

The impact of AI tools on the student experience in programming courses: An intersectional analysis approach

Sri Yash Tadimalla & Mary Lou Maher



Dr. Mary Lou Maher

Director of Research Community
Initiatives, Computing Research
Association.

Mary Lou's research interests fall under the general topics of Human-Centered AI.

Highlights of her recent research are grounding AI through integrated cognitive and deep learning models, ethical and trustworthy human-AI interaction, cognitive models of curiosity as a basis for education technology, design and cognitive impact of AI-based co-creativity, and collaborative active learning and inclusivity in CS education.

She is the author or co-author of over 300 publications with an h-index of 60 with over 12,000 citations.

In 2020-2023, she was listed in the top 2% of the world for the number of citations in the field of AI and Visualization.

She is organizing the AAI 2024 Spring Symposium on Increasing Diversity in AI Education and the IUI 2024 Workshop on Human-AI Co-Creation with Generative Systems.





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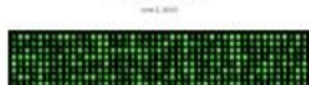
Yash's [research](#) explores how an individual's identity influences their interaction with and learning of technology, particularly in the domains of Artificial Intelligence (AI) and Computer Science (CS) education.

Serving as the Technology Focal Point for [United Nations MGCY Science Policy Interface](#) and the incumbent General Secretary of the [World Student Platform for Engineering Education and Development \(SPEED\)](#), he advocates for the equitable advancement of STEM education on a global scale, actively fostering youth participation in STEM initiatives through [engagements](#) with the United Nations Major Group and stakeholder mechanisms.

At UNC Charlotte he is assisting various NSF research projects under the [Center for Humane AI](#), [Center for Education Innovation \(CEIR\) Lab](#) and the [Human-Centered Computing \(HCC\) Lab](#).



It's the End of Computer Programming as We Know It. (And I Feel Fine.)



UC San Diego Today

In This Era of AI, Will Everyone Be a Programmer?

ChatGPT and Large Language Models (LLMs) are viewed by many as a threat to the field of computer science education because they're able to...

Dec 7, 2023

Navigate The Promises And Risks Of AI-Assisted Coding



Adam Tornhill Forbes Councils Member
Forbes Technology Council COUNCIL POST | Membership (Fee-Based)



Dec 28, 2023, 07:15am EST

The Harvard Crimson

CS50 Will Integrate Artificial Intelligence Into Course Instruction | News

This year, students who enroll in Computer Science 50: Introduction to Computer Science, Harvard's flagship coding course, will have a new...

Jun 21, 2023

Erudera

AI Assistant to Teach Students in Coding Course at Harvard Starting This Fall – Erudera

The oldest Ivy League school, Harvard University, has announced plans to integrate an AI-based teaching assistant to help its students in...

Jul 6, 2023



AI assisted Programming



Time for a Pause: Without Effective Public Oversight, AI in Schools Will Do More Harm Than Good.

LEARN AI-Assisted Python Programming

With GitHub Copilot and ChatGPT

Lee Porter - Daniel Zagora
Interview by Bob Swain, Ph.D.

MIT Technology Review

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ARTIFICIAL INTELLIGENCE

How AI assistants are already changing the way code gets made

ing assistants are here to stay—but just how big a difference they make is clear.

Douglas Heaven

December 6, 2023



The Verge

Microsoft has built an AI-powered autocomplete for code using GPT-3

Microsoft has announced an update for its PowerApps software that uses GPT-3 to turn natural speech into code. The tool only works with the...

May 25, 2021

Business Insider

AI Technology Like ChatGPT Will Reshape Software Coding Jobs Forever

AI has come for software developers, and the job will never be the same again.

Apr 26, 2023



Context

- AI Assistance with Programming in class/lab
 - Students can use AI tools when coding parallel to lab environment (Using Chat GPT along with Lab)
 - Students can use AI tools when coding within lab environment (Copilot in Visual Studio/Coding rooms)
 - Students can use AI tools to debug their code (After the lab)

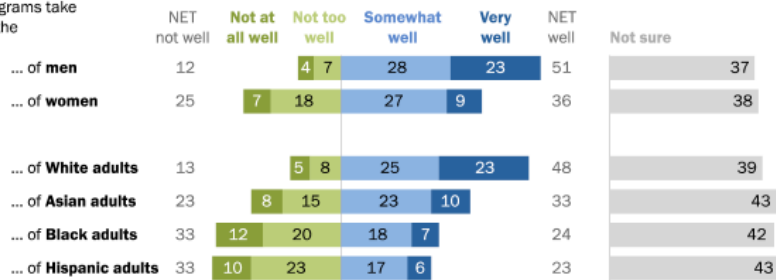
But before we start scale implementation of AI assistance tools in Courses, we need to study their impact on students from different backgrounds.

Why do we need to think about AI perception

Whose experiences and views are taken into account when AI programs are designed? Views vary depending on the demographic group in question

% of U.S. adults who say each of the following ...

The people who design artificial intelligence computer programs take into account the experiences and views ...



Note: Figures may not add up to NET values due to rounding. Respondents who did not give an answer are not shown.

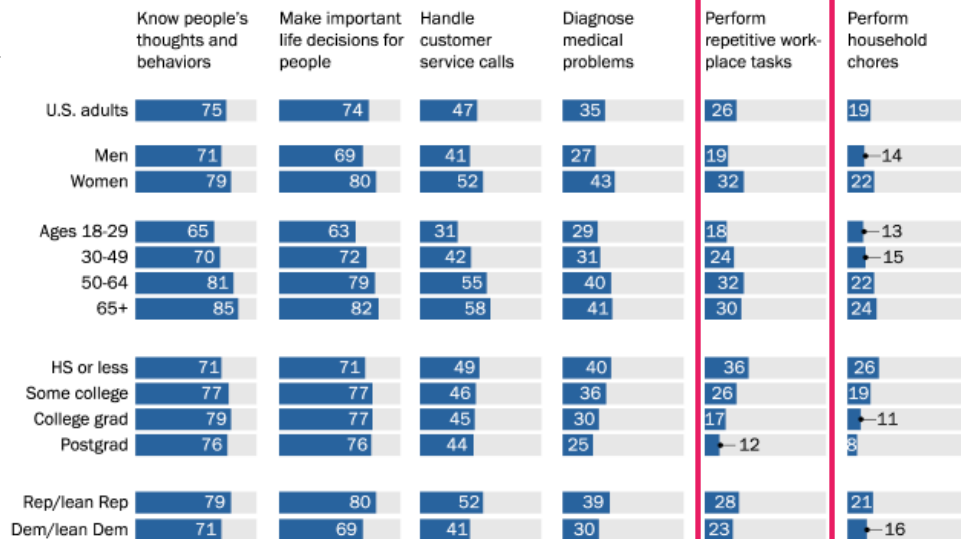
Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

