

## PAPER

# The Effect of ChatGPT on Education in the UAE

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## ABSTRACT

This study examines the impact of ChatGPT on undergraduate students' learning. The study utilizes a survey to gather authentic data from a sample of 316 bachelor students from 15 universities across the UAE. The survey comprises 22 dimensions categorized into four constructs related to ChatGPT usage, benefits, drawbacks, and the types of questions ChatGPT can address. A statistical analysis was conducted to explore three primary hypotheses. The analysis involved using Excel and R software to perform one-sample t-tests, two-sample t-tests, ANOVA, and correlation. The findings indicate that students' use of ChatGPT for various assignments is still infrequent, despite their familiarity with it. This suggests that educators have not yet integrated ChatGPT into assignments and view it more as a threat than an opportunity. Students acknowledge both the advantages and disadvantages of ChatGPT. However, students in medical fields expressed more criticism towards ChatGPT compared to students in engineering, computer science, and business disciplines. Additionally, male and female students hold similar perceptions, except for two dimensions. The results also suggest that educators should pose questions that necessitate personal arguments, experiences, and critical thinking to deter academic dishonesty.

## KEYWORDS

ChatGPT, educators, learning, cheating, innovative assignments

## 1 INTRODUCTION

Digitalization has emerged very rapidly in the last few years and is influencing human life, including education. Big data is a major outcome of digitization, and it is an area of investment for many organizations contemplating knowledge mining and extracting relevant knowledge. ChatGPT is a recent example of an innovation utilizing artificial intelligence (AI) that applies machine learning to extract useful knowledge from large amounts of data. ChatGPT was introduced in late 2022 by OpenAI, and while it is not the first AI model ever created nor the first by OpenAI, it marks a significant advancement in the field [1]. ChatGPT is a large model to perform natural language processing (NLP) tasks using deep learning from large amounts of data. Students in universities have started to utilize ChatGPT in their assignments,

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and researchers are currently using it to prepare their study papers. This has raised some concerns about the use of ChatGPT in education, such as generating false data and plagiarism [2, 3].

The aim of this paper is to investigate the positive and negative effects of ChatGPT on bachelor students' education based on their perceptions. Since the ChatGPT concept is new, study is still needed to learn about its advantages and disadvantages. This is done using real data from the users themselves. Therefore, a survey is used to gather the perceptions of 316 students in 15 universities from various majors in the UAE about ChatGPT opportunities, threats, and potential ways to use it effectively. To the best of the authors' knowledge, no previous studies have conducted such a comprehensive analysis in the UAE. Ammar et al. [4] investigated the effect of ChatGPT on student behavior in the UAE, but on a small sample size of 54 participants.

The use of ChatGPT presents challenges in education. Both students and professors need training on how to use it efficiently [5]. In ChatGPT, the dialog setup allows users to repeatedly change their input to get clearer and more accurate answers. However, the model's output result cannot be guaranteed to be accurate and must be cross-checked, taking context and knowledge domains into account. Based on complex math and probability science, ChatGPT can uncover patterns and extract relationships between words and topics. But what about context, meaning, text thoughts, and reasoning? ChatGPT doesn't take any responsibility for the output of the model. If the output of the model is input to another system, who will be responsible for the consequences? ChatGPT and other similar tools are still incompetent and far from intelligent [6]. ChatGPT sparked a discussion about the potential benefits and threats, particularly for higher education institutions. Many researchers discussed the opportunity of enhancing learning for both students and faculty. In addition, ChatGPT may help researchers develop their study work, considering academic integrity. Other researchers have spoken about academic integrity risks [1, 7]. Threats include issues with work originality, intellectual property, honesty, integrity, and authorship, all of which are crucial academic principles.

