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# Enhancing Coding Skills and Learning Efficiency in Engineering Programming Courses by Using AI Tools

**Prof. Milad Rezvani Rad, University of Southern Indiana**

Dr. Milad Rad is an Assistant Professor in the Engineering Department at the University of Southern Indiana. He earned his Ph.D. in Mechanical Engineering from the University of Alberta in Canada. Besides his specialization in functional thermally sprayed coatings, he explores innovative AI-driven approaches to enhance student engagement in the classroom.

**Dr. Ronald Diersing, University of Southern Indiana**

Ronald Diersing is an Associate Professor of Engineering with the University of Southern Indiana. He received his B.S.E.E degree from Purdue University in 2001; M.S.E.E. and Ph.D. degrees from the University of Notre Dame in 2004 and 2007. He has been with the University of Southern Indiana since 2007. His research focuses on stochastic control with applications towards structural control.

**Ryan Integlia, University of Southern Indiana**

Ryan Integlia, Associate Professor, Electrical Engineering at University of Southern Indiana, specializes in wearables, robotics, and AI applications in healthcare, wellness and education.

**Dr. Julian Ly Davis, University of Southern Indiana**

Jul Davis is an Associate Professor of Engineering at the University of Southern Indiana in Evansville, Indiana. He received his PhD in 2007 from Virginia Tech in Engineering Mechanics where he studied the vestibular organs in the inner ear using finite element models and vibration analyses. After graduating, he spent a semester teaching at a local community college and then two years at University of Massachusetts (Amherst) studying the biomechanics of biting in bats and monkeys, also using finite element modeling techniques. In 2010, he started his career teaching in all areas of mechanical engineering at the University of Southern Indiana. He loves teaching all of the basic mechanics courses, and of course his Vibrations and Finite Element Analysis courses.

# Enhancing Coding Skills and Learning Efficiency in Engineering Programming Courses by Using AI Tools


## Abstract

Integrating AI tools like ChatGPT and Gemini into programming courses, such as the freshman-level Fundamentals of Engineering, provides students with invaluable support for enhancing their coding skills. One common challenge students face is the correct use of characters and punctuation, which often leads to errors and frustration. This manuscript examines how ChatGPT can help students overcome these obstacles by providing real-time feedback and guidance. In-class examples were used to evaluate the accuracy of code troubleshooting, and student surveys assessed the impact on motivation, engagement, and coding efficacy. Results show that access to AI resources not only improves students' ability to write more efficient code but also significantly enhances their overall learning experience. These tools encourage deeper engagement, fostering independence and confidence in coding. Furthermore, AI support is particularly beneficial for complex topics like loops and subroutines, where students often struggle with logic and procedure. In such cases, AI provides examples, guidance, enabling students to make minor corrections efficiently, saving both time and effort. While ChatGPT has its limitations, it remains a highly valuable educational tool for students seeking to refine their coding skills, and deepen their understanding of programming concepts, and insight into trends of its integration into industry tools seeking to enhance productivity. In doing so, it also contributes meaningfully to their professional development.



**Keywords:** AI in Education, In-class Coding Assistance, Student Engagement, Real-time Feedback, Enhanced Learning,


## Introduction

The rapid advancement of technology has reshaped how education is delivered, with artificial intelligence playing an increasingly pivotal role. One such AI-driven innovation is ChatGPT 4.0, a sophisticated language model developed by OpenAI. Since its debut in November 2022 [1], this tool has been widely utilized in academic settings, significantly impacting various fields of study. Its evolution reflects a broader trend in AI, where intelligent systems are transforming communication, learning methodologies, and everyday interactions [2].

AI's integration into education has expanded access to diverse learning tools enabling students to engage with material in novel ways. Additionally, AI has revolutionized instructional methods by introducing dynamic teaching tools, including adaptive course content and automated classroom systems that enhance student participation. The emergence of AI-based assessment solutions has further allowed educators to deliver instant feedback, customize learning paths, and refine teaching strategies [3].

Despite these advancements, the role of ChatGPT in education remains a topic of debate, particularly regarding concerns about academic honesty and genuine student comprehension [1]. In engineering education, ChatGPT serves as an aid for refining written communication, providing virtual tutoring, and supporting problem-solving tasks [4]. However, the model's inherent limitations mean that errors can occur, potentially leading to misunderstandings. Consequently, it

is essential for students to critically assess AI-generated responses rather than rely on them entirely. While ChatGPT should not be the primary tool for computational work, its explanatory functions and structured guidance can provide valuable learning support [5]. Further research is necessary to explore its influence on student engagement and motivation [6]. When properly implemented, ChatGPT 4.0 can enhance analytical reasoning, problem-solving abilities, and programming expertise, making it a promising tool for skill development [7]. Researchers have shown that ChatGPT can be effectively used for coding, given its 71.88% success rate in solving programming problems, particularly in structured tasks, making it a valuable tool for AI-assisted programming [8]. Additionally, studies have demonstrated that ChatGPT performs efficiently in terms of time and memory complexity, providing key insights into AI-driven code generation. However, researchers also highlight its limitations in debugging incorrect solutions, suggesting the need for further improvements in AI models for programming assistance [8].

This study explores the potential of using ChatGPT 4.0 as a learning aid for coding in MATLAB. Many students find MATLAB challenging, struggling with syntax, debugging, and understanding coding logic. Students may perceive it as difficult to navigate, which hinders their learning process. ChatGPT provides instant feedback, helping students refine their code, understand errors, and grasp fundamental programming concepts. By offering real-time assistance and explanations of coding structures and commands, ChatGPT serves as an effective tool to enhance students' comprehension of the coding process and improve their problem-solving skills in MATLAB. Supporting this approach, King *et al.* [9] successfully incorporated Large Language Models (LLMs), including ChatGPT, into a graduate-level bioengineering course, where students critically evaluated AI-generated solutions alongside their own through iterative interactions. Students generally found these LLM integrations beneficial for advancing their MATLAB programming skills and mastering complex numerical methods. Despite these promising outcomes, the existing literature on the educational use of ChatGPT specifically within MATLAB remains limited engineering education, indicating a need for further research into this emerging educational strategy. Thus, the current study aims to contribute to the field by offering insights that may help inform and improve the integration of ChatGPT into MATLAB programming education.