PEW RESEARCH CENTER

Older adults and women are more likely than others to express at least some concern about some possible AI developments

% of U.S. adults who say they would be **very** or **somewhat concerned** if artificial intelligence programs could ...



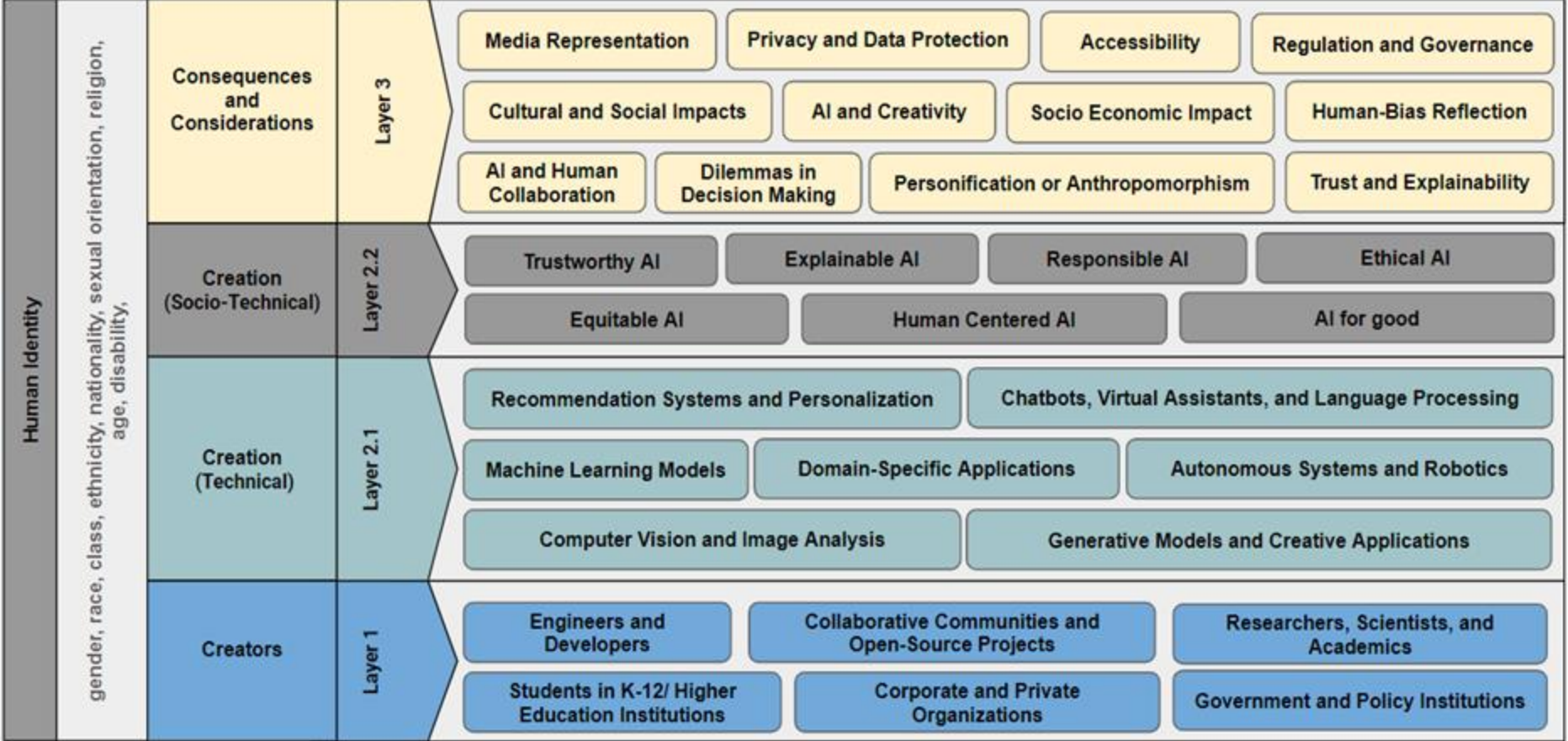
Note: Respondents who did not give an answer or who gave other responses are not shown.

Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

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AI Ecosystem and the Impact of Identity



Assumptions

To change the perception of AI we need more diversity.

To increase diversity in AI creators we need more diversity of people in AI education.

Understanding the impact of Student Identity is a key consideration for increasing diversity of people in AI education.

Research Questions

Does Student Identity affect whether students:

- want to use AI?
- use AI effectively?
- can learn while using AI?

Hypotheses Guiding Study Design and Data Analysis

H1: Student Identity has an impact on the way students **interact** with AI tools such as chatGPT and Co-pilot.

H2: Student Identity has an impact on student **perception** of using AI as a tool for learning how to program.

Initial Study Design – Between Subjects

- Condition A: No AI
 - No AI tool: Participants complete programming tasks using only a standard lab environment and guidance of the study facilitator.
- Condition B: ChatGPT
 - AI chatbot: Participants complete programming tasks and can ask questions to an AI chatbot (OpenAI ChatGPT) that provides natural language responses and code snippets.
- Condition C: Github Copilot
 - Generative AI tool: Participants complete programming tasks and can use a generative AI tool (GitHub Copilot) that suggests code completions and solutions based on the context.

