3 shows the level of student engagement in the cognitive domain with a composite score of 3.86. By item results, the sixth item obtained the highest mean score of 4.36 and the seventh item got the lowest mean score of 2.15

**Table 3***Student Engagement in the Cognitive Domain*

Cognitive Domain	Mean Score
1. I understand the teacher's lecture in an online class.	3.81
2. I learn a lot from the lessons discussed during online classes.	3.87
3. I ask questions from my classmates or teachers for further understanding on the lessons during online classes.	3.72
4. I answer questions raised by our teachers during online classes.	3.64
5. I share my opinions or comments in an online class discussion.	3.38
6. I answer assigned exercises to check my understanding on a lesson in an online class.	4.36
7. I spend most of the online class time listening to a teacher's lecture.	2.15
8. I can discuss things related to our lessons with my classmates in an online class.	3.69
9. We work as small groups on assigned tasks in an online class.	3.82
10. I know what lesson objectives I need to achieve in an online class.	3.97
11. I organize my study time with online classes.	3.90
12. I reflect on what and how I learn from my errors committed in exercises/tests in an online class.	4.15
13. I can analyze well problems given as exercises in an online class.	3.77
14. I can solve problems given as exercises in an online class.	3.87
<b>Composite Mean Score</b>	<b>3.86</b>

The composite score of 3.86 indicates that the respondents of the study possess high levels of active learning, metacognition, and self-regulation. By item analysis, the highest scoring item, respondents doing the exercises in order to check their understanding of the lesson, indicates a very high level of metacognition, which is the ability to process one's thinking. This also implies that the respondents are highly aware of their cognitive processes and the need to regulate them. This result has a positive implication on student outcomes as research in educational sciences has gathered substantial evidence to show the importance of metacognition in learning and academic achievement (Fleur et al., 2021).

The item with the lowest mean score shows that the respondents spend most of the online class time listening to a teacher's lecture. This result implies a one-way student-teacher interaction and passive learning among the respondents. One consequence of a large-group lecture in higher education is passive learning which is not in tune with the current academic rhetoric (Roberts, 2019). This is another area for improvement to enhance student-teacher interaction. In the study of Martin and Bolliger (2018), online students in graduate school found student-teacher interaction to be more important than student-student interaction and student-content interaction. Thus, online teachers should have less talking time in course discussions (Dixson, 2010), timelier and more consistent feedbacks to the students (Martin & Bolliger, 2018), and have regular communication of announcements, reminders, graded rubrics, and expectations

by the online teacher (Martin & Bolliger, 2018).

### Affective Domain

Table 4 shows the level of student engagement in the affective domain with a composite score of 3.24. By item results, the 8th item obtained the highest mean score of 3.91. Items 6 and 10 got the lowest mean scores of 2.45 and 2.25, respectively.

**Table 4**

#### *Student Engagement in the Affective Domain*

Affective Domain	Mean Score
1. I am inspired attending our online classes.	3.90
2. I prefer sitting in an online class than in a face-to-face class.	2.67
3. I am bored listening to lectures during online classes.	3.02
4. I am motivated to study during online classes.	3.30
5. I do not feel I belong as a member of an online class.	3.63
6. I have experienced technical difficulties joining our online classes.	2.45
7. I enjoy learning lessons in an online class.	3.45
8. I feel the caring and supportive presence of my online teacher.	3.91
9. I am satisfied with the learning materials used in an online class.	3.79
10. I experience physical discomfort (i.e. headache, eye strain, back ache, etc.) attending an online class.	2.25
<b>Composite Mean Score</b>	<b>3.24</b>

The composite score of 3.24 indicates that the respondents possess moderate emotional satisfaction in an online class. By item analysis, the 8th item with the highest mean score of 3.91 indicates high emotional satisfaction of the respondents on the caring and supportive presence of their online teachers. The result shows that online teachers of the respondents have nurtured a caring and supportive relationship with their students. Moreover, the result is similar to the study of Zaheer et al. (2015) that showed instructor support with the highest mean score, indicating that instructors were doing well in providing support and guidance for their online learners.

The low-scoring items (6 and 10) indicate emotional dissatisfaction of respondents due to their experiences of technical difficulties in joining the virtual platform and the physical discomfort during an online class. This experience of technical difficulties and physical discomfort, however, is not a unique case as this was also experienced by students attending classes in various Philippine universities in the wake of the COVID-19 crisis (Rotas & Cahapay, 2020).

### Behavioral Domain

Table 5 shows the level of student engagement in the behavioral domain with

a composite score of 3.70. By item results, the 6th item obtained the highest mean score of 4.43 while items 2 and 8 got the lowest mean scores of 3.01 and 2.95, respectively.

**Table 5**

*Student Engagement in the Behavioral Domain*

Behavioral Domain	Mean Score
1. I am on time or earlier joining our online classes.	4.21
2. I browse other websites while an online class is ongoing.	3.01
3. I do not pay attention to the teacher's lecture during an online class.	3.66
4. I cheat in an online test.	3.80
5. I do not pay attention to my classmates who answer, discuss, or explain something during an online class discussion.	3.67
6. I make, complete, and submit my online assignments on time.	4.43
7. I play with my cellphones while an online class is ongoing.	3.89
8. I perform other lesson activities aside from listening to lectures in an online class.	2.95
Composite Mean Score	3.70

The composite score of 3.70 indicates that the respondents possess a strong sense of self-discipline, responsibility, and regard for others. By item analysis, the 6th item, with the highest mean score of 4.43, indicates that the respondents are very strongly responsible in making, completing, and submitting online assignments on time. This is an encouraging result as literature has shown a significant association between online submission of assignments and academic performance. Previous studies have reported that prompt submission of online assignments resulted in better online learning experience and higher academic performance (Akcapinar & Kokoc, 2020), and late submissions were associated with lower academic performance and procrastination tendencies (Cormack et al., 2020).

The 2nd item, a low-scoring one, indicates that the respondents' class attention is divided as they browse other websites while the online class is ongoing. Similarly, in the study of May and Elder (2018), students used Internet-connected devices for both academic and non-academic purposes, which was a source of distraction from their attention in an online class. The 8th item, another low scoring item, indicates that there are fewer lesson activities performed by the respondents aside from listening to lectures in an online class. According to Wu (2021), the online instructional behaviors often performed by college teachers were lectures with a presentation and a whole-class synchronous discussion. A whole-class discussion is not the most conducive format to encourage participation from a greater number of students. Thus, the students were likely to become passive and disengaged in a whole-class discussion as well as the online lecture of a teacher.

### Student Engagement in the Three Domains

Table 6 shows the composite scores and overall mean score of student engagement in the cognitive, affective, and behavioral domains. The cognitive domain had the highest composite score of 3.86 and the affective domain got the lowest at 3.24. The overall score was computed at 3.63.

**Table 6**

*Student Engagement in the Three Domains*

Learning Domains	Composite Mean Score
Cognitive Domain	3.86
Affective Domain	3.24
Behavioral Domain	3.70
Overall Mean Score	3.63

An overall mean score of 3.63 indicates that the respondents of the study are engaged in the cognitive, affective, and behavioral domains of online learning. This result has a positive implication on the academic performance of online learners. Research literature abounds with studies showing outcomes of positive relationships between student engagement and academic performance (Rajabolee et al., 2019; Moubayed et al., 2018).

### Student Engagement by Internet Use Profile

Based on the Internet use profile, the respondents of the study were grouped into three categories: according to access to the Internet, time spent using the Internet for non-academic purposes, and types of gadgets used. Table 7 shows the results of the test of difference of student engagement in these categories. Using the Kruskal-Wallis test, the computed p-values (i.e., .82014, .11164, and .33626) are all greater than .05.

**Table 7***Test of Difference of Student Engagement by Internet Profile*

Students' Internet Profile			
Access to Internet			
Access to Internet	H-statistic	p-value	Interpretation
Home Internet	0.3966 (2, N=239)	.82014	Not significant
Phone Internet			
School Internet/Others			
Time Spent Using the Internet for Non-Academic Purposes			
Daily Time Use	H-statistics	p-value	Interpretation
2 hours or less	4.385 (2, N=239)	.11164	Not significant
More than 2 – 4 hours			
More than 4 hours			
Types of Gadgets Used			
Types of Gadgets Used	H-statistics	p-value	Interpretation
Personal computers and others	2.1797 (2, N=239)	.33626	Not significant
Laptop			
Cell phones			

Table 7 shows all results to be insignificant. These indicate that the respondents of the study—regardless of their access to the Internet, time spent using the Internet for non-academic purposes, and types of gadgets used—have the same levels of engagement in the cognitive, affective, and behavioral domains. These further indicate that the Internet-related factors do not affect student engagement in an online class.

### Conclusions and Recommendations

#### Conclusions

The following are the conclusions based on the objectives of the study:

1. The student uses a cellphone and phone Internet to access the online classroom and spends more than 2 to 4 hours daily on the Internet for non-academic purposes.
2. Student engagement in an online class is characterized by the following: high levels of active learning, metacognition, and self-regulation; moderate emotional satisfaction; and strong sense of self-discipline, responsibility, and regard for others.
3. There are no significant differences in the levels of student engagement when grouped according to academic program, Internet access, time spent



using the Internet for non-academic purposes, and types of gadgets used.

### Recommendations

Based on the objectives and the above conclusions, this study makes the following recommendations:

1. Online teachers may attend training sessions in order to know and master teaching strategies that promote active listening among online learners, asking direct questions from the teachers, greater talking time of the students, and more interaction between teacher and students.
2. To encourage collaborative learning among online students, an online classroom may have the feature of a breakout room. This feature provides an online teacher the ability to provide spaces for small group discussions. A small group discussion provides students greater opportunity to share their ideas or opinions as well as to interact with the other group members.
3. Students may complement their online learning engagement with regular physical activities during their free time in order to alleviate the physical and mental strains spawned by prolonged screen time.
4. Future researchers may pursue further study on what factors could impact student engagement in an online class. In identifying these factors, consideration should be given to teaching strategies that help develop and promote student-teacher interaction in an online class.

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## Appendices

### Appendix A

*Intervals, rating scales, and descriptive interpretations for an overall learner*

Numerical Scale	Interval Range	Descriptive Range	Descriptive Interpretation
5	4.21 – 5.00	Always	Learners are fully engaged in the cognitive, affective and behavior domains.
4	3.41 – 4.20	Usually	Learners are engaged in the cognitive, affective and behavior domains.
3	2.61 – 3.40	Sometimes	Learners are less engaged in the cognitive, affective and behavior domains.
2	1.80 – 2.60	Rarely	Learners are disengaged in the cognitive, affective and behavior domains.
1	1.00 – 1.79	Never	Learners are fully Disengaged in the cognitive, affective and behavior domains.

**Appendix B**

*Intervals, rating scales, and descriptive interpretations for cognitive learner, affective learner, and behavioral learner*

<b>Numerical Scale</b>	<b>Interval</b>	<b>Rating Scale</b>	<b>Descriptive Interpretation</b>
<b>5</b>	4.21– 5.00	<i>Always</i>	a cognitive learner with very high levels of active learning, metacognition, and self-regulation
			an affective learner with very high emotional satisfaction
			a behavioral learner with a very strong sense of self-discipline, responsibility, and regard for others
<b>4</b>	3.41– 4.20	<i>Usually</i>	a cognitive learner with high levels of active learning, metacognition, and self-regulation
			an affective learner with high emotional satisfaction
			a behavioral learner with a strong sense of self-discipline, responsibility, and regard for others
<b>3</b>	2.61– 3.40	<i>Sometimes</i>	a cognitive learner with moderate levels of active learning, metacognition, and self-regulation
			an affective learner with moderate emotional satisfaction
			a behavioral learner with a moderate sense of self-discipline, responsibility, and regard for others
<b>2</b>	1.80– 2.60	<i>Rarely</i>	a cognitive learner with low levels of active learning, metacognition, and self-regulation
			an affective learner with emotional dissatisfaction
			a behavioral learner with a weak sense of self-discipline, responsibility, and regard for others
<b>1</b>	1.00– 1.79	<i>Never</i>	a cognitive learner without active learning, metacognition, and self-regulation
			an affective learner with strong emotional dissatisfaction
			a behavioral learner without self-discipline, responsibility, and regard for others

# Perceptions of Higher Education Faculty Regarding the Use of Chat Generative Pre-Trained Transformer (ChatGPT) in Education

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## Abstract

*This research delves into the perspectives of faculty members in higher education regarding the utilization of Chat Generative Pre-Trained Transformer (ChatGPT) in the realm of education. Additionally, it examines the probable impacts of this technology on social transformation and academic settings in the Philippines. A research study was conducted wherein 20 faculty members from a state university in the Philippines were questioned to acquire their perspectives and firsthand encounters regarding the utilization of ChatGPT in their academic instruction. The research's findings showed that ChatGPT had both beneficial and detrimental effects on higher education. On the positive side, ChatGPT can be a helpful learning tool for students, especially for those who are introverted, and can simplify the repetitive tasks that educators perform while encouraging the growth of students' self-directed critical thinking skills. The utilization of ChatGPT may have adverse effects on students' critical thinking skills and promote excessive dependence on technology. Moreover, the research revealed that although the faculty members were cognizant of ChatGPT's existence, they did not entirely depend on technology to execute high-quality education. The efficacy of artificial intelligence and its incorporation in the realm of education, as per the respondents, was contingent upon the conscientiousness of the faculty and administrators in facilitating the enhancement of students' analytical and evaluative proficiencies.*

**Keywords:** artificial intelligence, ChatGPT, AI education

## Introduction

The integration of artificial intelligence (AI) tools, particularly the Chat Generative Pre-Trained Transformer (ChatGPT), has garnered significant interest in the ever-evolving field of educational technology. As institutions explore the potential of these advancements, understanding faculty perspectives on the utilization of ChatGPT in their courses and analyzing the consequences of these perspectives on the teaching-learning process becomes crucial. This research aims to bridge the gap between faculty attitudes towards the incorporation of AI and the tangible effects of these perspectives on educational approaches.

The integration of AI has brought about a substantial change in the way students approach learning tasks. In today's society, where social responsibilities are in

constant flux, and expectations are higher than ever, students find themselves under increased pressure. This pressure has prompted faculty members to recognize the need to update their teaching methods, especially in technology courses. AI has emerged as a catalyst for student-centered learning, providing personalized tutorials that significantly facilitate academic tasks.

### **Objectives**

The general objective of this research was to investigate the viewpoints of higher education instructors on the educational implications of ChatGPT. Specifically, the research intended to: (1) examine and analyze the attitudes and beliefs of faculty members towards the incorporation of ChatGPT in their educational courses; (2) investigate the specific effects and consequences of integrating ChatGPT into educational activities, focusing on the implications for teaching and learning processes; and (3) evaluate the role and impact of ChatGPT and AI in education in fostering social change within the educational context, considering its potential to influence pedagogical approaches and learning outcomes. By achieving these objectives, the research seeks to contribute valuable insights into the dynamic relationship between faculty perspectives and the practical implications of integrating ChatGPT into educational settings. This study aims to provide a foundation for informed decision-making and strategic implementation of AI tools in higher education.

### **Review of Related Studies**

Anderson et al. (2018) have examined the potential of networked AI in improving human effectiveness, which has been recognized. Nevertheless, there are concerns that arise regarding the implications of interconnected artificial intelligence on human self-governance and capacity for action. The growing incorporation of AI systems such as ChatGPT in education is especially significant, leading to investigations into the potential influence on students' intellectual independence and ability to make decisions. This concern originates from John McCarthy's 1956 hypothesis, suggesting that machines have the ability to imitate different aspects of human learning.

Recent studies conducted by Atlas (2023), Chan and Hu (2023), and Luckin (2017) have shown a gradual increase in the use of AI in educational institutions with the aim of improving student learning. These scholars emphasize the capacity of AI to provide immediate customized feedback and adjust to various learning preferences. Through imparting AI knowledge to students, educational institutions strive to enable their active engagement in achieving the wider societal advantages that AI can provide.

The BEDP 2030 and the National AI Roadmap in the Philippines highlight endeavors to utilize predictive models for data-based decision-making and promote the development of AI technologies (Guey, 2021). Nevertheless, it is imperative to tackle obstacles such as the high expenses associated with installation and the lack of expertise in AI technology. It is advisable to promote cooperation between the industry and the education sector in order to close the skills gap and generate a workforce that is in line with the requirements of the



Nilsson (2012) offers a historical viewpoint on the inception of AI, ascribing its origins to the concepts proposed by John McCarthy in 1955. McCarthy's conception of a computer endowed with cognitive capabilities similar to those of humans has established the philosophical basis for the advancement of AI from a theoretical idea to a practical technological actuality.

Duan et al. (2019) and Topol (2019) highlight the progress of artificial intelligence in replicating intelligent human behaviors. This perspective portrays AI as a tool that replicates and enhances human cognitive capacities, in accordance with the philosophical belief that technology enhances human abilities. In their extensive analysis, Baker and Smith (2019) propose a philosophical framework that classifies AI in education into three distinct categories: learner-oriented AI, instructor-oriented AI, and institutional system-oriented AI. This categorization highlights the significance of tailored artificial intelligence solutions in meeting the distinct requirements of learners, instructors, and educational systems.

According to Smith (2019), Teacher-Oriented AIEd plays a crucial role in empowering educators and fostering innovation in the classroom. Artificial Intelligence in Education (AIEd) functions as a potent instrument to improve teaching methods, decrease workload, offer valuable insights into student progress, and promote the adoption of innovative teaching practices. Artificial intelligence is the cornerstone of all computer learning, and such systems will ultimately be in charge of all complex decision-making. Nevertheless, AI is a reality that will not go away. The learning technology of the future is AI. Our approach to education could be fundamentally changed by AI, which would make it more individualized, effective, and efficient. Reports from around the world indicate that AIEd is one of the most promising new areas in educational technology. Although it has been around for about 30 years, educators are still unsure of how to take full pedagogical advantage of it and how it can affect teaching and learning in higher education (Educause, 2018).

The UNESCO framework for artificial intelligence in education is outlined in their guide titled "AI and Education Guidance for Policy Makers" (2021) and promotes a humanistic approach, prioritizing the safeguarding of human rights and the cultivation of essential skills and values. The framework emphasizes the importance of efficient collaboration between humans and machines in different areas of life, education, and employment, while giving significant value to human control within the realm of artificial intelligence. Chan's (2023) study emphasizes the necessity of incorporating AI technologies to enhance skills such as digital competence and time management. The main emphasis is placed on cultivating fundamental transferable competencies in students. The importance of continuous monitoring and evaluation is stressed to guarantee the success of AI integration in university teaching and learning. This enables regular assessments of the impact of AI on teaching practices and student performance.

## Methodology

This study investigated faculty members' perceptions of the use of ChatGPT and its implications in higher education. The research was conducted

at a state university in the Philippines. Participants in this study were selected using purposive sampling, employing a homogenous sampling method. All respondents are lecturers and faculty members from the aforementioned state university in the Philippines.

During the planning phase, potential participants were informed about the study, and the researcher clarified the purpose and scope of the research to ensure transparency. The primary data collection method involved an online survey with five statements related to faculty perceptions regarding ChatGPT and its implications in higher education. Additionally, a face-to-face interview was conducted with a key informant—an expert in Artificial Intelligence in Education. A formal consent form and a permission document for research were established to formally request data collection within the university. A data privacy statement was prepared and provided to participants before distributing the online survey forms. The collected data underwent exploratory qualitative analysis using an online qualitative research tool. Thematic analysis, following Braun and Clarke's (2006) guidelines, were employed to identify patterns, themes, and insights within the responses.

Ethical considerations included obtaining informed consent from participants, ensuring data privacy, and obtaining formal permission from the university to conduct the research. The study was conducted in three phases: planning, data collection, and data analysis, with a realistic timeline established to ensure the efficient execution of each phase. Limitations included the generalizability of findings, given the specific context of the state university in the Philippines. Additionally, the study relied on self-reported perceptions, introducing a subjective element to the data.

## **Results and Discussion**

Based on feedback from 20 academic staff members at a state university, it is evident that ChatGPT shows promise as an educational tool for post-secondary institutions. Nevertheless, it is imperative to tackle concerns pertaining to precision and morality and establish procedures prior to incorporating it into the university environment. The data indicates that a substantial proportion of participants do not utilize ChatGPT for research endeavors. While some faculty members utilize it, they lack formal training and have self-educated themselves through online tutorials and practical use. Despite its limitations, ChatGPT can assist educators in generating and evaluating data efficiently, especially when resources are limited. Limited experience and resources with ChatGPT present a notable challenge. The data suggests that many faculty members are unfamiliar with ChatGPT, primarily due to time and resource constraints. Academic staff members face heavy workloads due to research commitments, administrative tasks, and teaching responsibilities, leaving them with insufficient time to explore ChatGPT's various applications. Faculty members have expressed concerns about their proficiency in using ChatGPT, with one noting its reliance on programming techniques, which necessitates a learning process for senior academic staff. Additionally, some faculty members lack confidence in their ability to utilize new technology effectively and question the accuracy of data provided by ChatGPT.

Furthermore, several participants have not yet evaluated ChatGPT's suitability for their courses, hindering its integration into instructional activities. In higher education, the application of AI is met with skepticism among most research participants. This skepticism is primarily due to their limited knowledge of its implementation, inadequate access to resources, lack of self-assurance, and little incentive to acquire expertise in its use. Concerns are also raised about ChatGPT's potential to make errors, misinterpret instructions, and provide inaccurate data. Many survey participants are hesitant to embrace ChatGPT or AI in higher education due to the absence of established ethical guidelines by academic institutions. Additionally, while some features are available for free, the full range of functionalities requires a recurring monthly fee. Faculty members have provided feedback on the integration of ChatGPT in higher education, emphasizing its accessibility and user-friendliness for tasks like information generation, essay review, and project evaluation. At a state university, some participants are using ChatGPT for scholarly purposes. Common uses include verifying assignments, creating templates, reviewing essays, finding research inspiration, developing instructional materials, and supporting research writing and knowledge acquisition efforts. As indicated by the sixth participant (P6) of the study:

"Actually, ChatGPT can really be beneficial if used correctly. From the point of view of a student, writing long essays and papers will be easy. They will learn from the info they can get from AI like ChatGPT. Decision-making systems will be more accurate if AI is integrated."

A significant number of participants instruct various disciplines, including education, social sciences, and information technology. Some members of the academic community are open to using ChatGPT in higher education, believing that implementing deep learning methods can enhance students' comprehension of subjects and prepare them for professional careers. Despite initial reservations, ChatGPT has proven useful in creating educational materials and assessing students' written assignments. According to feedback from faculty members, integrating Artificial Intelligence into tertiary education is a viable prospect, and ChatGPT can have a substantial positive impact. One respondent stated, "AI is already here and here to stay," suggesting that strict regulations from the administration won't hinder students' adoption of new technology, which can equip them with essential skills and knowledge for employment. P11 also noted ChatGPT's potential as a utility tool in higher education:

"I have not exhaustively explored the utility of this tool in higher education but in some of my uses the tool can potentially be used to assist the faculty in marking students' assignments, essays, etc.; also, it can be used to find ways on how to clearly communicate the theories or concepts to the students; you can request assistance from the tool to present the theory in a simplified discussion; thirdly, the tool can also be used to synthesize a long discussion so that only those important points can be highlighted; it can also provide an immediate feedback to queries that students may raise in the class."

The utilization of ChatGPT shows promise in enhancing the educational ex-

perience for students by providing convenient access to relevant information and supporting their decision-making processes. Educators can benefit from ChatGPT in evaluating academic assignments, conveying theoretical and conceptual knowledge to learners, and promptly addressing student inquiries. Participants have noted that ChatGPT has the potential to reduce the time spent on classroom preparation and improve the quality of educational resources, depending on the user's proficiency level, as stated by P16: "It can make specific parts of our workflow faster." Furthermore, ChatGPT functions as a proficient automated tutor, assisting learners with basic inquiries and offering evidence-based perspectives and relevant literature on specific subjects.

The use of ChatGPT may raise concerns related to academic dishonesty, inadequate safeguards for intellectual property, overreliance on technological tools, decline in self-directed learning, and hindrance to the development of critical thinking skills. Most participants agree that relying on ChatGPT in the future could lead to dependency on the technology and hinder their academic progress. Additionally, some participants emphasized the problematic aspects of ChatGPT due to its lack of uniformity, making it susceptible to the spread of misinformation and deceptive content. One respondent stressed the importance of educators recognizing and appreciating the impact of Artificial Intelligence (AI) in education. As explained by P9, people who use it may rely too heavily on ChatGPT's answers and not make sufficient effort on their own. While this is an impressive AI tool, it is still prone to errors. Users should maintain critical thinking and analysis to identify fake news and misinformation.

Participants stressed the importance of creating an environment that promotes the growth of AI while ensuring that students continue to acquire essential skills. Educators face a significant challenge in establishing a conducive learning environment that fosters the development of crucial competencies while integrating technology. Most participants express concerns about the potential misuse of ChatGPT for academic dishonesty and the spread of inaccurate information among students due to the lack of established ethical protocols.

Consequently, using thematic analysis, the first prominent theme, characterized as the *perception of ChatGPT usage in courses*, emerged. The data revealed the following insights: (1) Varied Feedback: The data shows a wide range of feedback from participants regarding the use of ChatGPT in courses, indicating diverse perspectives among faculty members. Both positive and negative feedback indicate a multifaceted and subtle comprehension of the efficacy and worth of ChatGPT in education; (2) Potential Benefits: Participants recognize the prospective advantages of ChatGPT as an instructional tool in higher education courses in the Philippines. The perceived benefits of these enhancements extend to both students and faculty members, suggesting the potential to improve teaching and learning experiences; (3) Negative Perception and Distrust: A considerable proportion of participants exhibited unfavorable perceptions of ChatGPT, predominantly attributing their lack of trust as the primary factor. The negative sentiment is ascribed to participants' limited knowledge and inadequate access to the ChatGPT application, which underscores potential obstacles to acceptance and adoption; (4) Positive Perception Based on Experience: Conversely, some participants had positive perceptions

of ChatGPT, which were influenced by their prior utilization of it in their professional domain. This indicates that previous exposure to ChatGPT can have a beneficial impact on faculty members' views and attitudes towards its utilization in educational environments; (5) Perceptual Complexity: The thematic analysis highlights the intricate nature of faculty members' perceptions regarding the use of ChatGPT in courses. Perceptions are shaped by variables such as past encounters, availability of knowledge, and personal dispositions towards technology in education.

The use of AI in educational institutions to enhance students' skills and competencies for the modern industry represents a form of social change. Integrating AI as an innovative educational tool is a vital skill that contemporary educators should possess. Despite the widespread use of AI, it remains a crucial task for educators to create a pedagogical environment that encourages the development and application of these proficiencies among students. This underscores the importance of artificial intelligence in expanding the information resources available for higher education institutions, as emphasized by P11 in the study:

“I could not foresee it that way. Social change will still be initiated by human agencies. I mean, it is still within the decision-making process of the members of the society that can initiate social change. The use of ChatGPT may challenge education and educators but it may not impact the society as a whole. It may or may not change educational processes within an institution but may not affect the society in general.”

The use of AI tools has the potential to impact the development of critical thinking skills in students, as they might overly rely on it for various tasks. Educators must devise strategies to create an academic environment that encourages the acquisition of these competencies. This may influence the subject matter expertise used to achieve educational goals in higher education. Despite the availability of AI resources, it is expected that instructors will remain vigilant and adhere to established procedures. This research reveals that educators have shown diligence and adaptability in their teaching approaches, despite the challenges posed by the presence of artificial intelligence. Feedback from academic professionals highlights the obstacles they face while striving to provide comprehensive education to students. However, it is crucial to maintain a positive outlook when addressing these challenges. The results suggest that a reassessment of evaluation methods incorporating artificial intelligence is necessary to gauge their potential impact on enhancing students' competencies.

The use of ChatGPT holds promise in improving the educational experience by enabling students to access relevant information conveniently and enhancing their decision-making processes. Educators can use this tool to assess academic assignments, impart theoretical and conceptual knowledge, and swiftly address student inquiries. Some participants have noted that implementing ChatGPT can reduce classroom preparation time and improve the quality of educational resources, depending on the user's proficiency level, as mentioned by P16: "It can make specific parts of our workflow faster."

Furthermore, ChatGPT serves as a proficient automated tutor, assisting learners with basic inquiries and providing evidence-based perspectives and relevant literature on specific subjects. Like Wikipedia, this system allows for personalized and efficient information retrieval, but there is a risk of coming across inaccurate data, as highlighted by P11:

"When incorporated into the teaching-learning process, this tool can act as the faculties-in-charge (FICs) by addressing students' queries, questions, or clarifications. Beauty lies in its ability to provide instant information. The students will not delay for the FIC to address their inquiries, explanations, or questions."

The ChatGPT platform has the potential to facilitate classroom discussions and foster the development of analytical skills. It can also serve as an educational aid, assisting educators in guiding students who struggle with complex concepts. ChatGPT can efficiently verify activities, generate summaries, and analyze data promptly, making it a valuable educational resource that can enhance students' research skills and boost their confidence in producing reliable data. With proper training and data validation, this tool can be effectively used in advanced academic settings.

However, faculty members commonly express concerns about the downside of GPT in higher education, including worries about intellectual dishonesty, unethical use, and students becoming overly reliant on technology, potentially bypassing essential learning processes. As highlighted by P13, the implementation of ChatGPT in higher education can have both advantages and disadvantages, similar to a double-edged sword. P13 stated, "ChatGPT is a double-edged sword, and its impact on education depends on the users. That's why teachers or faculty members should help develop students' critical thinking skills."

Faculty members' responses are based on their prior experiences with students using ChatGPT in the previous academic year. A common consensus among faculty members is that students' use of AI may lead to a reduction in self-directed learning and the potential for academic dishonesty by presenting others' work as their own. The integration of AI in education raises concerns about bypassing critical learning processes. It can be seen as delegating mental work that the brain is supposed to undertake during the learning process, potentially hindering the development of cognitive capacities, particularly in contexts where enhancing students' cognitive abilities is a primary goal. While AI can optimize and facilitate research and writing processes, it poses challenges to the cultivation of essential skills like analytical reasoning, technical composition, and meticulous editing. Participants highlight several potential drawbacks of ChatGPT, including academic dishonesty, inadequate safeguards for intellectual property, overreliance on technology, reduced self-directed learning, and hindered development of critical thinking skills.

Many participants share concerns that the increased use of ChatGPT may foster reliance on the technology and hinder scholarly advancement. Overdependence on AI tools may reduce engagement in independent learning, as

noted by P10: "Overreliance on technology, potentially reducing engagement in independent learning." P10 highlighted the potential downside of relying too heavily on AI tools, which could lead to decreased engagement in independent learning. Furthermore, the lack of uniformity in ChatGPT's responses makes it susceptible to the spread of misinformation and deceptive content. Participants stress the importance of educators recognizing and appreciating the impact of AI in education, while also establishing an environment that promotes AI growth while ensuring students continue to acquire fundamental skills. They express concerns about potential misuse of ChatGPT for academic dishonesty and the dissemination of inaccurate information among students due to the absence of established ethical protocols.

Furthermore, the research unveiled a significant second theme categorized as the *implications of ChatGPT in education activities*. The data showed the following: (1) Advanced Learning Techniques and Improved Understanding: ChatGPT is recognized for its potential to generate advanced learning techniques, contributing to improved understanding of academic material among students. This suggests a positive impact on students' preparedness for future career endeavors; (2) Facilitation of Discourse and Analytical Proficiencies: The use of ChatGPT facilitates discourse within the classroom and promotes the advancement of analytical proficiencies among students. Educators can use ChatGPT to assist students in comprehending complex ideas, thereby enhancing their analytical skills; (3) Instructional Tool for Assisting Students: ChatGPT serves as an instructional tool for educators, enabling them to provide additional guidance and support to students who require assistance in their academic pursuits; (4) Authentication, Synopsis Generation, and Information Scrutiny: ChatGPT demonstrates capabilities in authentication, synopsis generation, and information scrutiny, enhancing research capabilities and reinforcing confidence in generating reliable data. This highlights its potential to streamline research processes. This gives students confidence to write research papers; (5) Potential Benefits and Concerns for Introverted Students: The integration of AI, represented by ChatGPT, holds promise in facilitating the learning process for introverted students by providing alternative avenues for engagement and participation. However, there may be concerns regarding privacy and data security that need to be addressed; (6) Streamlining Repetitive Tasks for Educators: ChatGPT can streamline repetitive administrative tasks for educators, freeing up time to focus more on instructional activities and student support, thereby improving overall efficiency in educational settings; (7) Fostering Self-Directed Critical Thinking Abilities: The use of ChatGPT has the potential to foster the development of self-directed critical thinking abilities in students. By engaging with AI-driven resources, students are empowered to think independently and critically evaluate information, which is crucial in today's digital age; (8) Consideration of Ethical and Privacy Implications: Alongside the benefits, it's important to consider ethical implications and privacy concerns associated with the use of AI in education. Safeguards must be in place to protect students' privacy and ensure responsible use of AI technologies in educational settings.

The utilization of ChatGPT may present challenges in education, but its broader societal impact may be limited. As expressed by P17, the direction of change depends on how educators choose to address it. There is a potential scenario

where employers may require a certain level of AI competency for job candidates, potentially instigating a societal shift. The effectiveness of technology integration in education depends on user proficiency, with educators playing a crucial role in helping students develop analytical and evaluative skills. While ChatGPT can serve as an alternative to conventional search engines, it also has the potential to foster excessive dependence among users. Promoting critical thinking and inclusivity among students can facilitate social change.

Regarding faculty perceptions of using ChatGPT in their courses, the study's results indicate mixed feedback. While it shows potential as an educational tool for higher education in the Philippines, some respondents expressed distrust due to limited knowledge and access to ChatGPT. However, certain participants who had prior experience with ChatGPT in their professional field had more favorable perceptions. The study's participants are aware of ChatGPT's existence and are willing to engage with it for their academic pursuits. Assuming appropriate ethical guidelines and adherence to academic protocol, the university can proceed with its utilization. It is crucial to reevaluate assessment protocols incorporating artificial intelligence to gauge their potential impact on enhancing students' skills. Regarding the implications of ChatGPT in education activities, the study's results suggest that it can introduce advanced learning techniques, potentially improving students' comprehension of academic material and accelerating their preparedness for future careers. ChatGPT can facilitate classroom discussions and enhance analytical skills. It serves as an instructional tool, helping educators assist students in grasping complex ideas and quickly authenticating actions, generating summaries, and analyzing information.

Furthermore, ChatGPT can act as an educational tool, enhancing students' research capabilities and boosting their confidence in producing reliable data. Artificial Intelligence in education shows potential for introverted students, automating educators' routine tasks, and promoting independent critical thinking abilities. However, it can also hinder students' critical thinking skills and impede their ability to promote social change.

Regarding ChatGPT's ability to influence social change, the study suggests that its implementation coincides with an ongoing societal transformation. Awareness of artificial intelligence among individuals and its continuous development contribute to this shift. The impact of ChatGPT on broader social change will depend on how educators and institutions choose to harness its potential in the context of ongoing societal changes. One significant aspect of societal change is the integration of new technologies into people's daily lives, which serve as tools that reshape their lifestyle. Contrary to the prevailing belief, technology does not determine modern society, as stated by Castells in 1996. This assertion remains valid, emphasizing that technology consists solely of tools that assist humans, while society itself can be seen as a type of technology.

In addition, the thematic analysis discovered a noteworthy third theme, which was classified as the *ChatGPT's Role in Driving Social Change*. The data revealed the following information: (1) Correspondence with Societal Transformations: The results suggest that educators adopting ChatGPT align with cur-



rent societal changes, specifically regarding the integration of technology into daily routines; (2) The incorporation of new technologies, like ChatGPT, into people's daily routines is influenced by the presence of artificial intelligence and ongoing societal changes. This leads to changes in lifestyle; (3) The incorporation of technology, such as ChatGPT, is vital in influencing societal principles and promoting global interconnectedness, as it enhances human cognitive and physical capabilities; (4) The use of technology aims to achieve global interconnectedness and promote societal transformation; (5) Technology as a Catalyst for Lifestyle Modification: ChatGPT and other technologies serve as catalysts to modify individuals' lifestyle and daily routines.

This study delved into the use of technology with the objective of achieving global interconnectedness and promoting societal transformation. Moreover, the findings revealed that ChatGPT and other technologies serve as catalysts for lifestyle modification, exerting influence on individuals' daily routines and overall way of life.

### **Conclusion**

The research findings shed light on the diverse perceptions of faculty members regarding the usage of ChatGPT in courses. Although there are some positive aspects, such as its potential as an educational tool, there are also concerns regarding trust and the long-term impacts on students. Integrating ChatGPT into educational activities shows potential for enhancing learning methods, promoting discussions, and enhancing research abilities. Nevertheless, it is of utmost importance to exercise prudence in order to uphold ethical principles and avoid compromising critical thinking abilities. Furthermore, the adoption of ChatGPT corresponds to current societal shifts, emphasizing the importance of faculty competence in leveraging technology to promote beneficial social transformation. The integration of technology and society seeks to enhance human abilities, promote global interconnectedness, and facilitate profound societal changes. Ogburn's viewpoint from 1922 emphasizes the crucial significance of technology in molding society and its fundamental principles. In order to successfully incorporate artificial intelligence into education, it is crucial for educators and administrators to be dedicated to developing students' abilities to analyze and evaluate information. The level of expertise demonstrated by technology users is crucial in determining the success of these endeavors.

### **Declaration of AI Assistance in the Writing Process**

During the preparation of this work, the author used Grammarly and Prowriting aid, Quilbot / Grammar Checker and Paraphrase for grammar checking, paraphrasing, and citation making. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

This section is adopted from <https://www.elsevier.com/journals/resources-policy/0301-4207/guide-for-authors>.

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## Evaluation of the UPOU MOOC "Principles of Graphic Design" using Product Variable of Biggs' 3P Model

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### Abstract

*As Massive Open Online Courses (MOOCs) are being recognized as a link between higher education and the increasing demand for employability, it is imperative to employ continuous evaluation for quality assurance. This research aimed to evaluate the University of the Philippines Open University (UPOU) MOOC "Principles of Graphic Design" in accordance with the MOOC Quality Guidelines developed by the Commonwealth of Learning. With Biggs' 3P Model incorporated in the MOOC Quality Guidelines, this evaluation research focused on the product variables of the model: completion/retention and certification rates, and enjoyment and self-satisfaction. The completion and certification rates were computed using LMS analytics, while the enjoyment and self-satisfaction rates were evaluated using a survey instrument based on the learner ratings for the product variable in the Guidelines for Quality Assurance and Accreditation of MOOCs using a five-point Likert scale on outcomes perception, continuing education, employment opportunities, and socializing. With a total of 22,942 enrolled students, 7,620 managed to complete the course and receive certificates. Of these, a total of 7,239 agreed to be survey respondents. Results of the study showed high satisfaction rates, with 77.95% of the respondents giving "very satisfied" rates to the said MOOC. The mean scores for three out of the four learner ratings were above four (4.32 to 4.88), with the socializing component given a neutral rating (3.14 to 3.59). Overall, results showed high completion and certification rates, as well as enjoyment and self-satisfaction ratings for the MOOC.*

**Keywords:** MOOC Evaluation, Biggs' 3P Model, Enjoyment and self-satisfaction, Completion Rates, Quality Assurance

### Introduction

#### Background of the Study

Massive Open and Online Courses (MOOCs) have emerged as a transformative force in the field of education, breaking down traditional barriers to learning by providing access to quality and curated educational resources and opportunities. MOOCs have been characterized as open, participatory, and distributed (Baturay, 2015). It is open as it offers free enrollment for everyone who has access to the internet. The learning pace is also dictated by the students themselves. Further, Baturay (2015) argued that it is participatory and distributed as "learners may interact with their fellow learners and instructor

and participate in the various learning activities prepared” and that “knowledge sharing is encouraged to foster creative thinking in its participants.”

The University of the Philippines Open University (UPOU) pioneered the development and offering of MOOCs in the country since its commencement in 2012 (Almodiel et al., 2020). It uses a Moodle-based platform called MODeL, which means Massive and Open Distance e-Learning.

Among the array of MOOC offerings by UPOU, the MOOC titled "Principles of Graphic Design" has garnered substantial interest and active participation from learners. As multimedia production courses continue to attract attention, understanding their quality and effectiveness becomes paramount to optimize their impact and cater to the diverse needs of learners effectively. Therefore, the primary objective of this study is to evaluate the UPOU MOOC "Principles of Graphic Design" using the product variable of Biggs' 3P Model.

### **Statement of the Problem**

In light of the dynamic and expanding landscape of MOOCs, this research sought to comprehensively assess the quality and efficacy of the UPOU MOOC titled "Principles of Graphic Design" through the lens of the product variable of Biggs' 3P Model. The product variable evaluation focused on critical dimensions such as completion/retention and certification rates, alongside learners' subjective experiences of enjoyment and self-satisfaction with the course content and delivery.

### **Objectives**

This study evaluated the UPOU MOOC “Principles of Graphic Design” based on completion/retention and certification rates, as well as the enjoyment and self-satisfaction of the students.

Specifically, it aimed to:

1. Evaluate completion/retention and certification rates based on LMS analytics; and
2. Evaluate students' enjoyment and self-satisfaction using a survey instrument based on the learner ratings for the product variable in the Guidelines for Quality Assurance and Accreditation of MOOCs.

### **Significance of the Study**

With the increase in MOOC enrolment in UPOU, MOOC quality needs to be regularly evaluated and improved. While measures should be taken to make sure that a MOOC meets certain criteria before it is offered, the MOOC should also be evaluated post-delivery. This study contributes to studies on MOOC quality by presenting the results of the evaluation and by presenting an instrument that could be used for post-delivery evaluation.

## Scope and Limitations

This study involved voluntary participants from the MOOC "Principles of Graphic Design" offered from February to March 2023. A total of 7,239 out of the 22,942 enrolled students (31.55%) consented to participate in the study.

## Review of Literature

### MOOCs

Massive Open Online Courses (MOOCs) are a form of online education that emerged in 2008 and transformed the landscape of learning worldwide. Through these online courses, anyone who has access to the Internet is provided with an affordable and flexible way of learning new knowledge and acquiring new skills as the courses are offered for free. MOOCs also provide learners with opportunities to access high-quality educational content from prestigious institutions without the constraints of geographical boundaries (Yousef et al., 2015).

MOOCs have been referred to as a type of disruptive technology, a major revolution in education, and have four key characteristics (Bates, 2014). These are as follows:

- a) It has infinite scalability (massive) as it can accommodate as many learners as possible.
- b) It has no prerequisites and does not require tuition fees for participants (open). Its only requirement is for the participant to have access to a computer/mobile device and the Internet.
- c) Courses are available online although some institutions have started to implement MOOCs in blended format.
- d) MOOCs are organized in one whole course.

The first MOOC offering is the course "Connectivism and Connectivity." It was developed in 2008 by Stephen Downes and George Siemens (Bates, 2014). Since then, more than 200 million learners have enrolled in various MOOC offerings, reaching almost 20,000 courses offered by 950 universities all over the world (Shah, 2021).

In the Philippines, the University of the Philippines Open University (UPOU) started to develop its own MOOC in 2012. By the following year, the university offered the MOOC "Introduction to Mobile Applications Using the Android Platform" through UPOU's first MOOC platform called @ral. Bandalaria (2013), the main proponent of MOOCs at UPOU, said that the creation and offering of MOOCs is in line with the university's public service programs and its advocacies for open learning. The university later developed the MOOC platform, UPOU MODeL, or Massive Open Distance eLearning .

The university's MOOCs duration ranges from 4 to 6 weeks. The teachers in this MOOC, called course coordinators, evaluate the learners who are qualified to receive certificates for completion. The learner support system is the UPOU

MOOC's distinguishing feature. Interactions between learners and course coordinators are also encouraged. These are held not only within the online learning management system but as well as in social media as social media platforms are more accessible to UPOU MODeL learners (Almodiel et al., 2020).

### *Evaluating the Quality of MOOCs*

With MOOCs' affordances – being offered for free, having no enrollment eligibility requirement, and aiding people to learn new knowledge and/or acquire new skills needed for the changing requirements in the workplace – its growth and development are projected to further propel by 34.54% from 2020 to 2027 (Business Wire, 2022).

Though there is a further increase in MOOC's popularity, still there are high rates of dropout and non-completion (Aldowah et al., 2020; Badali et al., 2020; Rekha et al., 2023). According to a report on Forbes.com, MOOCs offered by Stanford, MIT, and Harvard have a course completion rate of around 20% (Newton, 2022).

Thus, it is necessary to evaluate MOOCs to gauge their effectiveness, understand their impact on learners, and identify areas for improvement.

### *Satisfaction in and Completion/Non-Completion of MOOCs*

A learner's journey towards completion or non-completion of a MOOC has been the subject of several studies.

The primary factors that cause students to drop out from MOOCs are academic abilities, previous experience, course design, lack of feedback, social presence, and social support. On the other hand, the secondary factors identified were interaction, course and time difficulty, motivation, commitment, and family and work (Badali et al., 2020).

Motivation is also a MOOC completion factor identified in a study conducted in India (Aldowah et al., 2020). Motivation has six main factors that influence participants' MOOC completion: academic, social, course, personal, professional, and technological. In a systematic literature review of 50 relevant publications conducted in 2022, the influence of motivation for completing MOOCs was further explored (Badali et al., 2020). Two categories of motivations were identified, need-based motivation and interest-based motivation with academic motivations as having the most influence on a participant's retention in a MOOC class.

In terms of continuance to participate in MOOCs, the learner's perceived reputation and perceived openness to a MOOC were shown to be the strongest predictors (Alraimi et al., 2015). In another study, MOOC performance, in terms of knowledge transmission quality, and the learner's preference for MOOCs as a learning mode significantly increases continuance intention for pursuing studies through MOOCs (Dai et al., 2020). Other factors identified to influence continuance and satisfaction are confirmation of learners' expectations of the

MOOCs they are enrolled in and the usefulness of the courses, respectively (Rekha et al., 2023; Shah & Khanna, 2022).

### **Biggs 3P Model**

The 3P Model developed by John Biggs, a scholar in the field of educational research and instructional design, has greatly influenced the teaching and learning assessment systems being used today (Barattucci, 2017).

The model was structured along three phases of learning (Biggs, 1993):

1) Presage, or the phase beginning the teaching-learning process or before learning is produced. There are two groups of variables at play in this stage: the characteristics of the students, i.e., prior knowledge/experiences, cognitive ability or skills, ways of learning and expectations and values and the characteristics of the teaching context, i.e., teaching objectives, teaching methods, assessment methods, and learning space conditions, among others.

2) Process, or the learning phase itself. It refers to what or how the student accomplishes a task in a specific context to learn. Biggs (1993) stated that how a student pursues a task is affected by one's perception not only of the task to be done but also of oneself.

3) Product, or the learning outcomes which are of three types: – quantitative, qualitative, and affective. Quantitative refers to the amount of information and the skills acquired. Qualitative is the complexity of thoughts and knowledge that were developed while affective is the student's commitment and satisfaction of the process.

Biggs' model assumes that learning outcomes are affected by several factors that interact with each other, thus requiring not only effectiveness and good quality but also compatibility of the components (Barattucci, 2017).

Due to its integrative character, the model is used in research as a framework to ensure that all aspects contribute to a student's learning process, allowing for a better understanding of how the factors influence each other (Allison, 2021; de la Fuente et. al., 2014; Kanashiro et al., 2020; Song, 2018). The 3P model has been used in various contexts such as MOOCs, psychological processes studies, and K-12 computing instruction, among others (Allison, 2021; Ganotice & Chan, 2019; Song, 2018).

Though studies have criticized the 3P Model as outdated, oversimplified, and not the only model that can be used to understand educational context, it appears that it is the “most prominent learning model in higher education” (Allison, 2021; Kanashiro et al., 2020).

### **Theoretical Framework**

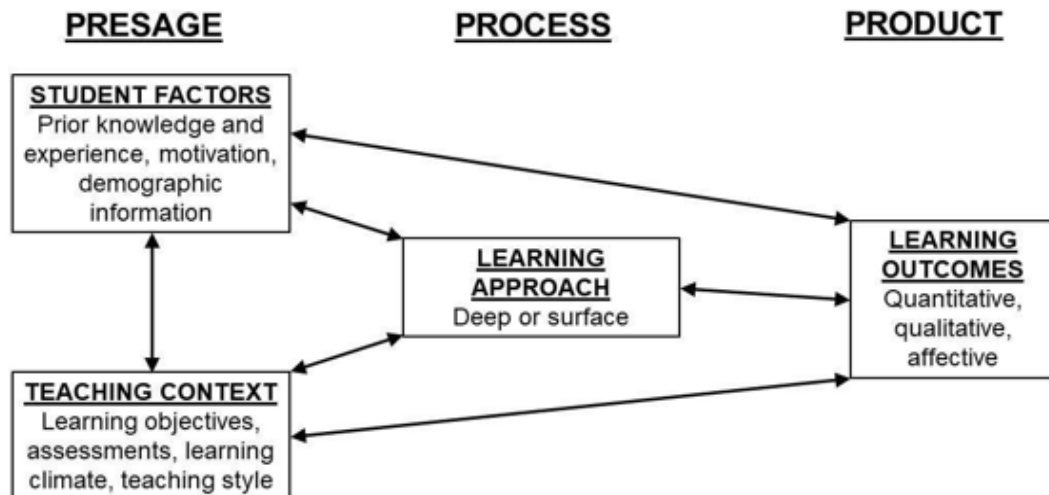
The Biggs' 3P Model used in the Guidelines for Quality Assurance and Accreditation of MOOCs (Commonwealth of Learning, 2016) consists of



three groups of variables: presage variables, process variables, and product variables. In Figure 1, it can be seen that these variables are interconnected with each other, as all factors contribute to a student's learning process.

**Figure 1**

*Biggs' 3P Model of Student Learning*



This research focused on the product variables in its post-delivery evaluation because also evaluating the presage and process variables will result in extensive research given the number of MOOC enrollees. For the product variables, the research considers enjoyment and self-satisfaction, with the completion/retention and certification rates achieved by the students as variables identified by COL (2016).

## Methodology

### Research Design

The learning management system (LMS) analytics and data gathered from an online survey were used to evaluate the product variables in this study. Specifically, the LMS analytics used were course participation and activity completion. For the online survey, a Qualtrics form was created with questions about outcomes perception, continuing education, employment opportunities, and socializing variables to determine enjoyment and self-satisfaction.

### Respondents of the Study

This study involved voluntary participants of the Principles of Graphic Design MOOC, offered from February to March 2023, who were 18 years old and above. An online questionnaire was given at the end of the class and the learners were able to choose whether they would participate or not. Participants were given informed consent upon accessing the survey instrument. Names and other personal information were not collected, and all data collected were treated with confidentiality.

The target sampling size for the study was 378/22,942 MOOC enrollees. This was calculated with a 95% confidence level and 10% margin of error. Since 7,239 learners participated in the study, the target sampling size was exceeded.

### **Data Gathering Procedure**

For this research, data was gathered in two ways:

1. The completion and certification rates were computed using the LMS analytics; and
2. The enjoyment and self-satisfaction rates were evaluated using a survey instrument based on the learner ratings for the product variable in the Guidelines for Quality Assurance and Accreditation of MOOCs using a five-point Likert scale: outcomes perception, continuing education, employment opportunities, and socializing.

Qualitative data was also collected through the survey instrument to gain further insight into the evaluation done through the quantitative scales.

### **Data Analysis**

Data was collected for the completion and certification rates using the LMS analytics of course participation and activity completion which identified the number of enrollees in the course as well as course completers. Results for the enjoyment and self-satisfaction rates collected through the Qualtrics survey were analyzed quantitatively using mean and standard deviation and supported with the summary of their qualitative answers using a word cloud. Aside from the learner ratings for the enjoyment and self-satisfaction rates, data collected from their demographics were also analyzed in terms of their frequency distribution which included their age, gender, civil status, location, highest educational attainment, employment status, current program enrollment, and previous MOOC experience.

## Results and Discussion

**Table 1**

*Summary of demographic profile of online learners*

Variable	Frequency	Percentage
1. Age		
<b>18-34 years old</b>	<b>6800</b>	<b>80.12%</b>
35-50 years old	1325	18.30%
51-70 years old	112	1.55%
71 years old and above	2	0.03%
2. Gender		
Male	2430	33.57%
<b>Female</b>	<b>4607</b>	<b>63.64%</b>
Prefer not to say	202	2.79%
3. Civil status		
<b>Single</b>	<b>6768</b>	<b>79.68%</b>
Married	1443	19.93%
Widowed	28	0.39%
4. Location		
<b>Philippines</b>	<b>4886</b>	<b>67.60%</b>
Abroad	114	1.57%
No Answer	2239	30.93%
5. Highest educational attainment		
Unfinished education	206	2.85%
Elementary graduate	17	0.23%
High school graduate	699	9.66%
<b>Bachelors</b>	<b>4627</b>	<b>63.92%</b>
Diploma	1079	14.91%
Master	548	7.57%
Doctorate	63	0.87%
6. Employment status		
<b>Employed</b>	<b>3921</b>	<b>54.16%</b>
Self-employed	938	12.96%
Unemployed	2380	32.88%
7. Currently enrolled in a degree program		
Yes	1925	26.59%
<b>No</b>	<b>6314</b>	<b>73.41%</b>
8. Previous MOOC experience		
Yes	922	12.74%
<b>No</b>	<b>6317</b>	<b>87.26%</b>
<b>TOTAL</b>	<b>7,239</b>	<b>100%</b>

Out of the 22,942 enrollees, a total of 7,874 were able to access the survey instrument. However, only 7,239 respondents were able to finish the Qualtrics survey on enjoyment and self-satisfaction as some of those who initially accessed the survey were minors (aged 17 and below) and some did not proceed with answering the survey.

For the demographics, learners were classified into eight categories: age, gender, civil status, location, highest educational attainment, employment

status, enrollment in a program, and previous MOOC experience. Table 1 shows the summary of the demographic profile of the learners

**Table 2**

*Summary of the highest demographic per learner rating category (+ for positive rating, 0 for neutral rating, - for negative rating)*

	Age	Gender	Civil Status	Location	Highest Educational Attainment	Employment Status	Currently enrolled in a degree program	Previous MOOC experience
<b>Outcomes Perception</b>	18-34 yrs old (+, 0, -)	Female (+, 0, -)	Single (+, 0, -)	Philippines (+, 0, -)	Bachelors (+, 0, -)	Employed (+, 0, -)	Not currently enrolled (+, 0, -)	No previous experience (+, 0, -)
<b>Continuing Education</b>	18-34 yrs old (+, 0, -)	Female (+, 0, -)	Single (+, 0, -)	Philippines (+, 0, -)	Bachelors (+, 0, -)	Employed (+, 0, -)	Not currently enrolled (+, 0, -)	No previous experience (+, 0, -)
<b>Employment Opportunities</b>	18-34 yrs old (+, 0, -)	Female (+, 0, -)	Single (+, 0, -)	Philippines (+, 0, -)	Bachelors (+, 0, -)	Employed (+ only) Unemployed (0, -)	Not currently enrolled (+, 0, -)	No previous experience (+, 0, -)
<b>Socializing</b>	18-34 yrs old (+, 0, -)	Female (+, 0, -)	Single (+, 0, -)	Philippines (+, 0, -)	Bachelors (+, 0, -)	Employed (+, 0, -)	Not currently enrolled (+, 0, -)	No previous experience (+, 0, -)
<b>Overall Satisfaction</b>	18-34 yrs old (+, 0, -)	Female (+, 0, -)	Single (+, 0, -)	Philippines (+, 0, -)	Bachelors (+, 0, -)	Employed (+, 0, -)	Not currently enrolled (+, 0, -)	No previous experience (+, 0, -)

These data were also analyzed in parallel with their enjoyment and self-satisfaction ratings, and it was found that there were no significant differences in the classification of the learners regarding the rating they were given. The ratings were categorized into positive, neutral, and negative based on their level of satisfaction. As shown in Table 2, the majority of the positive, neutral, and negative ratings were given by nearly the same demographic classification. The only difference was seen under the employment opportunities category, where the employment status for positive ratings was from employed learners and the neutral and negative ratings were from unemployed learners.

Using a five-point Likert scale, with 1 being the lowest and 5 being the highest, learners were asked to rate their enjoyment of the MOOCs course per item. The results were then calculated using mean and standard deviation.

**Table 3**

*Summary of the outcomes perception rating of the learners using mean and standard deviation*

Field	Mean	Standard Deviation
I am interested in the topics presented in this course.	4.86	0.38
The learning that I undertake is very important to me.	4.81	0.43
I feel prepared for the demands of this course.	4.50	0.65
I meet the goals I set for myself in this course.	4.60	0.59
<b>I will be able to use what I learn in the future.</b>	<b>4.88</b>	<b>0.36</b>

Tables 3 to 6 show the mean and standard deviation results for the learner ratings. Table 3 reflects the outcomes perception rating. Each item had mean scores of four or higher, meaning a high enjoyment rating. The item with the highest mean score and low standard deviation was “I will be able to use what I learn in the future”.

**Table 4**

*Summary of the continuing education rating of the learners using mean and standard deviation*

Field	Mean	Standard Deviation
I try to translate new information into my own words.	4.48	0.65
I create my own examples to make information more meaningful.	4.49	0.67
<b>During learning I treat the resources I find as a starting point and try to develop my own ideas from them.</b>	<b>4.67</b>	<b>0.54</b>
I read beyond the core course materials to improve my understanding.	4.40	0.79
When I am learning, I combine different sources of information (e.g. people, websites, printed material).	4.56	0.65

Table 4 focuses on the continuing education rating with all items having mean scores of above four, meaning high enjoyment rating. The item with the highest mean score with a low standard deviation was “During learning I treat the resources I find as a starting point and try to develop my own ideas from them”.

**Table 5**

*Summary of the employment opportunities rating of the learners using mean and standard deviation*

Field	Mean	Standard Deviation
I try to understand how what I have learned impacts my work practice.	4.64	0.58
<b>I often think about how my learning fits into the “bigger picture” of my work/practice.</b>	<b>4.65</b>	<b>0.58</b>
I had an increase in work efficiency because of what I have learned.	4.44	0.74
I became more confident in my work with my learning in mind.	4.55	0.66
Learning this has helped me advance in my job.	4.32	0.86

Table 5 shows the employment opportunities rating results, also with all items having above four mean scores, again meaning high enjoyment rating. The item with the highest mean score under this learner rating with a relatively low standard deviation is “I often think about how my learning fits into the “bigger picture” of my work/practice”.

**Table 6**

*Summary of the socializing rating of the learners using mean and standard deviation*

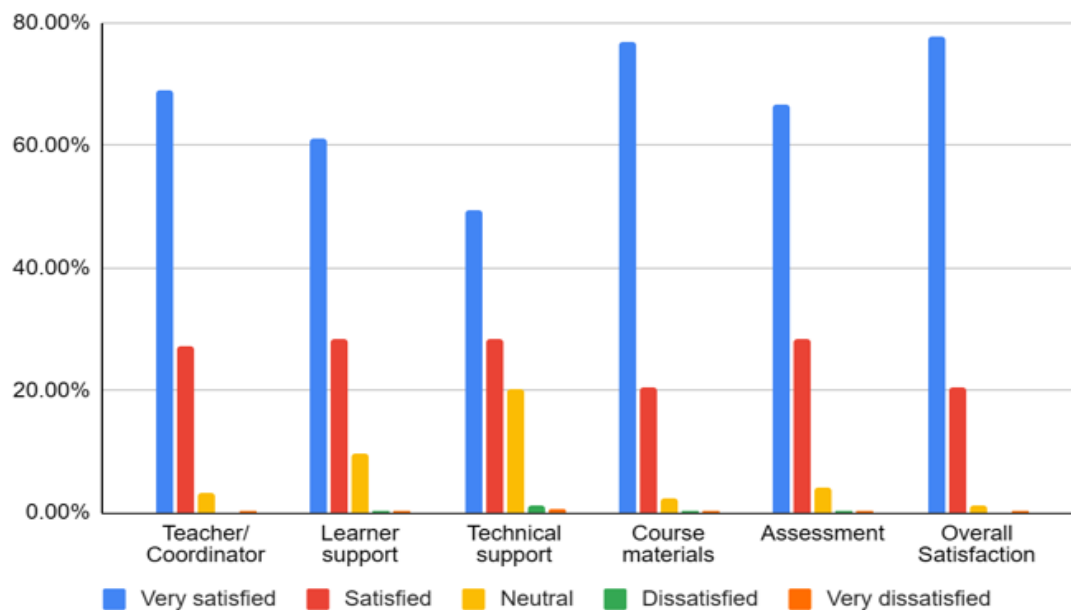
Field	Mean	Standard Deviation
I have met people from different walks of life through this course.	3.51	1.18
I try to identify others whom I can ask for help if necessary.	3.53	1.18
When I do not understand something, I ask others for help.	3.53	1.24
<b>I ask others for more information when I need it.</b>	<b>3.59</b>	<b>1.23</b>
I keep in touch with the people I encountered in the course.	3.14	1.33

Table 6 focuses on the socializing rating, where the mean scores ranged around three, meaning a neutral enjoyment rating from the learners. The highest mean score which had a relatively high standard deviation was the item on “I ask others for more information when I need it”.

Meanwhile, the satisfaction component of the survey had six parts: teachers/coordinators, learner support, technical support, course materials, assessment, and overall satisfaction. Their qualitative answers per item were analyzed and presented using a word cloud.

**Figure 2**

*Summary of satisfaction rating of learners*



As seen in Figure 2 above, each item had a high satisfaction rate from the learners. Most of the learners were very satisfied, especially with the course materials provided in the MOOC, followed by their satisfaction with the teacher/coordinator, assessment, and learner support. Technical support had a low satisfaction rating compared with the rest of the factors. The reason given by some of the learners for the said low rating is that they did not need much technical support from the course.

Overall, satisfaction with the MOOC course was very high. Other MOOC enjoyment and satisfaction survey results have also resulted in high satisfaction ratings; however, with the advantage of a more detailed survey, this paper has identified the nuances of what keeps a learner satisfied in a MOOC course. Hood et al. (2015) as well as Littlejohn et al. (2016), have identified that the satisfaction of a learner in a MOOC course is determined by their goals for learning and participation. This paper has determined the learners' goal for enrolling in the MOOC studied in this research. Specifically, the learners aimed for the knowledge they gained in the MOOCs course to be used for the future (outcomes perception learner rating, question number 5; continuing education learner rating, question number 3). In 2021, Alyoussef evaluated satisfaction based on its perceived ease of use and utility; the results of this paper have identified that informative course materials and knowledgeable teacher/coordinator are some of the main components of a MOOC course that are important to keep learners satisfied.

**Figure 3**

*Word cloud of the qualitative responses of learners*



Figure 3 shows the compiled word cloud from the qualitative components of the survey answered by the learners to describe their learning satisfaction rating. The word cloud tracks the most used words in the comments. The bigger the font size of the word, the more frequently it is cited by the respondents. From this, the general sentiments of the learners can be inferred from the reasons/s as well for the satisfaction rating given.

The course material category with high satisfaction ratings is supported by its corresponding word cloud, where learners attribute their satisfaction with the “material” used in class. Surrounding the word “material” as the biggest font size, are words such as “helpful”, “useful”, and “easy” where it can be derived that the learners are highly satisfied due to the “helpful, useful, and easy material” provided in the learning course. Similarly, the overall satisfaction received high satisfaction ratings because, as gleaned from its word cloud, learners were able to “learn and experience a lot” and were “satisfied with the knowledge” they had gained from the course.

For the teacher/coordinator category, the word cloud has identified that learners described them with the following words: “easy”, “explain”, “understand”, “informative”, and “helpful” among many others. From here, it is understood that the high satisfaction rating from the learners was due to the “informative and helpful teacher/coordinator” that made the course “easy to understand with



their explanations". In the assessment category, the word cloud presents the word "assessment" with positive descriptions such as "good", "satisfy", "easy" and "learning" where it can be assumed that the assessments used in the course were "good, easy and satisfying assessments" that helped them "learn a lot".

The learner support category also had the words "learner support" surrounded with positive descriptors like "great", "helpful", "good", and "easy". This provides context that the high satisfaction rating for the learner support category was due to the learners receiving "great and helpful learner support" that must have made their course "good and easy". On the other hand, the technical support category with a lower satisfaction rating was surrounded with words such as "problem", "encounter", "good", and "issue" which is clarified with the supporting words "haven't" and "didn't" that were also seen in the word cloud. As it is, the reason for the lower satisfaction rating is for a more neutral stance as the learners "haven't encountered issues or problems" while they are taking the course.

### Conclusion and Recommendations

Overall, the MOOCs course "Principles of Graphic Design" evaluated using the product variable resulted in high enjoyment and self-satisfaction, and completion/retention and certification rates. Of the 22,942 enrolled students, 7,620 managed to complete the course and received certificates of completion, which resulted in a high completion rate of 33.21%.

Under the enjoyment component of the survey, learners had high enjoyment for three out of the four learner ratings with a mean score of above four. Meanwhile, the learner rating for socializing had a lower rating with a mean score around the range of three, with a more neutral tone of enjoyment. Based on the identified items per learner rating with the highest mean score, it can be concluded that most of the learners enjoy the MOOCs course for the additional knowledge and learning they can acquire, and do not place much focus on the socialization aspect.

For the self-satisfaction component, learners also had high ratings for each item, with their highest rating on the course materials, and the lowest at technical support. The word cloud of qualitative answers from the learners also supported the fact that the learners enjoyed the course and were generally satisfied with their experience in the course.

For future studies, it is recommended that the survey instrument include questions focusing on the learners' intention upon enrolling in the course and study if the intentions have a direct effect on completion and certification rate. On the other hand, the low ratings given by learners regarding socializing as an enjoyment component can be used as a basis for developing various assessment activities for a MOOC. MOOC courses focus on independent learning to produce self-directed learners, but MOOC developers can also experiment with group requirements that can help develop collaborative skills or create a balance between independent learning activities and group activities to provide

learners avenues to develop various life skills essential for 21st-century learners and workers. A study on socializing as an enjoyment component can also be further studied in the future, i.e., What are the factors that promote socializing as an enjoyment component? What are the learning and assessment activities that promote enjoyment in MOOCs? Is there a relationship between enjoyment factor, self-satisfaction, and topic of the MOOC?

Lastly, future MOOCs can also focus on providing more learner support as well, having been identified as another relatively low satisfaction category.

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## Template for Quantitatively-Oriented Articles

### Title of Article

Author 1<sup>1</sup> and Author 2<sup>2</sup>

<sup>1</sup>Position, Institutional Affiliation, Country, Email address

### Abstract

*Abstract in 150-250 words.*

**Keywords:** No more than five (5) keywords.

### Introduction (Center Heading 1)

This section contains a clear historical background of the study, showing why the research had to be undertaken. In this section, the author(s) shall have the opportunity to expound on what the research says about the research problem, and show clear support for the need to undertake the research, through appropriate research gap analysis.

### Objectives (Center Heading 2)

This section provides a clear statement of the goals and objectives of the research.

### Conceptual/Theoretical Framework (Center Heading 3)

The conceptual or theoretical framework would be expected for research studies that dealt with empirical procedures and methodologies. A framework of this nature would provide for clear interrelationships and direction of interactions of variables which the researcher expects to show by his/her data and data interpretations. It should be noted that variable interactions may be easier to understand if they were to be presented in illustrated model formats.

### Methodology (Center Heading 4)

This section includes brief discussions of data collection procedures and analyses. Data must be presented in appropriate tables.

## **Results and Discussions (Center Heading 5)**

Analytical discussions must present possible relationships of the results of the study and the findings from other studies specifically reviewed for this purpose. Post analysis data may be presented in both statistical tables and appropriate models and figures.

Include subheadings as are necessary.

## **Conclusions and Recommendations (Center Heading 6)**

Conclusions must be according to the objectives of the study.

Recommendations must reflect the objectives and conclusions of the study.

## **References**

General format must follow the suggestions for authors, but generally must follow the APA Style for publications. (As of writing, APA's publication manual is in its 7th edition.)

## Template for Qualitatively-Oriented Articles

### Title of Article

Author 1<sup>1</sup> and Author 2<sup>2</sup>

<sup>1</sup>Position, Institutional Affiliation, Country, Email address

### Abstract

*Abstract in 150-250 words.*

**Keywords:** no more than five (5) keywords

### Introduction (Center Heading 1)

This section contains the historical background of the study, including specific reports and studies that provided direct support to the research problem. Some relevant part of the literature shall be included in the discussion of the research problem to establish more strongly the need to undertake the study.

### Objectives of the Study (Center Heading 2)

This section contains both the research over-all goal and the specific objectives to be attained.

### Relevant Studies or Review of Related Studies (Center Heading 3)

Review of studies that are highly related to the current study. After the relevant studies have been presented, a synthesis of these may be presented and the relationship of such synthesis must be related to the study under consideration.

Subheading may be determined as necessary. In these subheadings, specific observations may be noted and statistical tables presented as well as figures and models.

### Discussions (Center Heading 4)

In this section shall be inserted full discussion of results and findings, discussed



more deeply in relation to the related studies already reviewed. Subheads may be determined and included in the discussions.

### **Conclusions (Center Heading 5)**

The conclusions of the study must reflect the objectives of the research.

### **Recommendations (Center Heading 6)**

All recommendations must appropriately correspond to the conclusions, and therefore the objectives of the study.

### **References (Center Heading 7)**

Follow the APA Style Guide (As of writing, APA's publication manual is in its 7th edition.)

## Style Guide for Full Paper Submission

The paper should be 15-25 pages long (including tables, figures, and references) and prepared preferably in Microsoft Word format. The author(s) should provide a title, the name(s) of the author(s), position(s), institutional affiliation(s), institutional address(es), email address(es) and key words (no more than five). You may make use of the template for preparing your paper: Journal Article Template (Qualitatively-Oriented); Journal Article Template (Quantitatively-Oriented). Detailed guidelines are as follows:

### 1. **Font type**

The whole text should be in Arial.

### 2. **Margins**

The paper should be A4 size (21 x 29.7 cm). All margins (top, bottom, left, and right) should be 1 inch.

### 3. **Line Spacing**

The whole text should be single-spaced.

### 4. **Title**

The title of the paper should be 14-point, bold, in capital and lower case letters, and centered.

### 5. **Author Information**

Use 12-point and centered for the author name(s). The Western naming convention, with given names preceding surnames, should be used.

The author name(s) should appear below the title, with one blank line after the title.

Use 10-point for author(s)' position(s), institutional affiliation(s), country, and email address(es).

The author(s)' position(s), institutional affiliation(s), institutional address(es), and email address(es) should appear below the author name(s), with one blank line after the name(s).

### 6. **Headings**

- Heading font (with the exception of the paper title and the abstract) should be 14-point Arial and in bold.
- Headings should be centered and in capital and lower case letters [i.e. nouns, verbs, and all other words (except articles, prepositions, and conjunctions) should be set with an initial capital].
- There should be two blank lines before each heading and one blank line after it.

## 7. Subthemes

- Subtheme(s) should be 14-point Arial, in bold capital and lower case letters, and flushed left.
- There should be one blank line before and after each subtheme.

## 8. Abstract

- The abstract heading should be 14-point Arial, bold, centered.
- The abstract should be in **150-250 words**.
- The main text of the abstract should be 12-point Arial, italicized.
- Alignment of the main text of the abstract should be justified, no indent.

## 9. Key Words

- Include **at most five** keywords.
- Use 12-point Arial. The keywords should appear below the abstract, with one blank line after the abstract.

## 10. Main Text

- In general, paragraphs should be separated by a single space.
- All paragraphs must be in block format.
- Text font should be 12-point Arial, single-spacing. Italic type may be used to emphasize words in running text. Bold type and underlining should be avoided.
- The first line of each paragraph should not be indented.

## 11. Tables and Figures

- Tables and figures should be numbered and have captions which appear above them.
- Graphics and pictures should not exceed the given page margins.
- Captions should be 14-point centered.
- The tables and figures of the paper should follow the APA citation style.
- There should be no space between the caption and the table/figure.

## 12. Footnotes

- Footnotes may be used only sparingly. A superscript numeral to refer to a footnote should be used in the text either directly after the word to be discussed or – in relation to a phrase or a sentence – following the punctuation mark (comma, semicolon, or period)
- Footnotes should appear at the bottom of the page within the normal text area, with a line about 5 cm long immediately above them.
- Footnotes should be 10-point and aligned left.

## 13. References

- The author-date method in-text citation should be used. Following the APA format, the author's last name and the year of publication for the source should appear in the text.
- All references that are cited in the text must be given in the reference list. The references must follow the latest edition of the APA Style Guide (as of writing, APA's publication manual is in its 7th edition) and

arranged alphabetically at the end of the paper.

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Surname, A. A., Surname, B. B., & Surname, C. C. (2000). Title of article. *Title of periodical, volume number* (issue number). URL/web address.

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The paper should be **3,000-7,000 words** including tables, figures, and references.

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2. Objectives
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4. Methodology
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A publishable qualitatively-oriented paper should contain the following:

1. Abstract (with keywords)
2. Introduction
3. Objectives of the Study
4. Relevant Studies or Review of Related Studies
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