**Methodology**

A group of 27 students enrolled in a Fundamentals of Engineering course participated in a structured activity aimed at assessing the effectiveness of AI-powered tools in coding. The primary objective was to explore how ChatGPT 4.0 could assist students in proofreading their MATLAB code, debugging errors, and providing real-time feedback to enhance their understanding of programming concepts such as flowcharts, recursion, and subroutines.

While students had access to their instructor during class sessions, office hours, and troubleshooting discussions, availability was inherently limited due to scheduling conflicts and other commitments. Consequently, real-time feedback and guidance were not always accessible. ChatGPT 4.0, however, provided an alternative solution by offering instant, 24/7 assistance, making it a valuable supplement to traditional instruction.

To evaluate the impact of AI-assisted learning, students were assigned a MATLAB-based project focused on solving an engineering problem focused on projectile motion using various programming approaches. The details of this project are provided in Appendix A. The complexity

of the computations made manual calculations impractical, necessitating the use of MATLAB for efficient execution. Students were required to develop their own code independently but were encouraged to seek assistance from ChatGPT 4.0 whenever they encountered difficulties. ChatGPT provided hints, suggested debugging strategies, and explained coding principles as students worked through their solutions. An example of this is presented in Appendix B, which outlines the procedure for solving the first part of the project.

After completing the coding assignment, students took part in a survey, detailed in Appendix C, aimed at capturing their experiences with ChatGPT. The survey included structured questions about the usability, effectiveness, and limitations of AI-based assistance. Additionally, students were asked to provide written reflections detailing what they found helpful and challenging in their AI-supported learning process.

This study aimed to assess the role of AI tools like ChatGPT 4.0 in fostering independent problem-solving skills, improving debugging efficiency, and reinforcing MATLAB concepts in engineering education. As this research is still in progress, future iterations will involve a larger sample size and methodological enhancements to offer a more detailed evaluation of AI's influence on programming proficiency, its effectiveness in deepening students' comprehension, and supporting their engagement outside the classroom.

**Results and Discussions**

A survey evaluated students' prior experience with AI tools, including ChatGPT, for coding and programming. Figure 1 indicates that 86.4% had never used AI for MATLAB code development, making this their first exposure to such tools. The 13.6% with prior experience suggest that AI-assisted coding is not widely introduced before this course. This presents a learning opportunity for students to explore ChatGPT's effectiveness in improving coding comprehension, debugging efficiency, and problem-solving skills.

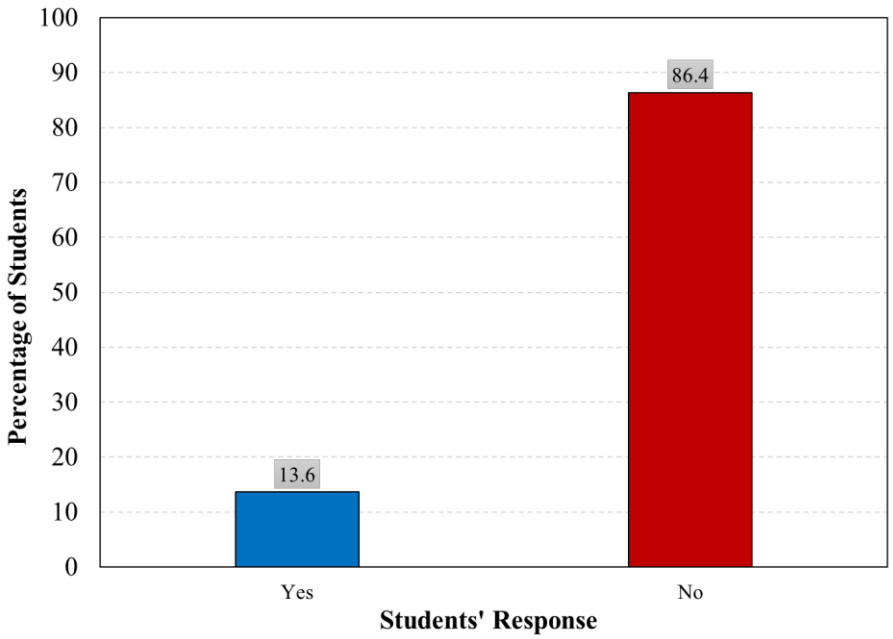



**Figure 1:** Previous Use of ChatGPT for Coding Purposes.

Another survey question asked students, "*Did using ChatGPT to generate MATLAB code help you better understand coding concepts?*" Figure 2 shows that 77.2% of students found ChatGPT beneficial, with 63.6% agreeing and 13.6% strongly agreeing. A neutral stance was taken by 13.6%, while only 9.1% disagreed, and 0.0% strongly disagreed. These findings suggest that ChatGPT is widely perceived as a valuable tool for improving MATLAB coding comprehension, offering real-time feedback and enhancing learning with minimal opposition.

In this context, some students shared the following comments, offering suggestions on how ChatGPT 4.0 can be used more effectively to enhance code comprehension.

- *"Ensure ChatGPT offers clearer explanations when needed."*
- *"Have it provide more detailed explanations of what was done in the code."*
- *"Always ask ChatGPT to simplify the code, as it improves understanding and comprehension."*
- *"Use ChatGPT to explain the code rather than generate it from scratch."*

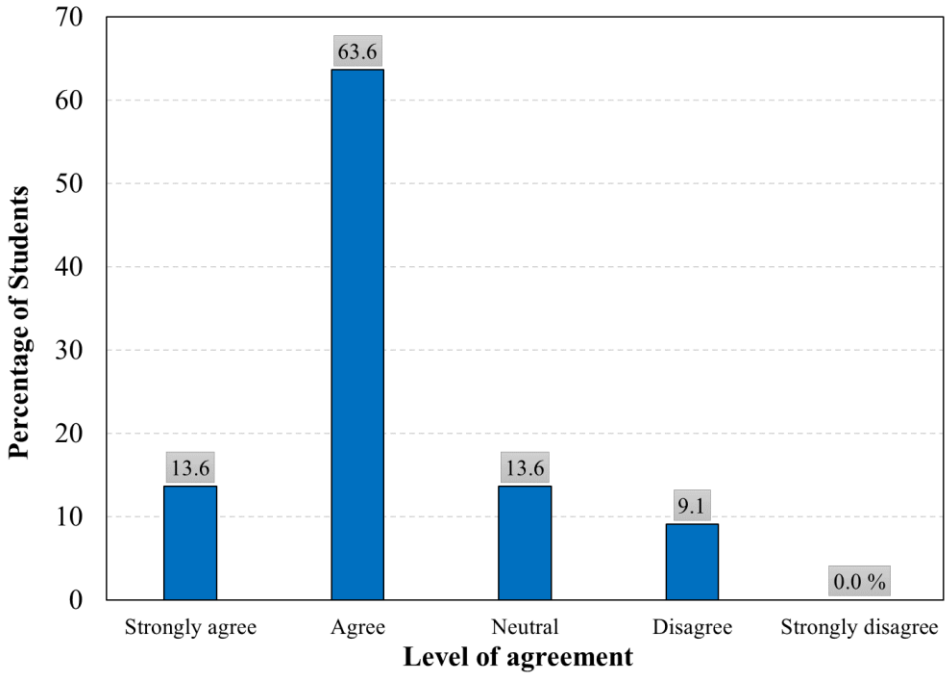



**Figure 2:** Impact of ChatGPT on Students' Understanding of MATLAB Coding Concepts.

Another survey question asked students, "*Did ChatGPT-generated MATLAB code work as intended for the assigned project?*" The survey results shown in Figure 3 indicate that most students found ChatGPT-generated MATLAB code to be useful, though with varying degrees of functionality. 59.1% reported that the AI-generated code worked most of the time but required minor modifications, while 9.1% found it to be fully functional without any adjustments. However, 18.2% remained neutral, suggesting a mixed experience. A smaller percentage of students encountered challenges, with 4.5% stating that the code rarely worked as intended, and another 9.1% reporting that it did not work at all. These findings suggest that while ChatGPT is generally effective for MATLAB coding, it may require human oversight and adjustments to ensure accuracy and functionality.

Discussions with students in class revealed that some developed techniques over time to structure their questions effectively and break problems into smaller parts, optimizing their use of ChatGPT. According to student feedback, the accuracy of ChatGPT's responses varied significantly depending on how questions were framed and whether additional context was provided. Moreover, students' overall satisfaction with the tool appeared to be strongly influenced by their level of familiarity and experience using it.

Some students provided insights on optimizing ChatGPT 4.0 to improve the accuracy and functionality of AI-generated MATLAB code for their projects.

- *"Once I asked ChatGPT to simplify the code three or four times, I could understand what the program was getting at and translated it into code we discussed in this course."*
- *"Knowing what questions to ask to get it to write the code that I need."*

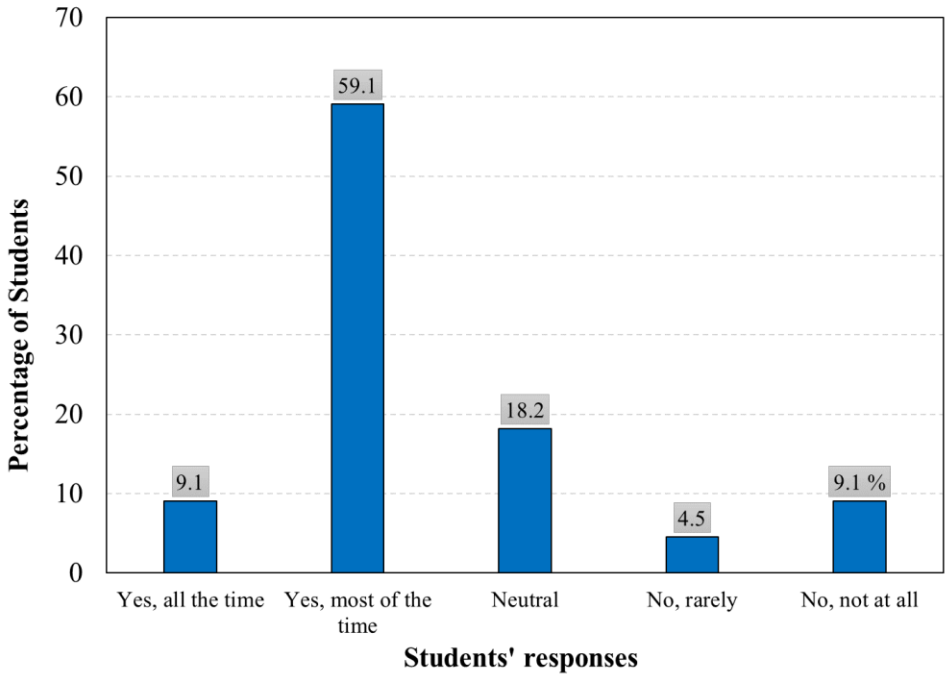



**Figure 3:** Student Feedback on the Accuracy and Functionality of ChatGPT-Generated MATLAB Code in Their Project.

In addition to generating MATLAB code, ChatGPT 4.0 provided explanations for each command and the overall code structure, guiding students on how and why specific commands should be used. In many cases, students found these explanations particularly valuable, as they helped clarify the reasoning behind ChatGPT's coding suggestions.