Study Protocol

We collect data from the following sources:

- **Pre- Survey:**
 - a. To measure the participants' prior knowledge, experience, and attitudes towards programming and AI tools.
 - b. Demographic Information
- **Pre-task quiz:** To measure the participants' conceptual understanding of concepts needed to complete the programming tasks.
- **Programming task:** To observe the participants' behavior, performance, and comprehension of the programming concepts and tasks.
- **Post-task quiz:** Same questions as the Pre-task quiz to measure any improvement in conceptual understanding.
- **Interview:** To gather feedback on their experience with AI tool, and perception of its impact on their motivation, confidence, and desire to persist in programming education.

Sampling the population of students

- The inclusion criteria is that the student must be/have been enrolled in an introductory Java programming course.
- The intention is to use stratified sampling to sample uniformly from traditional and underrepresented groups in Computer Science Education.
- The intention is to use stratified sampling to sample uniformly based on prior experience and perceived programming ability.

Pre Survey

These Questions are designed to have a base context for the students

- Knowledge mastery
- AI tools Experience

Survey

On a Scale of 1-5 how confident are you about applying your Java programming skills

Very High Confidence

High Confidence

Average Confidence

Low Confidence

Very low Confidence

On a Scale of 1-5 How much experience do you have with using AI tools for programming?

Very High Experience

High Experience

No Experience

Low Experience

Very Low Experience

Identity Survey

 Purpose: to enable stratified sampling and conduct intersectional analysis

- We collect data on identity characteristics, such as gender, age, ethnicity, and socio-economic status etc.

Identity 1	Identity 2	N
Female	Asian	3
	Black/African-American	5
	Hispanic/Latinx	2
	Middle Eastern/North African (MENA)	1
Male	Asian	5
	Black/African-American	9
	Hispanic/Latinx	2
	Native American/Alaska Native/First Nations/American Indian	1
Non-binary/ third gender	Hispanic/Latinx	1
	White	1
first-generation student status	Female	11
	Asian	4
	Black/African-American	8
	Hispanic/Latinx	2
having a disability or other chronic condition	Hispanic/Latinx	1
	White	3
	Female	2
	Male	1
	(LGBTQIA+) community	2
(LGBTQIA+) community	Black/African-American	1
	Hispanic/Latinx	1
	White	4
	Female	2
	Male	2
	Non-binary/ third gender	1
		75

Pre-Post Quiz

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Purpose: to assess participants' prior conceptual understanding of the concepts involved in the programming tasks.

Pre/Post quiz: assesses participants' knowledge and comprehension of arrays and loops in Java

What would the output of the following snippet of code be, if executed?

```
1 int[] numArray = {1,-6,9,7};
2
3
4 for (int val: numArray)
5 {
6     System.out.print(val + " ");
7 }
8
```

7 9 -6 1

1 -6 9 7

7

This code doesn't result in anything printed

Save Response

Programming Task

- Purpose: to observe participants while they perform programming exercises in each condition.
- Programming tasks: three questions of progressively increasing difficulty levels that require the use of arrays and loops in Java.
 - Easy question: find the average of an array.
 - Medium question: reverse a Java long variable.
 - Hard question: print out Pascal's triangle of size n.
- Participant's work is auto-graded with instant feedback.

Post-Task Interview

Purpose: to analyze the impact of Student Identity on perception of AI

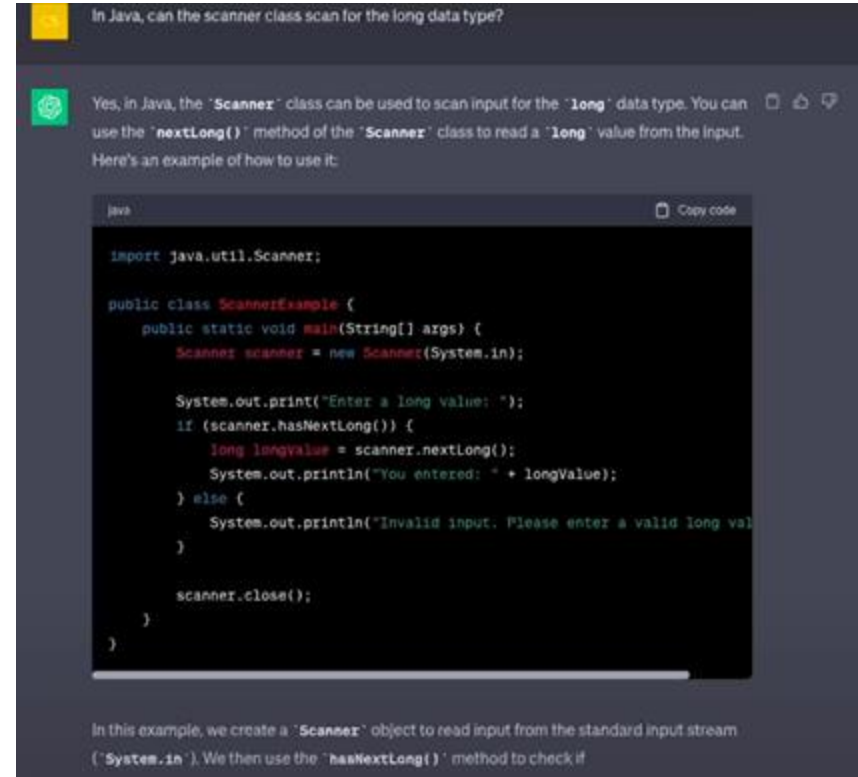
- Did having AI in the process of programming help you?
- When using the tool, do you feel supported or challenged?
- Have you used any AI tools before in any form for the purpose of learning?
- Do you think the way you used the AI tool should be considered cheating? Why or why not? Would it currently be seen as cheating?"
- Does your experience with using this AI tool motivate you to continue learning more about programming? Please explain.(scale of 1-5)
- How confident are you with programming in JAVA after your experience with using this AI tool? Please explain. (scale of 1-5).
- Are you more confident about being successful in this degree? Please explain. (1-5)
- Do you have any concerns about the use of AI tools in the classroom and professionally?

Preliminary Studies Discoveries

Data collected during the programming task

Observations of the participants' behavior while performing tasks and using ChatGPT.

Transcripts of the participants' prompts to ChatGPT and responses from ChatGPT.



The screenshot shows a chat interface with a dark background. At the top, a yellow speech bubble contains the prompt: "In Java, can the scanner class scan for the long data type?". Below it, a green speech bubble contains the response: "Yes, in Java, the 'Scanner' class can be used to scan input for the 'long' data type. You can use the 'nextLong()' method of the 'Scanner' class to read a 'long' value from the input. Here's an example of how to use it:". Underneath the response is a code block with a dark background and light-colored text. The code is for a Java class named ScannerExample. It imports java.util.Scanner, defines a main method that creates a Scanner object for System.in, prints a prompt, checks hasNextLong(), reads a long value, prints it, and handles invalid input. At the bottom of the chat, there is a small text block explaining the code: "In this example, we create a 'Scanner' object to read input from the standard input stream ('System.in'). We then use the 'hasNextLong()' method to check if".

```
import java.util.Scanner;

public class ScannerExample {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a long value: ");
        if (scanner.hasNextLong()) {
            long longValue = scanner.nextLong();
            System.out.println("You entered: " + longValue);
        } else {
            System.out.println("Invalid input. Please enter a valid long val");
        }

        scanner.close();
    }
}
```

In this example, we create a 'Scanner' object to read input from the standard input stream ('System.in'). We then use the 'hasNextLong()' method to check if

Thematic Analysis of participants' prompts while using AI

Themes for prompts we observed:

- Conceptual Questions
- Implementation of Code
- Debugging
- Other

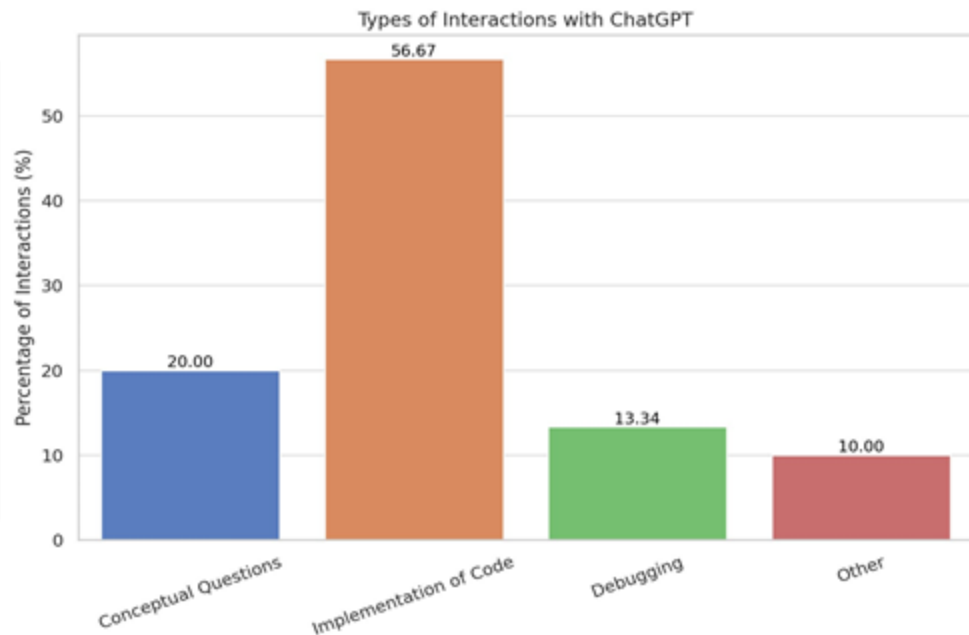
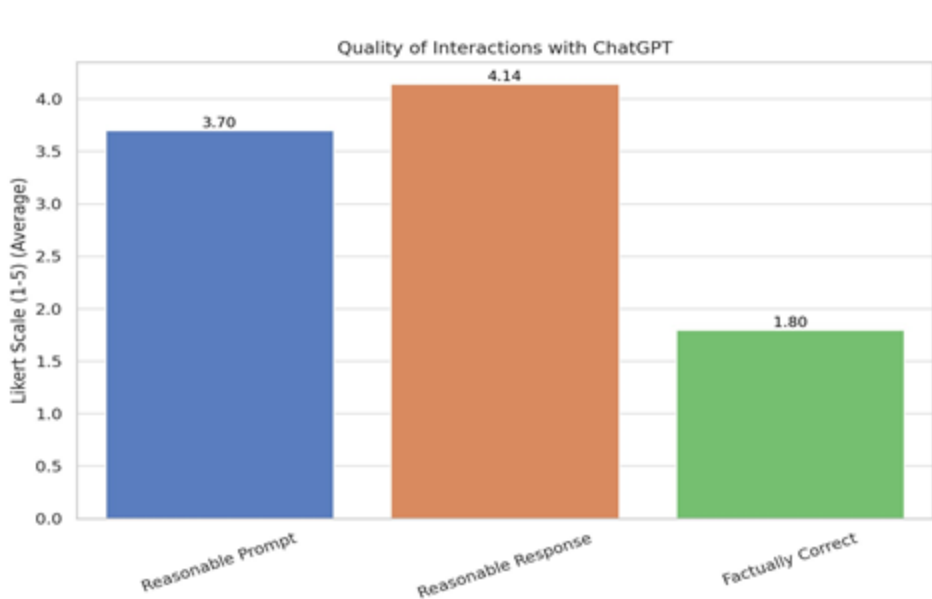
Thematic Analysis of participants' interactions with AI

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Themes related to prompt-response interaction:

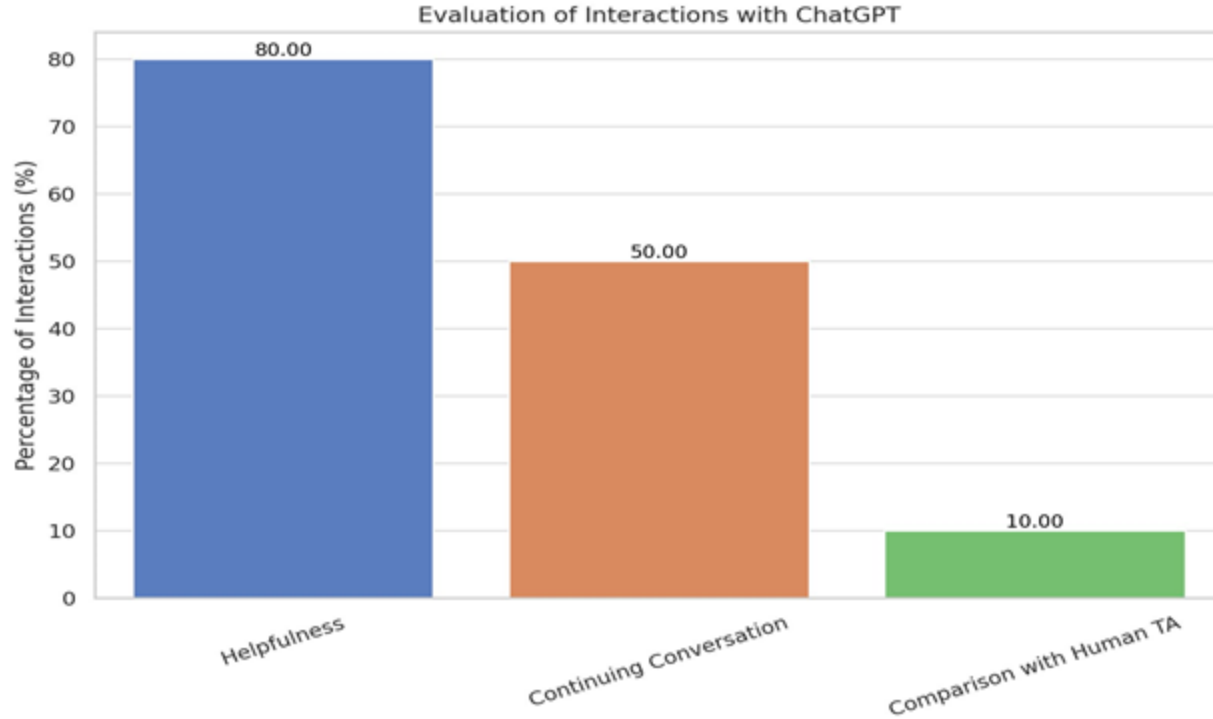
- Reasonable prompt
- Reasonable response
- Factually correct response
- Helpful response
- Comparison of response to human TA

Results of types of interactions with Chat GPT



Distribution of codes – Types of Interactions

Results of quality of interactions with Chat GPT



Distribution of codes – Quality of Interaction

Narrative Analysis of Interview Data and Identity from Pilot Study

Attribute	Participant 1	Participant 2	Participant 3
Prior Knowledge	Advanced understanding	Good understanding	Average understanding
Background	18-20, Vietnamese	18-20, African-American	21-24, White
Identity	Male, LGBTQIA+	Male	Male
Other Identifiers	Employed while studying	Employed while studying	Employed while studying
Java Experience	1 year, CS3	6 months, CS2	CS3
Task Performance			
Pre-task	2 mins, 4/5	4 mins, 4/5	2m 15s, 4/5
Task A	4 mins	5.5 mins	3m 45s
Task B	10 mins	11 mins	7 mins
Task C	17 mins	26 mins (incomp)	8 mins
Post-task	2 mins, 5/5	3 mins, 4/5	2m 45s, 5/5
Use of ChatGPT	Asked conceptual questions,	Poorly constructed questions,	Used heavily, minimal
	All tasks completed	Couldn't complete tasks	review of results
Perception of AI	Praises AI, warns	AI helpful, Concerns about misuse	AI didn't aid learning,

Plans for Follow Up Study

We collected data from 25 students across conditions Chat-GPT and Co-Pilot

Plans to identify emergent attitudes of participants towards AI

- Highly Confident
- Cautious
- Curious
- Frustrated
- Innovative

We plan to analyze the distribution of codes on prompt-response patterns

With larger data collection we seek to understand the patterns in differences in student perceptions and usage of AI for coding

Study of 50 participants: Chat GPT condition

Current progress on analysis of data

Consider 4 categories of data collected:

- Identity survey
- Pre and Post Task Quiz
- Programming Task Performance
- Reflection survey

Analysis Goals

- Explore approaches to an Intersectional Analysis of participants' responses to identity survey.
- Identify meaningful cohorts with intersectional identities.
- Explore the associations between intersectional cohorts and responses to reflection survey questions

Demographic distribution of students from Chat-GPT only study

Participants: 59 students currently in an AI literacy Course

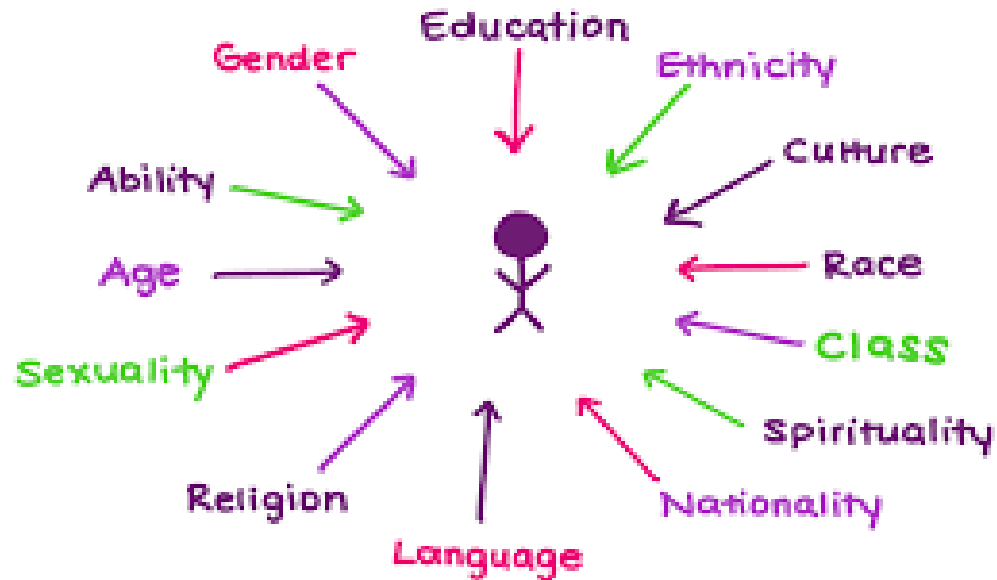
55 have taken a java programming Course before or were in one currently

n=50 after data cleaning

<i>Gender</i>	<i>N</i>	<i>first-generation student status</i>	<i>N</i>
Female	18	Maybe	1
Male	28	No	26
Non-binary / third gender	2	Yes	23
Prefer not to say	2		
Grand Total	51	Grand Total	51

<i>ethnic or racial category</i>	<i>N</i>
Asian	8
Black/African-American	14
Hispanic/Latinx	6
Middle Eastern/North African (MENA)	1
Native American/Alaska Native/First Nations/American Indian	1
Self-Identify:	2
White	19
Grand Total	51

Intersectionality



Intersectional Demographic Cohorts

<i>first-generation student status</i>	<i>ethnic or racial category</i>	N
-	White	1
Total		1
-	Hispanic/Latinx	1
m Total		1
-	No	
	Asian	4
	Black/African-American	6
	Hispanic/Latinx	3
	Native American/Alaska Native/First Nations/American Indian	1
	Self-Identify:	
	White	11
No Total		26
-	Yes	
	Asian	4
	Black/African-American	8
	Hispanic/Latinx	2
	Middle Eastern/North African (MENA)	1
	Self-Identify:	
	White	7
Yes Total		23
Grand Total		51

<i>Gender</i>	<i>ethnic or racial category</i>	N
-	Hispanic/Latinx	1
Total		1
-	Female	
	Asian	3
	Black/African-American	5
	Hispanic/Latinx	2
	Middle Eastern/North African (MENA)	1
	White	7
Female Total		18
-	Male	
	Asian	5
	Black/African-American	9
	Hispanic/Latinx	2
	Native American/Alaska Native/First Nations/American Indian	1
	White	11
Male Total		28
-	Non-binary / third gender	
	Hispanic/Latinx	1
	White	1
Non-binary / third gender Total		2
-	Prefer not to say	2
Prefer not to say Total		2
Grand Total		51

<i>first-generation student status</i>	<i>gender</i>	N
Total		1
-	Maybe	
	Male	1
m Total		1
-	No	
	Female	7
	Male	15
	Non-binary / third gender	2
	Prefer not to say	1
No Total		26
-	Yes	
	Female	11
	Male	11
	Prefer not to say	1
Yes Total		23
Grand Total		51

Intersectional Combination of Three Identities

<i>first-generation student status</i>	<i>gender</i>	Asian	Black/African-A	Hispanic/Latinx	Middle Eastern/Northern	Native/First N	Self-Identify:	White	Grand Total
+ Total								1	1
- Maybe	Male			1					1
	Female			1					1
	Non-binary / third gender			1					1
	Prefer not to say						1		1
m Total				1					1
- No	Female		1	1				5	7
	Male	4	5			1		5	15
	Non-binary / third gender			1				1	2
	Prefer not to say						1		1
	Total	4	6	3		1	1	11	26
- Yes	Female	3	4	1	1			2	11
	Male	1	4	1				5	11
	Prefer not to say						1		1
	Total	4	8	2	1		1	7	23
Grand Total		8	14	6	1	1	2	19	51



H1: Student identity has an impact on the way students **interact(Learn)** with AI tools such as ChatGPT and Co-pilot.

Student Self Efficacy(Pre-Task)

- Student Who identified as Both First Gen and Female: 2.91 (n=11)
- Students who identifies First Gen and URM : 3.07 (n=16)
- Students who identifies as Female and URM : 3.09 (n=11)

Student Performance (In the Task)

- Student Who identified as Both First Gen and Female: 3.45 (n=11)
- Students who identifies First Gen and URM: 3.98 (n=16)
- Students who identifies as Female and URM: 3.57 (n=11)

Student Self Efficacy(Post-Task)

- Student Who identified as Both First Gen and Female: 3.09 (n=11)
- Students who identifies First Gen and URM : 3.29 (n=16)
- Students who identifies as Female and URM : 2.91 (n=11)

H1: Student identity has an impact on the way students **interact(Learn)** with AI tools such as ChatGPT

- Student Who identified as White and Female: 7

Average of Task : Understanding of Concepts	Average of Reflection : Understanding of Concepts	Average of 1. Pre-task Quiz	Average of 5. Post-task Quiz
3.12	2.43	2.00	2.57

- Students who identified as White and Male: 11

Average of Task : Understanding of Concepts	Average of Reflection : Understanding of Concepts	Average of 1. Pre-task Quiz	Average of 5. Post-task Quiz
4.80	3.27	3.18	3.27

- Student Who identified as Both First Gen and Female (n=11)

Average of Task : Understanding of Concepts	Average of Reflection : Understanding of Concepts	Average of 1. Pre-task Quiz	Average of 5. Post-task Quiz
3.45	3.09	2.73	3.73

- Students who identifies First Gen and URM : (n=16)

Average of Task : Understanding of Concepts	Average of Reflection : Understanding of Concepts	Average of 1. Pre-task Quiz	Average of 5. Post-task Quiz
3.98	3.29	2.93	3.93

H1: Student identity has an impact on the way students interact with AI tools such as ChatGPT and Co-pilot.

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Next steps of analysis: Focus on identity cohorts of students that exhibit these behaviors and their interaction patterns to further understand the impact of identity on their experience

USER PROMPT - learning new know ledge	About a Concept
	About Implementation of Code?
	Debugging?
USER PROMPT - Solution Oriented	Direct Copy Paste of Question
AI Alignment	Setting context/ persona
Quality of interaction	Reasonable prompt
	Reasonable response?
	Factually, correct?
	Helpful to student?
prompt/response iterations	Continuing conversation?
	Comparison with Human TA (is human ta better?)

The emergent attitudes of participants towards AI

- Highly Confident
- Cautious
- Curious
- Frustrated
- Innovative

H2: Student identity has an impact on student perception of using AI as a tool for learning how to program.

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Thematic Analysis of reflective survey responses to these questions

- Did having AI in the process of programming Help
- Should using AI tool be considered cheating? Why or why not?
- Did using this AI tool motivate the student to learn more about programming?
- Were they more confident about being successful in computer science?
- Do you have any concerns about the use of AI tools in the classroom and professionally?

Did having AI in the process of programming help you? (Yes, No, Maybe)

Yes/No	Count of Participant ID
Yes	37
No	8
Maybe	4
	1
Total	50

YES: Responses from a student who said **Yes to AI helping** with the following characteristics: - White, Female, Not first Gen, Experiences a Disability, Suburb

I feel like it helped, but I **do not feel like the AI tool could understand me**. It just felt like regertated information.

I did not learn from AI in the way that I used it. **I had ChatGPT do it for me**.

AI could be a great teacher, however in my usage and wording, **I did not give it the chance to really teach**.

I feel like a mixture of both. I feel like it **supported me with information**, but it **challenged me to get the answers** out of it.

I have **learned how to use AI for the purpose of learning**. I had it explain to **me concepts in my data stuctures course a lot in the past**. I used it also for explaining to me data structures and algorithms as well.

NO: Responses from a student who said *No to AI helping*
with the following characteristics: *White, Non-Binary, Not first Gen, Rural*

I did not use AI in my process. I have used AI for learning before, and I am not a fan of it. I would prefer to find the information myself, as I learn more things along the way instead of getting my one single question answered and then having to double check it to make sure.

MAYBE: Responses from a student who said *Maybe to AI helping*
with the following characteristics: *Hispanic/Latinx, Has a disability/chronic condition, Non-Binary, Suburb Near a city*

It did help by providing answers, and it can explain topics if asked. However, within the time constraints I was not able to ask for explanations. I felt the AI understood the prompts to a degree. I feel AI's role was to complete the tasks for me as I have no knowledge of Java.

I gained a general knowledge of what Java code looks like from using this tool. I think this kind of AI could be a decent tutor/teacher, but the prompts would have to be carefully crafted.

I felt supported during the first two tasks. The third task felt much more challenging as I was not able to get a correct answer from ChatGPT. I have used AI tools in order to gain knowledge on topics by asking it questions.

Do you think the way you used the AI tool should be considered cheating? Why or why not? Would it currently be seen as cheating?"

Yes/No	Count of Participant ID
No	16
Yes	16
Both	13
Maybe	5
Total	50

Intersectional Identity Analysis

NO: Female + URM felt Not Cheating

YES: Female + White felt Cheating

Mostly NO, MAYBE: Male + URM

Mostly YES and MAYBE: Male + Non URM

Does your experience with using this AI tool motivate you to continue learning more about programming?

Yes/No	Count of Participant ID
Yes	25
	12
No	10
Maybe	3
Total	50

*Response from a student who said **Maybe** with the following characteristics: White, Male, first Gen, Small city/town*

I've used this **AI tool many times** before, I mean **its ChatGPT who hasent used it**. Its being used in **middle schools elementary schools and high scholls as well as colleges** everywhere.

So **using it is a part of life for a school student now**.

If any at all it has an effect on the **motivation to do the actual homework yourself most people now just copy and paste their problems for coding into chatGPT** and it solves it for them and its even encouraged in class to use it to help you. **But for me it motivates me to learn**.

Does your experience with using this AI tool motivate you to continue learning more about programming?

*Response from a student who said **No**
with the following characteristics: Black-African American, Male, not first Gen,
Small city/town*

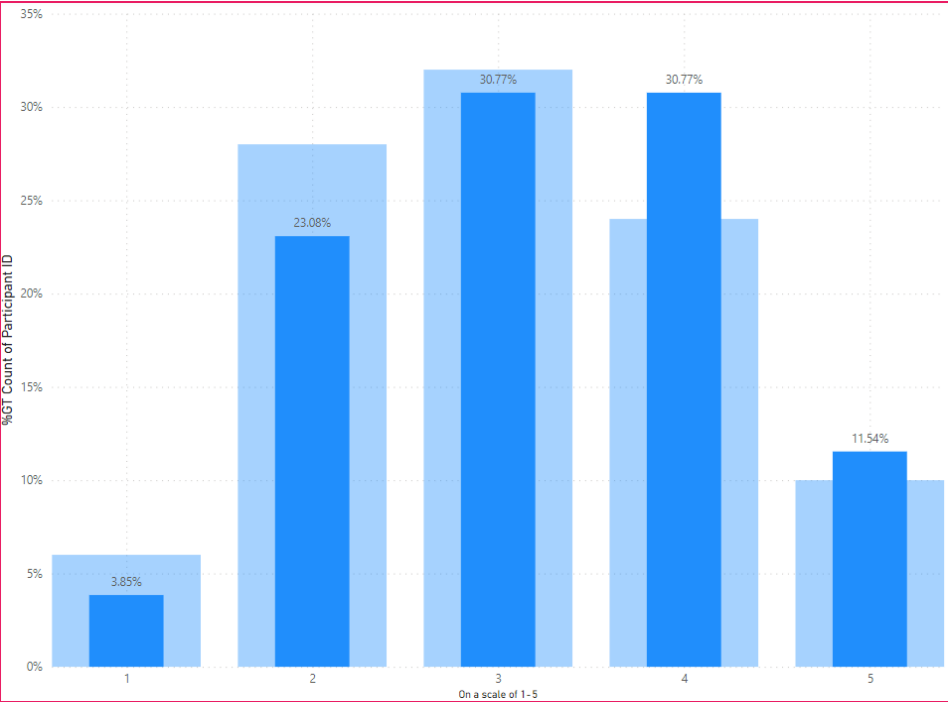
It does not. **If anything, it would make me want to learn less.** What I mean by that is, since AI is constantly advancing, **the consistency of AI will only get better.**

Knowing that, I could only assume that **AI is on the road to being able to do the coding itself.** I would rate the motivation a 2.

