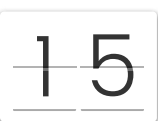


# Introduction



## Welcome and Thank You!

Thank you for participating in this research study on how different tools support learning about code vulnerabilities.

The session includes **a demographic survey, two learning tasks, and a final reflection.**

There are no right or wrong answers. We are interested in your genuine learning behavior and performance. Please respond naturally and honestly. Your responses are anonymous and used only for academic research.

As a thank-you for your time, participants who complete the full session with **frequent and thoughtful engagement with the learning tool** will receive a \$25 compensation based on your performance.

**Please do not close or leave this window until all tasks are finished.**

*Click “→” to begin the study.*

# Demographics

What's your age?

- ☐ 18-24
- ☐ 25-34
- ☐ 35-44
- ☐ 45-54
- ☐ 55-64
- ☐ 65+

What's your gender?

- ☐ Female
- ☐ Non-binary / third gender
- ☐ Male
- ☐ Prefer not to say

What is your race or ethnicity?

- ☐ Mixed / Multiple races
- ☐  Other (please specify):
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

- ☐ Prefer not to say
- ☐ Hispanic or Latino
- ☐ Native American or Alaska Native

What is your current academic or professional status?

- ☐ Undergraduate student (Bachelor's program)
- ☐ Graduate student (Master's or PhD program)
- ☐ Recent graduate (within the past 2 years)
- ☐ Employed in tech-related field
- ☐ Employed in a non-tech field
- ☐  Other:
- ☐ Prefer not to say

What year are you currently in?

- ☐ 1st year (Freshman)
- ☐ 2nd year (Sophomore)
- ☐ 3rd year (Junior)
- ☐ 4th year (Senior)
- ☐ 5th year or beyond

How long have you been learning or practicing programming?  
*Please include formal courses, self-study, or any practical experience.*

- ☐ Less than 6 months
- ☐ 6–12 months
- ☐ 1–2 years
- ☐ More than 2 years

How often do you use AI tools (e.g., ChatGPT, Claude, Gemini) in general?

- ☐ Every day
- ☐ A few times a week
- ☐ About once a week
- ☐ A few times a month
- ☐ Rarely
- ☐ Never

How often do you use these AI tools for technical or coding-related tasks?

- ☐ Every day
- ☐ A few times a week
- ☐ About once a week
- ☐ A few times a month
- ☐ Rarely
- ☐ Never

## Task 1-1: Pre-Test

Before any learning begins, we'd like to assess your current understanding of **the vulnerability shown above**.

Please examine the code snippet on the left and answer the following questions based on your own knowledge — without using external help.

You are free to fill in "**N/A**" if you are not sure about the answer.

When you're ready, click "→" to begin the test.

What is the name of the vulnerability you are currently working on?

*(You can find it at the top of this page, in red.)*

*This question is to help you confirm the current task. **Please focus only on the vulnerability mentioned above.***

***The code on the left may include other issues — please ignore them.***

Which line(s) in the code contain the vulnerability?

*Please specify the line number(s). For example: "Line 5" , "Lines 10–12", or "Lines 3 and 7".*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In your own words, explain how this vulnerability works.

*Please describe what causes it, how it behaves in the code, and why it could be dangerous in a real-world context.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you fix or prevent this vulnerability?

*Tip: You can explain the steps you would take, describe a general strategy, or point out what changes you would make in the code.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Learning Phase-1-non-llm

### Task 1-2: Learning with Online Resources

This is a self-directed learning task. Your goal is to strengthen your understanding of the vulnerability you were just tested on.

**Please create a new browser tab and use online resources**  
(e.g., Google, blogs, official documentation — but not AI tools)



**to understand or strengthen your knowledge of this specific vulnerability.**

*Please avoid AI-generated answers (e.g., summaries at the top of search results) and use only trusted sources.*

You'll apply this knowledge in a follow-up test with a new code example. High-quality, thoughtful engagement may qualify for a bonus.

You are not allowed to skip this task. You must complete this learning step before continuing.

Take your time – Click “→” to begin the test **when you feel confident about what you’ve learned.**

*Note: Button appears after 3 minutes. Keep this tab open while learning.*

Please rate the following aspects of the learning task you just completed, using the slider from 1 to 10.

[illegible]

very low

very high

1

2

3

4

5

6

7

8

9

10

How hurried or rushed was the pace of the task?

☐☐☐☐☐☐☐☐☐☐

How successful were you in accomplishing what you were asked to do?

☐☐☐☐☐☐☐☐☐☐

How hard did you have to work to accomplish your level of performance?

☐☐☐☐☐☐☐☐☐☐

How insecure, discouraged, irritated, stressed, and annoyed were you?

☐☐☐☐☐☐☐☐☐☐

## Post-test--task1

### Task 1-3: Post-test

Now that you've just completed the first learning task, we'd like to assess what you've learned.

**Please close any learning-related tabs before continuing.**

A new code snippet with the same type of vulnerability is shown on the left.

Answer the questions based on your updated

understanding.

You are free to fill in "**N/A**" if you are not sure about the answer.

When you're ready, click "→" to begin the test.

Which line(s) in the code contain the vulnerability?

*Please specify the line number(s). For example: "Line 5", "Lines 10–12", or "Lines 3 and 7".*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In your own words, explain how this vulnerability works.