To assess the clarity of these explanations, students were asked, "How would you describe the clarity of ChatGPT's explanations of the MATLAB code it generated?" The students' responses are shown in Figure 4. The majority found them effective, with 63.6% rating them as "Clear" and 9.1% as "Very clear," indicating that ChatGPT effectively communicated coding concepts. However, 18.2% remained neutral, reflecting mixed experiences, while 9.1% found the

explanations "Unclear," suggesting some difficulty in comprehension. Notably, no students (0.0%) rated the explanations as "Very unclear."

Overall, 72.7% of students considered ChatGPT's explanations clear or highly understandable, demonstrating its usefulness as a learning tool. However, the presence of neutral and unclear responses suggests that AI-generated explanations could still benefit from refinement or supplementary human guidance to enhance clarity and effectiveness.

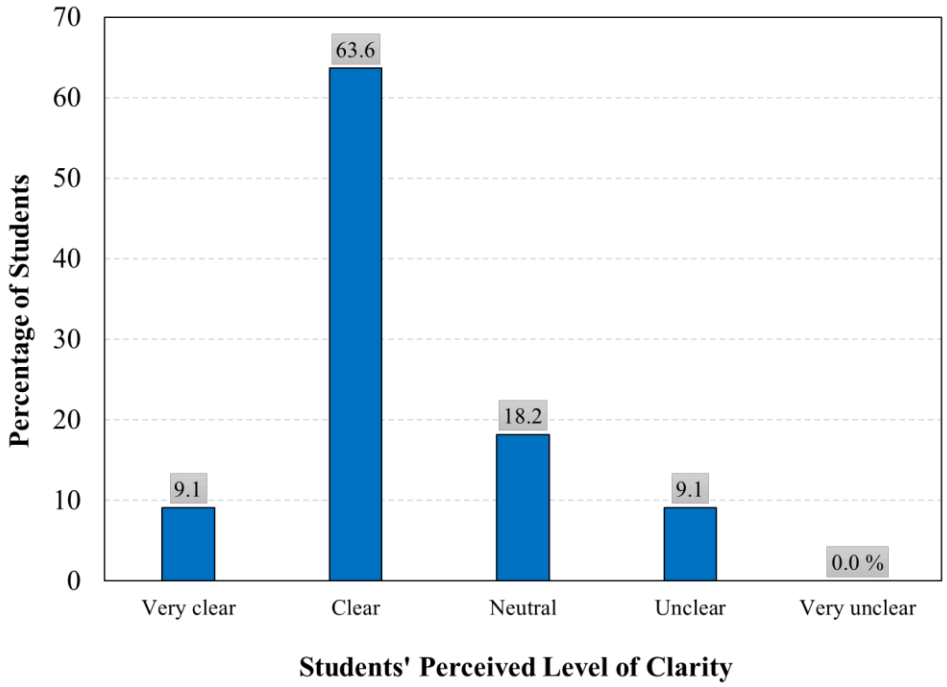



**Figure 4:** Students' Responses on the Clarity of ChatGPT's Explanations for MATLAB Code.

An essential aspect of the Fundamentals of Engineering course, based on the author's personal experience, is the time required for debugging MATLAB code. For most students, this is their first exposure to MATLAB, making it challenging to identify the root cause of errors. Many common mistakes involve misspellings, incorrect capitalization of commands, or punctuation errors, such as using single quotation marks instead of double quotation marks. While these errors may seem minor, they can take several minutes to hours to identify, especially in longer and more complex codes. More significant issues often arise in the logic of the code, such as improper structuring of if statements or loops, leading to functional errors. In all these cases, ChatGPT 4.0 can be a highly effective tool, quickly identifying and suggesting corrections for many errors within seconds.

Typically these skills are currently *still* missing when students reach their advanced Mechanical Engineering classes where they are expected to have experience debugging their own code. Often students have trouble with indexing, understanding how to use variable assignment, and writing loops to perform sequential calculations. This can be remedied with more experience, such as a sophomore level numerical methods course or targeted intervention that could be provided by AI.

Given the importance of reducing debugging time, students were asked, *"How did using ChatGPT impact the time you spent debugging your MATLAB code?"* Figure 5 presents their responses, showing that most students found ChatGPT beneficial in reducing debugging time. 50.0% reported that their debugging time was "somewhat reduced," indicating that while ChatGPT helped fix issues, it was not entirely flawless. Additionally, 31.8% stated their debugging time was "significantly reduced," meaning the AI greatly improved their efficiency in troubleshooting errors. However, 9.1% reported that ChatGPT "did not reduce" their debugging time, suggesting minimal impact on their workflow. A small percentage experienced an increase in debugging time, with 4.5% saying it was "somewhat increased" and another 4.5% stating it was "significantly increased," possibly due to ChatGPT introducing new challenges or requiring additional effort to interpret AI-generated suggestions. Overall, 81.8% of students benefited from reduced debugging time, demonstrating ChatGPT's potential as an effective coding assistant. However, the variability in responses highlights the need for human oversight and critical evaluation to ensure accuracy and efficiency when using AI for MATLAB debugging. In this context, one student shared their perspective, stating, *"ChatGPT is most effective for debugging, as it significantly reduces the time required to fix errors."*

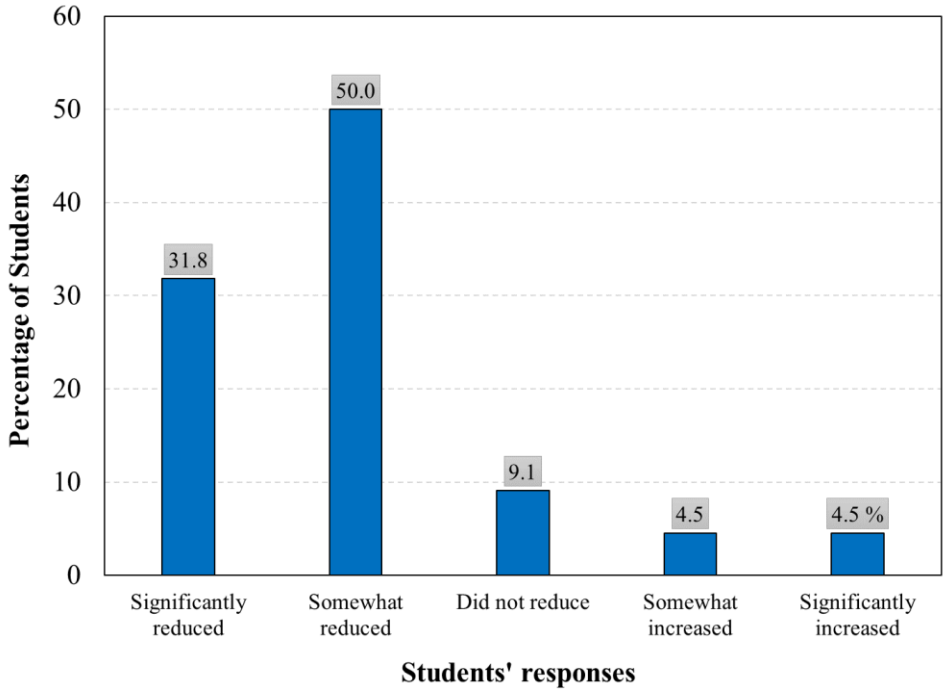



**Figure 5:** Students' Responses on the Impact of ChatGPT on MATLAB Debugging Time.

Students' confidence in developing MATLAB code for practical engineering problems was a key focus of another survey question. In this context, students were asked, *"How confident did you feel about your MATLAB coding skills after using ChatGPT?"* The results shown in Figure 6 indicate that 59.1% of students experienced increased confidence, highlighting ChatGPT's effectiveness as a learning aid. However, 27.3% remained neutral, and 13.6% reported a slight decrease in confidence, suggesting that AI-generated explanations may not be equally beneficial for everyone. While ChatGPT is a useful tool for improving coding comprehension, some students may benefit

from training on how to effectively utilize AI tools. Additionally, they may require further human guidance or alternative learning resources to fully grasp and apply MATLAB coding concepts.

Students were surveyed on the potential benefits of AI tools in future projects, specifically asking, *"Do you think integrating AI tools like ChatGPT into programming assignments is beneficial for future projects?"* The results shown in Figure 7 indicate strong support for AI integration, with 50.0% of students selecting "Agree" and 31.8% choosing "Strongly agree," indicating that most students recognize the advantages of using ChatGPT in programming tasks. Additionally, 18.2% responded "Neutral," suggesting that while they do not oppose AI integration, they are not fully convinced of its benefits. Notably, 0.0% of students selected "Disagree" or "Strongly disagree," reflecting no opposition to the idea. Overall, 81.8% of students support incorporating AI tools like ChatGPT in programming assignments, citing improvements in coding efficiency, debugging, and learning, while the neutral responses highlight the need for further exposure and experience with AI-assisted programming.

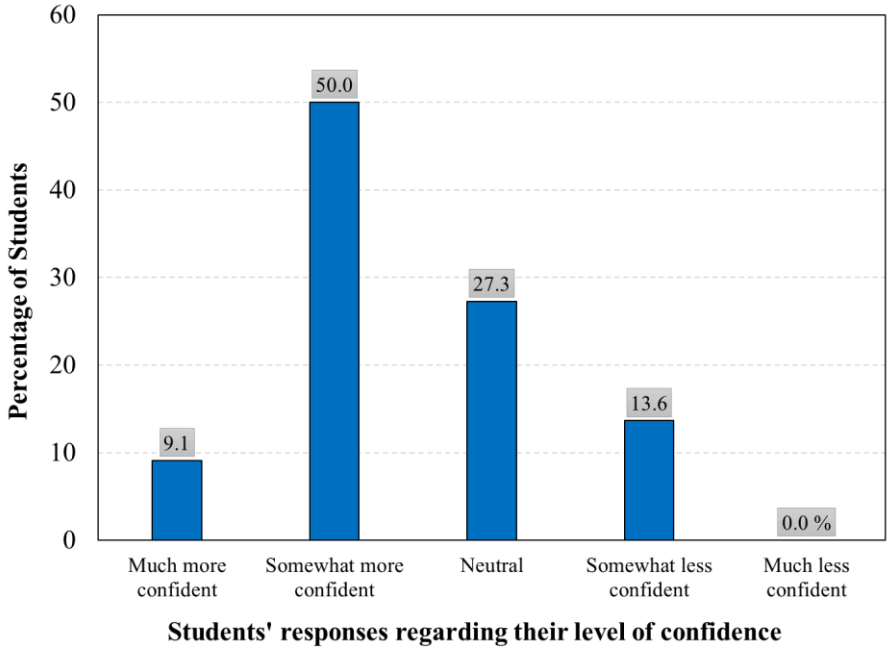



**Figure 6:** Students' Confidence Level After Using ChatGPT for MATLAB Coding.

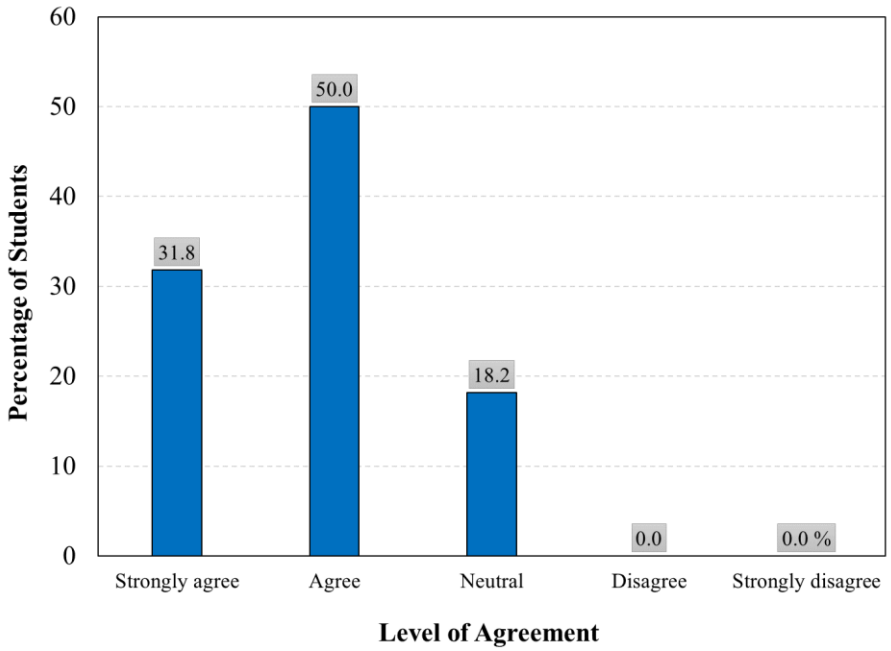



**Figure 7:** Students' Perceptions on the Benefits of Integrating AI Tools Like ChatGPT into Future Programming Assignments.

Recognizing the growing significance of AI in shaping future learning opportunities for programming, students were asked, *"Do you feel AI tools like ChatGPT could revolutionize the way students learn programming?"* Figure 8 illustrates students' positive attitude toward AI tools like ChatGPT as a valuable learning opportunity in programming education. The majority expressed strong support, with 45.5% selecting "Strongly agree" and 27.3% choosing "Agree," reflecting a broad consensus on AI's transformative potential in programming education. However, 18.2% remained neutral, indicating some uncertainty about AI's full impact on learning. A small portion, 9.1%, disagreed, expressing skepticism about AI's role in significantly changing programming education, while 0.0% strongly opposed its integration. Overall, 72.8% of students viewed AI as a valuable tool for enhancing programming education, though the presence of neutral responses suggests that additional exposure and experience may be necessary to fully understand its benefits.

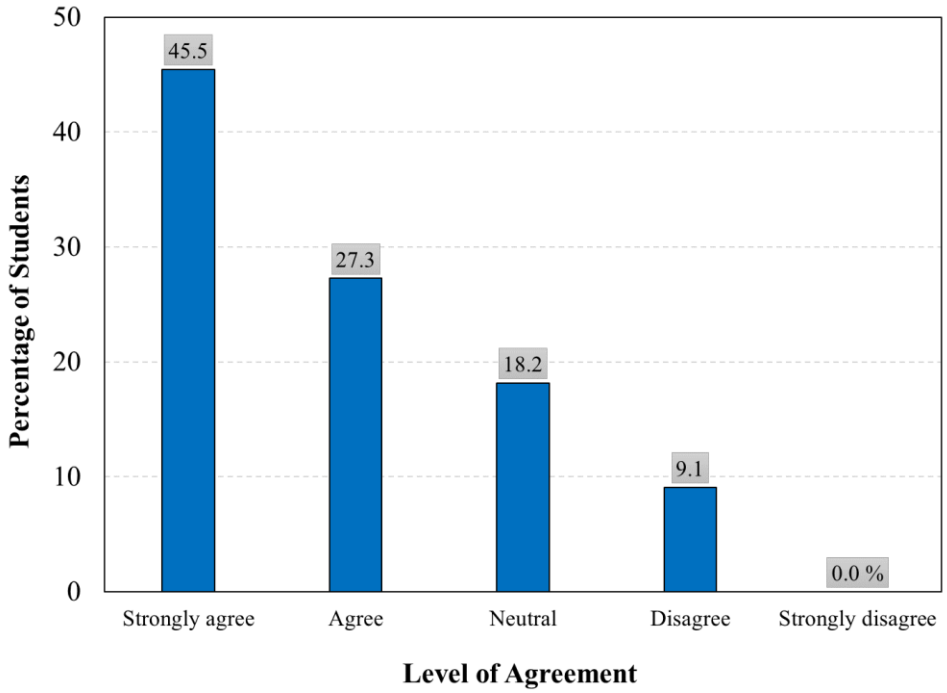



**Figure 8:** Students' Perceptions on the Potential of AI Tools Like ChatGPT to Revolutionize Programming Education.

To identify the challenges students encountered, they were asked: *"What difficulties did you experience while using ChatGPT 4.0 to generate MATLAB code?"*
Below are some of students' responses:

- *"It was hard to make the AI understand what tasks to complete without extremely specific instructions."*
- *"The main challenge that I faced when trying to use ChatGPT to generate MATLAB code was that it commonly would use functions that I have not seen within the class before."*
- *"It frequently would plug in random values for constants when I'd already given the correct values. This was frustrating."*

To explore ways to enhance the use of ChatGPT for coding tasks, students were asked: *"What suggestions do you have for improving the use of ChatGPT for coding tasks?"* Below are some of the responses provided by students:

- *"Make an attempt on the code first, so when you use ChatGPT, it aligns more closely with your approach rather than generating unfamiliar or confusing code."*
- *"Provide a clearer and more detailed sequence of steps to follow."*
- *"Clarify that ChatGPT is best used for correction rather than code generation."*
- *"Allow users to paste images into ChatGPT for better interaction."*
- *"Offer lessons on how to effectively use ChatGPT for coding tasks."*
- *"Provide more practice time and a dedicated section on how to ask the best questions."*
- *"Explore multiple ways to solve a problem instead of repeating the same method."*
- *"Introduce ChatGPT earlier in the course to maximize its benefits."*
- *"Ask for specific lines of code rather than an entire program."*

It is important to note that this research is still in progress, with plans for additional surveys to further explore students' preferences. Given ChatGPT 4.0's strong proofreading abilities, it was employed to correct grammatical and spelling errors and enhance the clarity of the text [10].

**Conclusions**

The findings from this study demonstrate that ChatGPT 4.0 has considerable promise as a supportive educational tool for enhancing MATLAB programming skills. A significant majority of students (77.2%) indicated that ChatGPT effectively improved their coding comprehension and problem-solving abilities through real-time feedback and the clarification of complex concepts. The use of ChatGPT also substantially reduced debugging time for most students (81.8%), although the increase in debugging time reported by some participants underscores the importance of human oversight in interpreting AI-generated code. Furthermore, while many students (59.1%) experienced an increase in their confidence when coding in MATLAB after utilizing ChatGPT, the decrease in confidence among some participants (13.6%) highlights the need for structured guidance and targeted training to optimize student engagement with AI tools. Challenges such as the generation of precise, relevant code and the occasional introduction of unfamiliar functions or incorrect values point toward areas for future improvement in AI-driven educational tools. Nonetheless, the strong support (72.8%) for AI's potential to positively impact programming education indicates that students perceive significant value in these technologies, underscoring the importance of ongoing refinement and thoughtful integration of AI into educational contexts.

It is also important to recognize potential ethical considerations regarding the use of ChatGPT in an engineering education context, such as how its integration might influence students' independent problem-solving and debugging skills, with respect to MATLAB. To better understand these implications, future surveys could include questions designed to explore students' perspectives on ethical aspects of using AI tools. This approach would support a balanced and thoughtful discussion about the effective and responsible integration of AI in education.

There are several possible avenues for future work with these results. One intriguing possibility is to use AI tools as a first step in programming process. For instance, students can generate their code as more of a pseudo-code and then test their initial thoughts with ChatGPT. This would work well as a pre-laboratory assignment, which would be especially helpful for students that do not have access to the software at home. It has the potential to make that initial program and AI test a sort of precompiling game to test how close their initial program comes to what ChatGPT outputs. Then in the beginning of lab they can test both their initial and their AI revised programs.

Another potential avenue to explore is the use of AI tools in transitioning between different programming languages. Many institutions teach either MATLAB or Python as an introductory computational software in the freshmen year, but as those students transition to upper-level classes, they may be asked to use a different language for similar tasks. As an example, a student may learn Python in the freshmen year, but then need MATLAB for a control systems course later in their studies. Switching between similar languages is common in the field of engineering. Therefore, introducing this possibility (in a lab or assignment) at the end of an introductory course could be

an interesting test of how well the AI tools handle this task and give students tools to help when they later confronted with this challenge.

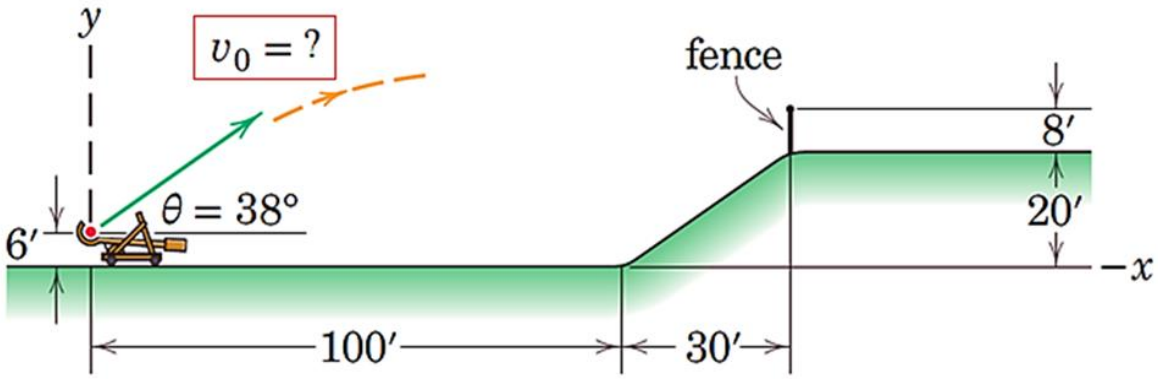
In the future, these ideas will need to be examined for an upper-level course. Upper-level courses often don't have time to discuss particulars of basic programming. On the other hand, students often forget aspects of their introductory courses by the time they reach these upper-level courses. This discrepancy is often compounded when projects are assigned in an upper-level lecture course, in which it is assumed the student will work on it outside of a laboratory environment. The techniques described in this paper should be investigated in these courses to help the students. The use of AI tools as a "personal TA" is very applicable to out of class projects and could give the students a useful resource to get immediate feedback.

Lastly, we need to investigate particular scenarios in which AI tools are helpful and when they are not. The learning process sometimes requires students to struggle with concepts to gain a greater understanding. So, incorporating new tools requires an evaluation of methods and an establishment of best practices. Therefore, several scenarios, such as precompiling, need to be tested and further evaluated to see which methods result in better student success.

**Appendix**

**A. Students were given the following project on projectile motion and were required to utilize ChatGPT 4.0 to aid in developing MATLAB code to solve the problem.**

A team of engineering students designs a medium-size catapult which launches 12-kg steel spheres. The launch angle is $\theta$ = 35° above the horizontal, and the launch position is 6 ft above ground level. The students use an athletic field with an adjoining slope topped by an 8-ft fence as shown.




We know that we can use the following equations to predict the motion of the projectile.

$$x = v_0 \cos\theta\, t$$

$$y = -½\, gt^2 + v_0 \sin\theta\, t + y_0$$

***a)*** Find the minimum launch speed that makes the projectile to pass the fence for the given angle of 35°.

***b)*** Find the minimum launch speed ($v_0$) values for any angle ($\theta$) between 15° and 85° with the resolution of 0.1°.

***c)*** Plot a two-dimensional curve for values of minimum launch speed ($v_0$) vs angle ($\theta$).

***d)*** Calculate the time that it takes for the projectile to clear the fence.

***e)*** Plot the three-dimensional curve for values of launch speed ($v_0$), angle ($\theta$), and time ($t$).

***f)*** Find the angle at which the lowest value of launch speed is required for the projectile to clear the fence by using *fminbnd* command.

***g)*** Find the angle at which the lowest value of launch speed is required for the projectile to clear the fence by using *for loop* and *logical statements*.

**B. Example of AI-developed code for solving part (a) of the project.**

## Explanation of the MATLAB Code for Projectile Motion

This MATLAB script calculates the **minimum launch speed** required for a projectile to reach a given horizontal distance (**x**) and height (**y**) when launched at a specific angle ($\theta_0$).

---

## Breaking Down the Code

### 1. Initialization

matlab Copy Edit

```
clear all
clc
```

- `clear all`: Clears all variables from memory.
- `clc`: Clears the command window.

### 2. Define Given Parameters

matlab Copy Edit

```
theta_0 = 38; % degrees above the horizontal
theta_r = (theta_0 * pi) / 180; % Convert degrees to radians
g = 32.2; % Acceleration due to gravity in ft/s^2
x = 130; % Horizontal distance (ft)
y = 28; % Vertical distance (ft)
y_0 = 6; % Initial height (ft)
```

- Converts the launch angle $\theta_0$ from degrees to **radians** since MATLAB trigonometric functions use radians.
- Defines the gravitational acceleration **g** in feet per second squared.
- Sets the **horizontal distance** (**x**), the **target height** (**y**), and the **initial height** ($y_0$).

### 3. Calculate the Required Initial Velocity

```matlab
V_0t = x / cos(theta_r);
```

- Calculates the **horizontal component** of the initial velocity ($V_{0t}$), assuming uniform horizontal motion.

### 4. Solve for Time of Flight (t)

```matlab
t = sqrt(((y - y_0) - (V_0t * sin(theta_r))) / (-0.5 * g));
```

- Uses the kinematic equation for vertical motion:

$$y = y_0 + V_0 \sin(\theta) t - \frac{1}{2} g t^2$$

- Rearranges the equation to solve for **t**:

$$t = \sqrt{\frac{(y - y_0) - (V_0 t \sin(\theta))}{-0.5g}}$$

### 5. Compute the Minimum Launch Speed

```matlab
V_0 = V_0t / t;
```

- Computes the **total initial velocity ($V_0$)** using:

$$V_0 = \frac{V_0 t}{t}$$

### 6. Display the Results

```matlab
V_0 % Minimum Launch Speed
t % Time
```

- Displays the computed **minimum launch speed ($V_0$)** and **time of flight (t)** in the command window.

**C. Survey questions on the use of ChatGPT 4.0 for enhancing comprehension in Mechanics courses, specifically Statics and Dynamics.**

1) What is your age?
2) Which engineering discipline are you studying?

    a. Mechanical
    b. Civil
    c. Electrical
    d. Manufacturing
    e. General Engineering

3) What is your current academic classification?

    a. Freshman
    b. Sophomore
    c. Junior
    d. Senior

4) Have you worked on any MATLAB coding projects prior to this course?
    a. Yes
    b. No

5) Prior to this task, had you used ChatGPT for coding purposes?
    a. Yes, frequently
    b. Yes, occasionally
    c. No

6) How comfortable were you with using MATLAB before taking this course?
    a. Comfortable
    b. Neutral
    c. Not comfortable

7) Did using ChatGPT to write MATLAB code help you better understand coding concepts?
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

8) Did ChatGPT-generated MATLAB code work as intended for your project?
    a. Very clear
    b. Clear
    c. Neutral
    d. Unclear
    e. Very unclear

9) How did using ChatGPT impact the time you spent debugging your MATLAB code?
   a. Significantly reduced
   b. Somewhat reduced
   c. Did not reduce
   d. Somewhat increased
   e. Significantly increased

10) How confident did you feel about your MATLAB coding skills after using ChatGPT?
   a. Much more confident
   b. Somewhat more confident
   c. Neutral
   d. Somewhat less confident
   e. Much less confident

11) How would you rate the accuracy of MATLAB code generated by ChatGPT?
   a. Very accurate
   b. Somewhat accurate
   c. Neutral
   d. Somewhat inaccurate
   e. Very inaccurate

12) Did the use of ChatGPT for writing MATLAB code improve your learning experience?
   a. Positively
   b. No impact
   c. Negatively

13) What challenges did you face while using ChatGPT to generate MATLAB code?

14) What suggestions do you have for improving the use of ChatGPT for coding tasks?

15) Did this task change your perception of how AI tools like ChatGPT can assist with programming?
   a. Yes, positively
   b. No, it remained the same
   c. Yes, negatively

16) Do you think integrating AI tools like ChatGPT into programming assignments is beneficial for future projects?
   a. Strongly agree
   b. Agree
   c. Neutral
   d. Disagree
   e. Strongly disagree

17) Do you plan to continue using AI tools like ChatGPT for coding in the future?
    a. Yes
    b. No

18) How would you assess the dependability of MATLAB code generated by ChatGPT?
    a. Very reliable
    b. Reliable
    c. Somewhat unreliable
    d. Not reliable

19) Have you encountered any challenges or limitations when using ChatGPT for MATLAB coding? If so, please describe.

20) Do you feel AI tools like ChatGPT could revolutionize the way students learn programming?
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

21) Do you believe ChatGPT helps develop critical thinking skills when troubleshooting or refining MATLAB code?
    a. Strongly agree
    b. Agree
    c. Neutral
    d. Disagree
    e. Strongly disagree

22) How do you evaluate the future of AI-powered technology?
    a. Highly optimistic - I believe AI-powered technology will revolutionize industries and improve our lives significantly.
    b. Optimistic - I have positive expectations for AI-powered technology, but I acknowledge potential challenges.
    c. Neutral - I have a balanced view, with neither particularly high nor low expectations for AI-powered technology.
    d. Cautious - I am concerned about potential risks and uncertainties associated with AI-powered technology.
    e. Pessimistic - I have significant doubts about the future impact of AI-powered technology and its potential risks.
    f. Highly pessimistic - I believe AI-powered technology poses substantial risks and may have detrimental effects on society.

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