## 2 LITERATURE REVIEW

Artificial intelligence (AI) is rapidly evolving and increasingly influencing our daily lives. The ability to process and learn from various types of data to extract useful and structured knowledge for automating human tasks or supporting detection holds a promising future [8]. The advancements in AI technologies, supported by the rapid development of deep machine learning, have led to the creation of large processing models like ChatGPT. ChatGPT is a language model trained on extensive datasets, including books, articles, websites, etc. [9]. This model can extract structured text and generate coherent and meaningful text using advanced deep-learning algorithms for NLP tasks. The learning process aims to identify patterns, trends, and relationships in texts to produce fully structured topics across various domains of knowledge [10].

ChatGPT benefits are acknowledged by many researchers, despite some disagreement. The ChatGPT model could assist in solving complex problems for learners [10]. Furthermore, its dialog capability and ability to respond to human natural language queries increase its appeal for learning purposes [11]. ChatGPT can also help learners grasp concepts from various knowledge domains before delving into formal educational resources such as books and lectures. Additionally, it can enhance

students' writing skills by assisting in text composition or restructuring sentences in alternative formats [12]. General language models such as ChatGPT are valuable for summarizing large bodies of text and abstracting information. This feature is particularly beneficial for students and researchers seeking to quickly gather the necessary knowledge for learning and writing study reports [13, 14]. ChatGPT is considered a valuable tool for both students and teachers in facilitating the learning process. For students, ChatGPT aids in self-study and extracting diverse and engaging learning materials such as text, images, and videos [15].

Scientific researchers may also use ChatGPT mainly for editing and paraphrasing. ChatGPT can provide alternative words to improve sentence structure for better clarity [12]. According to Hutson [16], some scientific researchers utilize AI-based tools to aid in evaluating, coding, and summarizing literature reviews. Researchers have identified and listed six core values of academic integrity: honesty, trust, fairness, respect, responsibility, and courage. Using ChatGPT to create reports, research, or essays violates academic integrity. Additionally, students or researchers can engage with ChatGPT to receive various outputs and select the most suitable for their work. The output from ChatGPT is generated from a vast collection of others' original work, raising significant concerns about intellectual property rights [1]. The accuracy of ChatGPT is another critical concern that questions the credibility of its outputs. The accuracy of ChatGPT is influenced by the volume of data it has been trained on, the complexity of the query, and the domain knowledge. However, it is highly recommended that the outputs be double-checked and validated, considering the context and domain knowledge [17].

Michalak [18] suggests that authors will soon be required to declare whether they used an AI-generated model to produce their study articles. Sullivan, Kelly, and McLaughlan [19] suggest that universities and higher education institutions should examine and explore the opportunity of using AI tools such as ChatGPT to enhance student learning. Utilizing this tool could benefit any type of learner at any level. However, like any other high-technology tool in our current era, it can be misused. Educational institutions and universities need to understand the tools' capabilities, accuracy, credibility, and scalability limitations and then develop policies, guidelines, and procedures for how to use any AI language model, such as ChatGPT.

Researchers investigated the impact of ChatGPT on education through various approaches, often focusing on specific fields or students from particular majors. For instance, Rejeb et al. [3] employed machine learning models to analyze 2003 web articles, highlighting the benefits and concerns regarding ChatGPT in education, including ethical considerations like data privacy. Halaweh [20] explored strategies for the responsible and effective integration of ChatGPT in education, presenting five techniques for student use. Srinivasan [21] envisioned a promising future for AI in education, offering a comprehensive framework to maximize learning potential and positive outcomes. Wardat et al. [17] studied the impact of ChatGPT on teaching and learning mathematics, while Ali et al. [22] examined its influence on English learning motivation. Firat [23] surveyed scholars and students from various countries to analyze perceptions of the advantages and challenges of ChatGPT. Al Shloul et al. [24] used a comparative approach to demonstrate the benefits of ChatGPT in education, such as creating an interactive learning environment. Chaudhry et al. [25] employed an experimental design to assess ChatGPT's ability to solve diverse assignments. Rasul et al. [26] identified five benefits and challenges of ChatGPT in education through a literature review. Student perceptions of ChatGPT were evaluated through a survey in [27], focusing solely on senior students in a

computer engineering program. In contrast, our study encompasses a large sample of students from 15 universities and various majors, providing a comprehensive assessment of these students' perceptions.

### 3 METHODOLOGY

The questionnaire in this study was distributed to many students in April 2023. The respondents are mainly bachelor students from 15 universities across the UAE, including the top-ranked universities in the country such as Sharjah University, United Arab Emirates University, Khalifa University, Abu Dhabi University, Ajman University, Higher Colleges of Technology, and Zayed University. However, the largest percentage of respondents are from the American University of Ras Al Khaimah. The total number of participants is 316, making the sample size large enough to represent the population. The study is based on the analysis of a questionnaire that focuses on four constructs: ChatGPT usage, ChatGPT advantages, ChatGPT disadvantages, and ChatGPT usage management. Each construct contains dimensions for measurement, totaling 22 dimensions. These dimensions were designed based on a literature review and expert opinions. In addition to these questions, there are three questions at the beginning of the questionnaire about the gender, specialty, and class standing levels (freshman, sophomore, junior, senior) or study year (1, 2, 3, or 4).

Table 1 presents the constructs and dimensions of the study. The questionnaire comprises questions related to the dimensions in Table 1, along with basic demographic data such as gender, academic level, and major or field of specialization. This concise overview is provided for future reference in other tables. The questionnaire consists of a total of 25 questions. Respondents are required to select one of the following options for the 22 dimensions: strongly agree, agree, not sure, disagree, or strongly disagree. During the analysis, the responses are transformed into a Likert scale ranging from 1 to 5, with 5 indicating strongly agree and 1 indicating strongly disagree.

**Table 1.** Study constructs and dimensions

Constructs	Dimension	Short Expression
ChatGPT Usage	I am familiar with ChatGPT	familiar with ChatGPT
	I use ChatGPT to answer homework questions	to answer homework
	I used ChatGPT for major assignments or projects	for major assignments
	I use AI tools other than ChatGPT	other tools
	I do NOT face technical troubles when I use ChatGPT	no technical troubles
ChatGPT Advantages	ChatGPT advantages are more than disadvantages	advantages are more
	I have a positive experience with ChatGPT	positive experience
	ChatGPT understands and answers the questions of the students correctly	understands and answers
	ChatGPT is capable of answering different types of questions	answering different questions
	I intend to use ChatGPT in my future career	use in future
	ChatGPT can improve student learning process	improve learning

(Continued)

**Table 1.** Study constructs and dimensions (*Continued*)

Constructs	Dimension	Short Expression
ChatGPT Disadvantages	ChatGPT can be misused	misused
	ChatGPT can be used in cheating in academia	cheating
	ChatGPT can destroy a lot of jobs in the future	destroy jobs
	ChatGPT makes students lazy and not making their jobs by themselves	lazy students
	ChatGPT still needs to be enhanced to work better in helping students	enhancements needed
Managing using ChatGPT	ChatGPT is always correct in answering calculations questions	correct calculations
	ChatGPT is a learning aid and it represents a huge opportunity for learning	learning aid
	Educators should introduce innovative assessments to use ChatGPT	innovative assessments needed
	ChatGPT can be used by students even when they are asked to include personal experiences or perspectives in their writing	effect of personal experiences
	ChatGPT can be used by students even when they are asked to include their own argument about a subject	effect of own argument
	ChatGPT can be used even for assignments that need creative and critical thinking abilities	effect of critical thinking

Dividing the study measures into constructs and dimensions makes the analysis easier to interpret. However, tests should be conducted to assess the internal consistency of each construct. Cronbach's alpha is used for this purpose. The impact of gender, major, and academic level will be examined. This examination is structured around the study hypotheses, which are outlined below:

- H1: Students agree or strongly agree about ChatGPT usage, advantages, disadvantages, and management.
- H2: The respondents' perception of ChatGPT may be influenced by gender.
- H3: The respondents' perception of ChatGPT may be influenced by factors such as class standing and major.

The above hypotheses are the "alternative" ones. The "null" hypotheses mean that there is no effect of gender, level, or major. Rejecting the null hypothesis means that the alternative hypothesis is accepted. Initially, basic statistics such as average and standard deviation are calculated for each question. The first hypothesis is investigated using a one-sample t-test. The mean will be checked if it exceeds 3 ( $\mu > 3$ ) because exceeding 3 indicates "agree" (4 on the Likert scale) or "strongly agree" (5 on the Likert scale). Rejecting the null hypothesis implies that the gender of the students affects their perception. To conduct a t-test, the p-value is calculated, and if the p-value is less than 0.05, the null hypothesis is rejected. This principle regarding the p-value applies to all three hypotheses. For the first hypothesis, if the average is less than 3, a t-test is unnecessary because the average cannot be greater than 3. The second hypothesis is examined using a two-sample t-test, assuming unequal variances. This test is typically conducted when there

are two samples, such as a sample of males and a sample of females. This process is carried out for each of the 22 questions. A two-sided t-test is employed, which means that the alternative hypotheses check if  $\mu_1 \neq \mu_2$ . In the third hypothesis, there are more than two samples, for instance, four levels and five major groups. If at least one of the levels differs from the others, the null hypothesis is rejected. For instance, if senior students have different perceptions than other students, the alternative hypothesis is accepted. This procedure is also applied to each question for the two factors (major and level). In this scenario, a t-test is unnecessary; instead, Analysis of Variance (ANOVA) is utilized. Consequently, three tests are conducted in this study, each on every question. To analyze the construct, the average of the respondents' answers about the dimensions of each construct is utilized.

Besides the above hypotheses, it is expected that individuals who use ChatGPT more frequently will hold more positive perspectives regarding its advantages. Therefore, the correlation between the frequency of usage and advantages is anticipated to be stronger than the correlation between usage and disadvantages. The Spearman correlation coefficient is calculated to verify this. The entire analysis is conducted using Excel and R software.

#### 4 ANALYSIS AND RESULTS

The number of male and female respondents is shown in Figure 1. The number of males and females is almost the same. Figure 2 shows the majors of the respondents. The number of fields of specialization is 58, which are combined into major groups. A large percentage of students are in the category of computer-related fields such as IT, AI, computer engineering, computer science, cybersecurity, and others. The second category comprises the rest of engineering majors such as mechanical engineering, electrical engineering, industrial engineering, etc. Additionally, medicine-related fields include medicine, dentistry, human nutrition and dietetics, physical therapy, nursing, and others. Business majors consist of business administration, business analytics, business finance, business marketing, digital marketing, and others. Subsequently, in the analysis, those majors with fewer than 10 students will be combined and named as "others". Figure 3 shows the students' class standing. Students are from all levels.

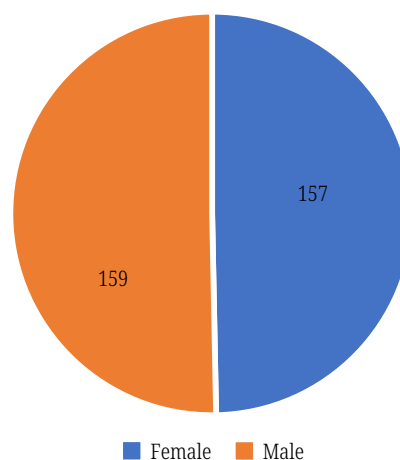


Fig. 1. Gender of respondents

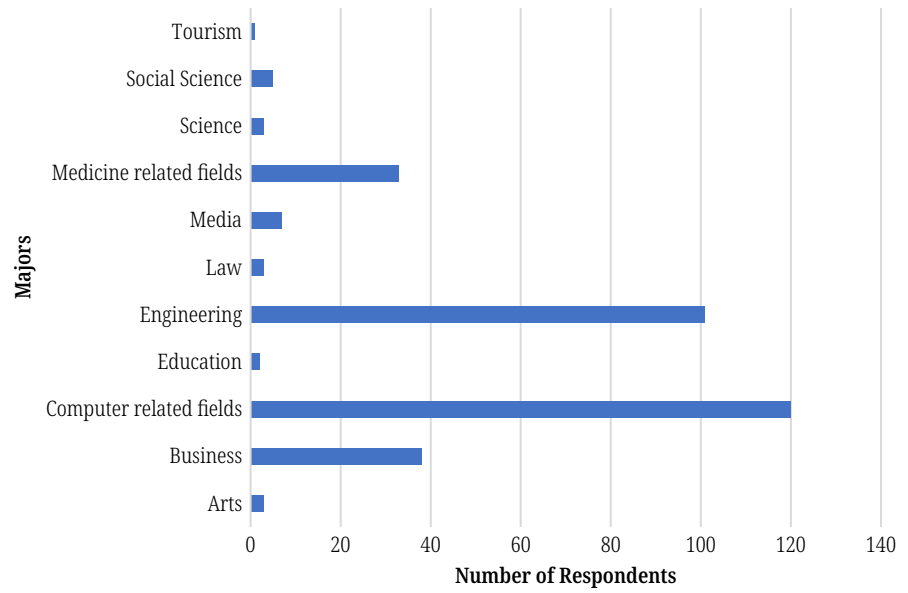


Fig. 2. Majors of respondents

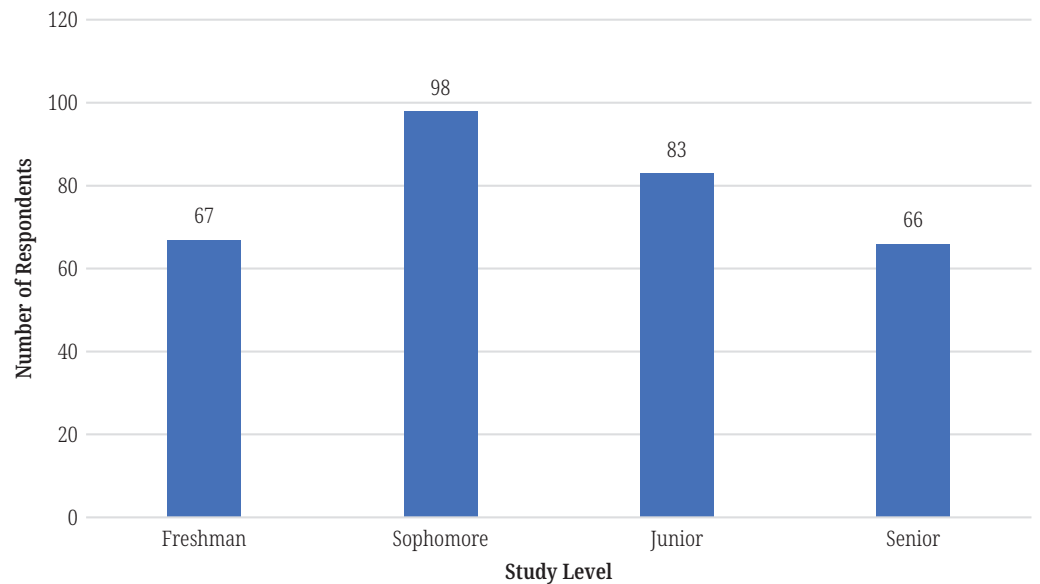


Fig. 3. Respondents class standing levels

The internal consistency of the dimensions in each construct is assessed using Cronbach’s alpha. Table 2 displays these values. All values are sufficiently high, as they are all above 0.6. The table also indicates that the overall average for each construct is approximately 3 or higher.

Table 2. Study constructs and averages

Constructs	Average	Cronbach Alpha
ChatGPT Usage	3.01	0.68
ChatGPT Advantages	3.20	0.82
ChatGPT Disadvantages	3.27	0.75
Managing using ChatGPT	3.19	0.67

Table 3 presents the averages, standard deviations, and t-test results for each dimension (question). NA is used when the average is less than 3. It is evident that respondents generally agree on the advantages, disadvantages, and management of ChatGPT. However, ChatGPT is not extensively utilized by students. Although students are acquainted with ChatGPT, they do not use it regularly. This is apparent as the averages are below 3 in four questions of the first construct, eliminating the need for a t-test.

**Table 3.** Average, standard deviation, and one sample t-test

	Average	Standard Deviation	t-Test (p-Value)
<i>ChatGPT Usage</i>			0.42
familiar with ChatGPT	3.45	1.35	0.00
to answer homework	2.92	1.26	NA
for major assignments	2.92	1.27	NA
other tools	2.81	1.32	NA
no technical troubles	2.94	1.16	NA
<i>ChatGPT Advantages</i>			0.00
advantages are more	3.19	1.26	0.00
positive experience	3.27	1.27	0.00
understands and answers	3.15	1.15	0.01
answering different questions	3.31	1.20	0.00
use in future	3.22	1.20	0.00
improve learning	3.08	1.26	0.14
<i>ChatGPT Disadvantages</i>			0.00
misused	3.31	1.28	0.00
cheating	3.41	1.32	0.00
destroy jobs	3.30	1.24	0.00
lazy students	3.10	1.28	0.09
enhancements needed	3.23	1.20	0.00
<i>Managing using ChatGPT</i>			0.00
correct calculations	3.39	1.21	0.00
learning aid	3.27	1.17	0.00
innovative assessments needed	3.26	1.14	0.00
effect of personal experiences	3.14	1.24	0.03
effect of own argument	3.04	1.19	0.27
effect of critical thinking	3.07	1.19	0.15

The students agreed about almost all the advantages mentioned. This can be seen when the p-value is less than 0.05. However, many of them do not think it can improve learning (p-value = 0.14). The students are concerned about the disadvantages of



ChatGPT, where the p-values are zero in most of them. The management of using ChatGPT is needed. Depending on the p-values, we can say that the students think that ChatGPT cannot be useful for questions that require their own argument and critical thinking. However, it can be very useful for calculation questions. For the questions about personal experiences, males and females have different perspectives. In the next paragraph, this will be discussed.

The above explanation examines the first hypothesis. For the second hypothesis, a two-sample t-test is required to assess the impact of gender on the results. The p-values are greater than 0.05 in all questions except for questions 15 and 20. Figure 4 illustrates the contrasting viewpoints of males and females on these two questions. Females believe that ChatGPT can remain beneficial even when questions about personal experience are required. Conversely, males believe that ChatGPT can lead to student laziness.

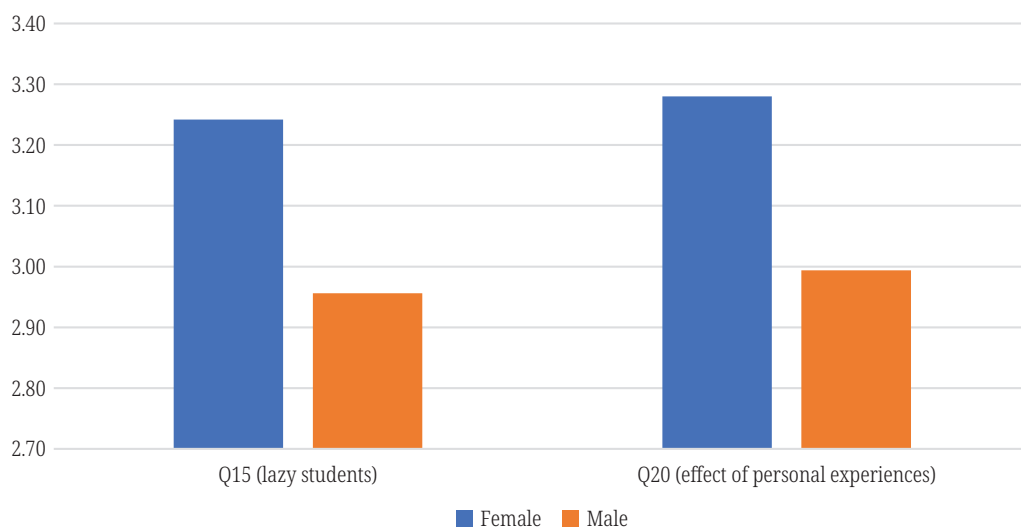


Fig. 4. Effect of gender on the perception of respondents regarding Q15 and Q20

The third hypothesis examines the impact of class standing level and major on students’ perceptions. An ANOVA test was conducted, revealing that students across different class standing levels share similar perceptions of ChatGPT, as indicated by p-values exceeding 0.05. However, the influence of major is more pronounced. By excluding majors with a small number of students, the sample size is reduced to 292. Table 4 displays the results of the ANOVA test for the questions.

Table 4. ANOVA test to check the effect of specialty

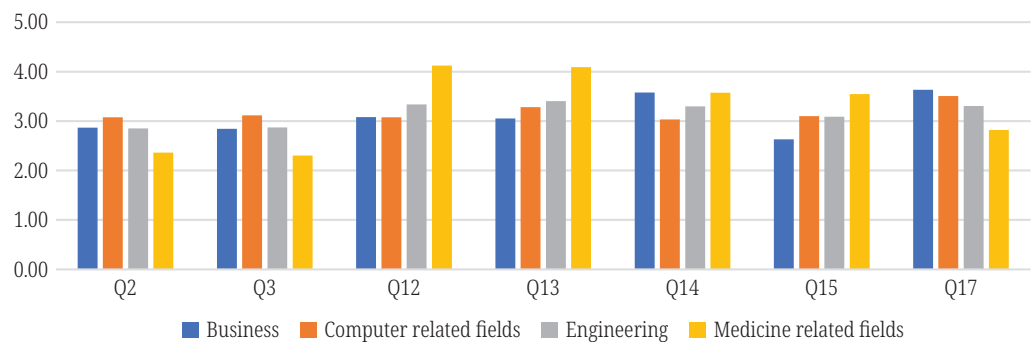
Question #	Constructs and Dimensions (Short Expression)	ANOVA Test (P-Value)
	<i>ChatGPT Usage</i>	
Q1	familiar with ChatGPT	0.87
Q2	to answer homework	0.03
Q3	for major assignments	0.01
Q4	other tools	0.07
Q5	no technical troubles	0.24

(Continued)

**Table 4.** ANOVA test to check the effect of specialty (*Continued*)

Question #	Constructs and Dimensions (Short Expression)	ANOVA Test (P-Value)
	<i>ChatGPT Advantages</i>	
Q6	advantages are more	0.91
Q7	positive experience	0.99
Q8	understands and answers	0.28
Q9	answering different questions	0.07
Q10	use in future	0.23
Q11	improve learning	0.82
	<i>ChatGPT Disadvantages</i>	
Q12	misused	0.00
Q13	cheating	0.00
Q14	destroy jobs	0.03
Q15	lazy students	0.03
Q16	enhancements needed	0.32
	<i>Managing using ChatGPT</i>	
Q17	correct calculations	0.02
Q18	learning aid	0.13
Q19	innovative assessments needed	0.46
Q20	effect of personal experiences	0.11
Q21	effect of own argument	0.54
Q22	effect of critical thinking	0.23

Figure 5 shows the varying perceptions of students from disparate major groups. The differences in other questions, not depicted in Figure 5, were found to be insignificant, with p-values exceeding 0.05. Hence, they have not been included in the figure.