*Please describe what causes it, how it behaves in the code, and why it could be dangerous in a real-world context.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you fix or prevent this vulnerability?

*Tip: You can explain the steps you would take, describe a general strategy, or point out what changes you would make in the code.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Pre-test--task2

**Now you're moving to the second learning task.**

*Please close any unrelated tabs (e.g., learning or searching pages) before continuing.*

Click “→” to continue.

## Task 2-1: Pre-Test

Before any learning begins, we'd like to assess your current understanding of **the vulnerability shown above**.

Please examine the code snippet on the left and answer the following questions based on your own knowledge — without using external help.

You are free to fill in **"N/A"** if you are not sure about the answer.

When you're ready, click “→” to begin the test.

What is the name of the vulnerability you are currently working on?

*(You can find it at the top of this page, in red.)*

*This question is to help you confirm the current task. **Please focus only on the vulnerability mentioned above.***

***The code on the left may include other issues — please ignore them.***

Which line(s) in the code contain the vulnerability?

*Please specify the line number(s). For example: "Line 5" , "Lines 10–12", or "Lines 3 and 7".*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In your own words, explain how this vulnerability works.

*Please describe what causes it, how it behaves in the code, and why it could be dangerous in a real-world context.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you fix or prevent this vulnerability?

*Tip: You can explain the steps you would take, describe a general strategy, or point out what changes you would make in the code.*



How confident are you in your above answer?

Not at all

Slightly

Moderately

Very

Completely

Confidence Level

☐☐☐☐☐

## Learning Phase-2-Ilm

### Task 2-2: Learning with ChatGPT

This is a self-directed learning task. Your goal is to strengthen your understanding of the vulnerability you were just tested on.

**Please use ChatGPT (GPT-4o) to learn:** 🖱️ [Click this link](#)

**To understand or strengthen your knowledge of this specific vulnerability.**

(Do not click on external links ChatGPT may show.)

You'll apply this knowledge in a follow-up test with a new code example. High-quality, thoughtful engagement may qualify for a bonus.

You are not allowed to skip this task. You must complete this learning step before continuing.

Take your time -Click “→” to begin the test **when you feel confident about what you’ve learned.**

*Note: Button appears after 3 minutes. Keep this tab open while learning.*

Please rate the following aspects of the learning task you just completed, using the slider from 1 to 10.

[illegible]

very low

very high

1 2 3 4 5 6 7 8 9 10

How successful were you in accomplishing what you were asked to do?

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

How hard did you have to work to accomplish your level of performance?

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

How insecure, discouraged, irritated, stressed, and annoyed were you?

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

## Post-test--task2

### Task 2-3: Post-Test

Now that you've just completed the second learning task, we'd like to assess what you've learned.

**Please close any learning-related tabs before continuing.**

A new code snippet with the same type of vulnerability is shown on the left.

Answer the questions based on your updated understanding.

You are free to fill in **"N/A"** if you are not sure about the answer.

When you're ready, click “→” to begin the test.

Which line(s) in the code contain the vulnerability?

*Please specify the line number(s). For example: "Line 5", "Lines 10–12", or "Lines 3 and 7".*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

In your own words, explain how this vulnerability works.

*Please describe what causes it, how it behaves in the code, and why it could be dangerous in a real-world context.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you fix or prevent this vulnerability?

*Tip: You can explain the steps you would take, describe a general strategy, or point out what changes you would make in the code.*

How confident are you in your above answer?

	Not at all	Slightly	Moderately	Very	Completely
Confidence Level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Reflection

### Final Reflection

**Please reflect on your experience using each learning method in this study..**

Think back to the specific task where you used it, and answer based on what you felt, learned, or found challenging.

*There are no right or wrong answers — we're interested in your honest opinions and experiences.*

What challenges or frustrations did you encounter while using **Non-ChatGPT-assisted method**?

*Please list at least two specific difficulties or frustrations you experienced.*

1.

2.

What benefits or strengths did you find in **Non-ChatGPT-assisted method**?

*Please list at least two advantages or positive aspects you noticed.*

1.

2.

What challenges or frustrations did you encounter while using **ChatGPT-assisted** method?

***Please list at least two specific difficulties or frustrations you experienced.***

1.

2.

What benefits or strengths did you find in **ChatGPT-assisted** method?

***Please list at least two advantages or positive aspects you noticed.***

1.

2.

Which learning method **did you prefer** overall for learning code vulnerabilities?

- ☐ ChatGPT-assisted learning
- ☐ Non-ChatGPT-assisted learning
- ☐ No clear preference

What factors influenced your preference?



***Please explain at least two reasons for your choice.***

1.
2.

## **Non-ChatGPT-Assisted Task**

	Not at all	Slightly	Moderately	Very	Completely
How helpful was this tool for your learning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much did you trust the answers and explanations provided?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How well did the tool respond to your reasoning or needs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How clear and understandable were the explanations?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## **ChatGPT-Assisted Task**

	Not at all	Slightly	Moderately	Very	Completely
How helpful was this tool for your learning?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Not at all

Slightly

Moderately

Very

Completely

How much did you trust the answers and explanations provided?

☐☐☐☐☐

How well did the tool respond to your reasoning or needs?

☐☐☐☐☐

How clear and understandable were the explanations?

☐☐☐☐☐

Do you have any additional thoughts or feedback about the two learning methods you experienced during the tasks?

1.



Please enter your Prolific Participant ID below:

