

Exploring the main issue of Mathematical word Problems in Calculus for Undergraduate Students after Using the ChatGPT

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ABSTRACT:- This paper has been prepared to explore the main issue of the results and the feedback after using the ChatGPT tool in calculus material for undergraduate students in Kuwait. The data was obtained by face-to-face interviews. The study was performed at college of basic Education, operating under the umbrella of the Public Authority for Applied Education and Training. The finding from this research study revealed that the most undergraduate students are not familiar with the results and the feedback generated by the ChatGPT in Calculus material. The main conclusion from this result is the most of undergraduate students need a help to solve the mathematical word problems after using the ChatGPT tool in calculus material.

KEYWORDS:- ChatGPT, Mathematics, Calculus, Kuwait,.

INTRODUCTION

Previous research studies have been examined the use of ChatGPT for solving the mathematical problems in education. It can provide learning experience, support self-regulated learning as well as assist in teaching mathematical concepts. For example, Li et al. (2023) revealed that the math questions for middle school can be answering in a high accuracy with the ChatGPT tool. Moreover, the ChatGPT tool can also providing the responses to secondary mathematics topics such as logarithmic and exponential functions. However, Urhan et al. (2024) revealed that the ChatGPT did not support students to solve the mathematical problems in learning calculus concepts.

Furthermore, Alenezi (2026) found that the most of undergraduate students have not enough knowledge to understand the results and the feedback after using the ChatGPT tool in Calculus concepts. Therefore, this research study aims to explore the main issue after using the ChatGPT tool in calculus material for undergraduate students in Kuwait. The objective was to gather the information from a wide range of undergraduate students at college of Basic education in Kuwait, to be achieved through face-to-face interviews.

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Now that the introduction has been detailed, a brief overview of ChatGPT and their applications followed by the research method will be detailed. Then, the results and discussion of this research will be analysed as well as the conclusion will be given at the end of this research.

RESEARCH METHODOLOGY

Given that the use of ChatGPT in education is still being evaluated, the face-to-face interviews were selected in this research methodology in order to explore the main issue in calculus material for undergraduate students after using the ChatGPT tool. The face-to-face interviews were conducted between 9 of June to 9 of July 2026 during the summer semester. The face-to-face interviews were given to 60 of male and female for undergraduate students, as shown in Figure 1.

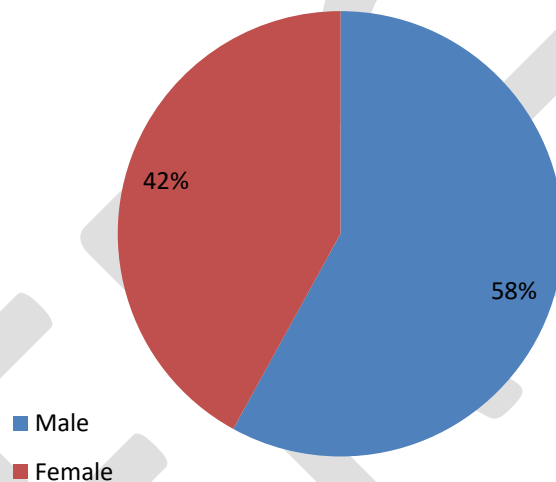


Figure 1. The total interviews in percentage of male and female for undergraduate students.

Findings and Discussion

Figure 2 showed the findings of the research study were compared with the manual methods as well as the results that have been presented by the teacher in the classroom. As shown in Figure 2, 53% and 42% as well as 5% of the responses were concluded that the results and the feedback generated by the ChatGPT are as follows: not familiar, not correct and no accurate, respectively. Based in literature review, the research studies found that the ChatGPT was not helpful to support students in calculus material.

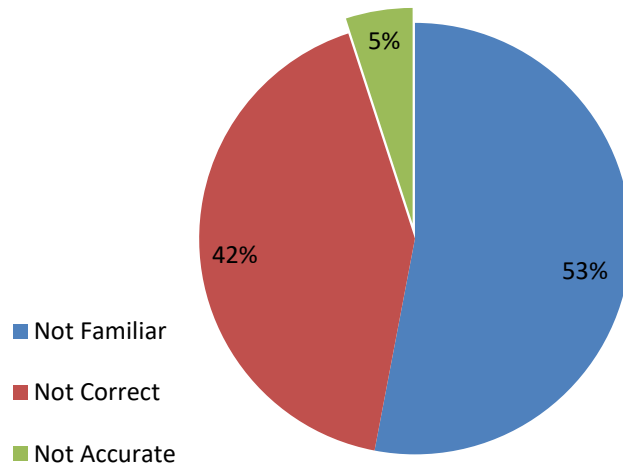


Figure 2. The findings of the research study after using the ChatGPT tool in Calculus concepts compared with the manual methods as well as the results that have been presented by the teacher in the classroom.

Moreover, the students were also struggled to understand the mathematical word problems after using the ChatGPT tool in Calculus material. Hence, this is in line with the previous study by Alenezi (2026) concluded that the most undergraduate students have not enough knowledge to understand the results and the feedback after using the ChatGPT tool in Calculus material, see figure 3.

The function is

$$f(x) = \cos\left(\frac{x}{2}\right) \tan\left(\frac{x}{2}\right).$$

Method 1: Simplify first (easiest)

Using the identity

$$\tan \theta = \frac{\sin \theta}{\cos \theta},$$

we get

$$f(x) = \cos\left(\frac{x}{2}\right) \cdot \frac{\sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)} = \sin\left(\frac{x}{2}\right).$$

Now differentiate using the chain rule:

$$f'(x) = \frac{1}{2} \cos\left(\frac{x}{2}\right).$$

Final Answer

$$f'(x) = \frac{1}{2} \cos\left(\frac{x}{2}\right)$$

Figure 3. The results and the feedback without the key words after using the ChatGPT tool in Calculus.

However, the Author tried to help the undergraduate students with their issue struggled in mathematical word problems after using the ChatGPT tool for calculus material. The results were providing a positive reflection to the most of undergraduate students. The key words used to clarify the results and the feedback after using the ChatGPT tool in Calculus concepts is as follow: How? and more accuracy, as shown in Figure 4. Therefore, further research study is required to provide more details to understand the main requirements to solve the mathematical word problems for undergraduate students in calculus material.

How and more accuracy

Let's differentiate it **step by step** using the **product rule**, without simplifying first.

Given:

$$f(x) = \cos\left(\frac{x}{2}\right) \tan\left(\frac{x}{2}\right)$$

Step 1: Identify the two functions

Let

$$u = \cos\left(\frac{x}{2}\right), \quad v = \tan\left(\frac{x}{2}\right).$$

The product rule states:

$$(uv)' = u'v + uv'.$$

Step 2: Differentiate each function

Differentiate u

Using the chain rule,

$$\frac{d}{dx} \left[\cos\left(\frac{x}{2}\right) \right] = -\sin\left(\frac{x}{2}\right) \cdot \frac{d}{dx} \left(\frac{x}{2} \right)$$

↓

$$\frac{d}{dx} \left(\frac{x}{2} \right) = \frac{1}{2},$$

we get

$$u' = -\frac{1}{2} \sin\left(\frac{x}{2}\right).$$

Differentiate v

The derivative of $\tan x$ is $\sec^2 x$.

Again, use the chain rule:

$$\frac{d}{dx} \left[\tan\left(\frac{x}{2}\right) \right] = \sec^2\left(\frac{x}{2}\right) \cdot \frac{1}{2} = \frac{1}{2} \sec^2\left(\frac{x}{2}\right).$$

So,

$$v' = \frac{1}{2} \sec^2\left(\frac{x}{2}\right).$$

Step 3: Apply the product rule

$$f'(x) = u'v + uv'$$

Substitute the derivatives:

$$f'(x) = \left(-\frac{1}{2} \sin\left(\frac{x}{2}\right) \right) \tan\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right) \left(\frac{1}{2} \sec^2\left(\frac{x}{2}\right) \right)$$

Factor out $\frac{1}{2}$:

$$f'(x) = \frac{1}{2} \left[-\sin\left(\frac{x}{2}\right) \tan\left(\frac{x}{2}\right) + \cos\left(\frac{x}{2}\right) \sec^2\left(\frac{x}{2}\right) \right].$$

Step 4: Simplify

Use the identities

$$\tan \theta = \frac{\sin \theta}{\cos \theta}, \quad \sec^2 \theta = \frac{1}{\cos^2 \theta}.$$

Substitute them:

$$f'(x) = \frac{1}{2} \left[-\sin\left(\frac{x}{2}\right) \cdot \frac{\sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)} + \cos\left(\frac{x}{2}\right) \cdot \frac{1}{\cos^2\left(\frac{x}{2}\right)} \right].$$

Simplify each term:

$$= \frac{1}{2} \left[-\frac{\sin^2\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)} + \frac{1}{\cos\left(\frac{x}{2}\right)} \right].$$

Take the common denominator:

$$= \frac{1}{2} \cdot \frac{1 - \sin^2\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)}.$$

Figure 4. The results and the feedback in 4 steps after using the key words (how? and more accuracy) in ChatGPT tool for Calculus.

CONCLUSION

The ChatGPT tool is still being used by the most of undergraduate students for calculus material in Kuwait. Previous study was found that the undergraduate students have not enough knowledge to understand the results and the feedback after using the ChatGPT tool in calculus material. Therefore, the aim of this paper was to explore the main issue of the results and the feedback after using the ChatGPT tool in calculus material for undergraduate students in Kuwait. To do that, the face-to-face interviews were conducted in a college of basic Education. The results from face-to-face interviews revealed that the most of undergraduate students were not familiar with the results and the feedback generated by the ChatGPT in calculus material. This was because the most of undergraduate students were struggled to understand the mathematical word problems after using the ChatGPT tool in calculus material. However, the Author found that the key words such as "How? and more accuracy" should be used in order to clarify the mathematical word problems after using the ChatGPT tool in calculus material.

Clearly, further research study is required to supporting and encouraging researchers in mathematics field in order to provide more details to understand the main requirements to solve the mathematical word problems for undergraduate students in calculus material.

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