**Fig. 5.** Effect of specialty on the perception of respondents

In spite of the differences between questions Q2 and Q3, almost all groups of students rated the questions lower than 3. Only the students in the computer-related fields have an average slightly larger than 3. These two questions are about the use

of ChatGPT. For questions 12, 13, 14, and 15, which are about the disadvantages of ChatGPT, the students from the medicine-related fields have the largest criticism about ChatGPT. The correlation coefficient was used to check if the students who use ChatGPT are more convinced about its advantages. Table 5 shows the correlation between the usage of ChatGPT and the perception of its advantages and disadvantages. The correlation between usage and advantages is relatively high (0.56). However, the correlation between usage and disadvantages can be negligible.

**Table 5.** Correlation between ChatGPT usage and its advantages and disadvantages

	ChatGPT Advantages	ChatGPT Disadvantages
ChatGPT usage	0.56	0.19

The main results of the study indicate a lack of awareness regarding the full benefits of ChatGPT. Students are more aware of its disadvantages than its advantages. Part of the problem is that ChatGPT is still in its initial phase of usage. Typically, professors avoid creating assignments specifically designed to use ChatGPT. The different specialties of students affect their perceptions. The study results generally agree with the major findings of previous studies. This is especially relevant to the importance of designing assignments in a way to prohibit cheating [2, 28]. Generally, the study shows that students are familiar with ChatGPT but are not using it frequently. However, in the future, it is expected that ChatGPT will become more popular. Students believe in its advantages and disadvantages. However, students from medicine-related fields have a stronger perception of ChatGPT's disadvantages. The performance of ChatGPT depends on the subject domain. This is the same result found by Lo [5]. Moreover, ChatGPT can be used more for simple, direct questions such as calculations. However, for those questions that include opinions, own arguments, or critical thinking, ChatGPT cannot be useful. Educators should design questions in an innovative way to utilize ChatGPT to some extent and also encourage students to exert efforts to answer the questions of assignments. ChatGPT can be used to create engaging and challenging tasks. Based on the above, the following managerial implications can be highlighted:

- Universities should not avoid using ChatGPT due to the challenges it presents. Instead, they should carefully manage the way ChatGPT is used.
- Universities should provide training for both students and faculty members on how to utilize ChatGPT efficiently. This training should cover not only the technical aspects of using the tool but also ethical considerations and proper citation practices.
- Professors should design assignments in a way that prevents cheating, such as by requiring personal perspectives from students.

Overall, embracing ChatGPT in education requires a balanced approach that addresses its challenges while considering its potential benefits to enhance learning outcomes.

## 5 CONCLUSION

In this study, we investigated the use of ChatGPT by bachelor students at different universities in the UAE. Data was collected through a questionnaire that asked students about using ChatGPT to solve their assignments. It also asked them about

their opinions regarding the advantages and disadvantages of ChatGPT and the types of questions ChatGPT can answer. Statistical analyses such as the one-sample t-test, two-sample t-test, ANOVA, and correlation were used to investigate three main hypotheses. Results showed that ChatGPT usage in assignments is still in its early stages. Students are familiar with ChatGPT and its pros and cons. The major has a significant impact on results. For instance, students in the medical field are more critical of its disadvantages. Males and females have similar perspectives, except for two questions. For instance, females believe ChatGPT can be used for personal experience questions. The primary limitation of this study is that it was conducted in the initial phases of ChatGPT. It is anticipated that students will become more acquainted with this tool and other text-generation tools. Educators will explore ways to incorporate ChatGPT into students' required assignments. Future studies could compare AI tools and their impacts on educational fields. Subsequent studies could delve deeper into the potential of such tools for learning.

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