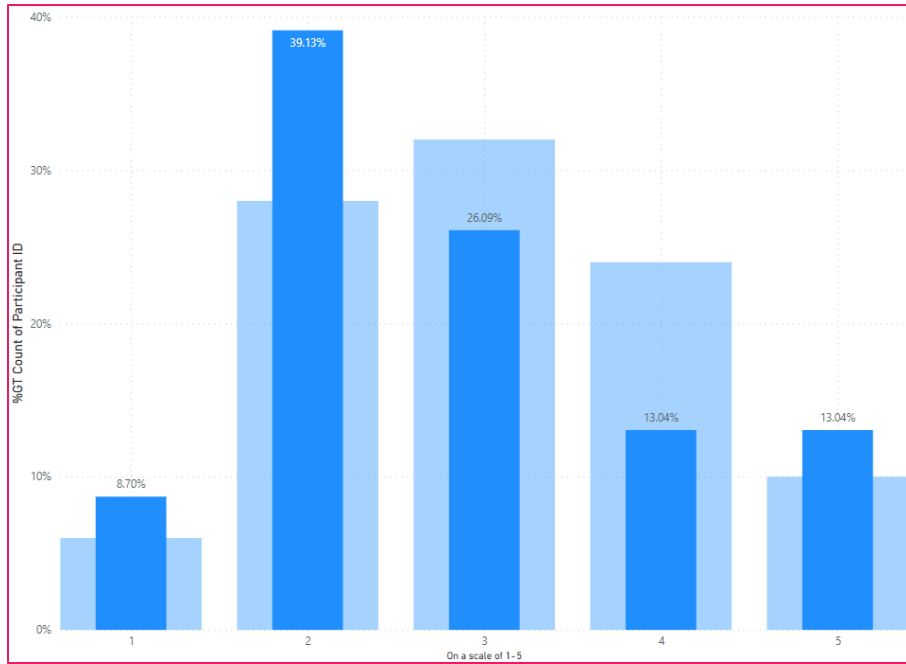
Are you more confident about being successful in this degree?

(Follow up of on a scale of 1-5)

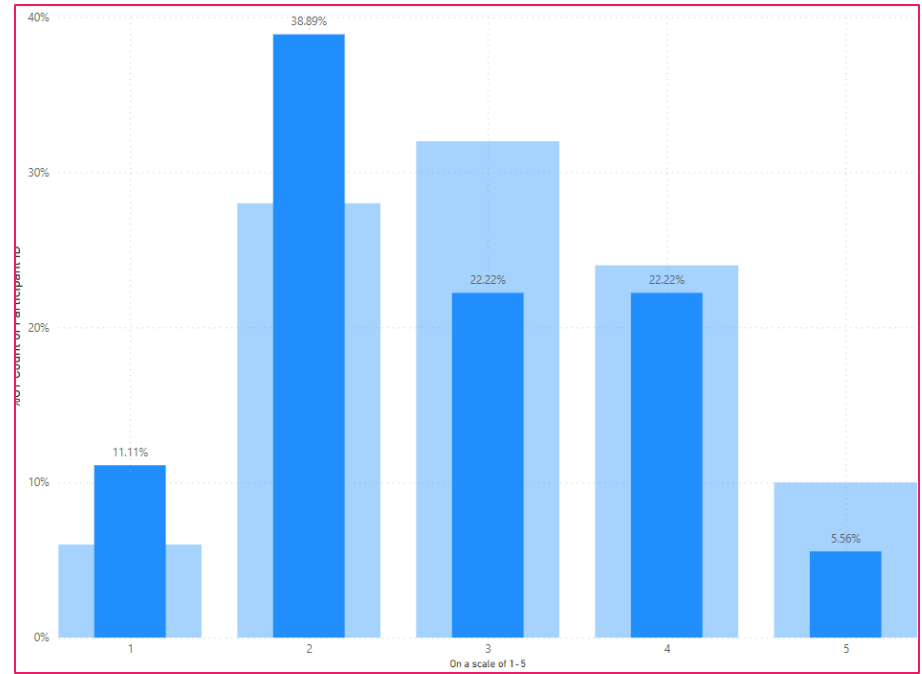
Yes/No	Count of Participant ID
Yes	24
	13
No	9
Maybe	3
Total	50



Male students



First Gen students



Female students

Do you have any concerns about the use of AI tools in the classroom and professionally?

Yes/No	Count of Participant ID
No	21
Yes	18
Both	6
Maybe	3
Total	50

*Response from a student who said **No** with the following characteristics: Hispanic/Latinx, Female, not first Gen, Small city/town*

I do not have any concerns about the use of AI in classroom. I do **believe that it makes it easier for people to strat coding**. It is also a great tool to understand code and learn from it. I think that **AI can open the doors** to understand concepts and any **questions we have 24/7**. Therefore, I am not worried about the use of AI as long as one knows how to use it and **understand the ethics**.

*Response from a student who said **Maybe***

with the following characteristics: Black/African American, Male, not First-Gen, Suburb near a Large City

My concerns for the use of AI tools in the classroom and professionally would be if **people were just using the AI to get answers and not actually asking for an explanation** or more in depth information as to how they got the answers or what the answers really mean. If people use AI efficiently and **actually emphasize on trying to learn from AI** then I believe that it can be incorporated in a very professional and efficient way. People would learn how to efficiently use AI which could allow people to expedite solving difficult real world problems.

*Response from a student who said **Yes***

with the following characteristics: Asian, Female, first Gen, Large City

There are some **ethical considerations I'm concerned** about that relates to AI training data that can lead to **unfair bias**. There is also the risk of **dependence on AI in both the classroom and professionally** which is a huge concern.

There is another concern **with privacy and security** as AI tools have and need access to a lot of data.

Accessibility is another concern specifically in the classroom as all students may not have **access to AI tools or technology**. There is also an issue of transparency and accuracy as mentioned above, which can affect the accuracy and consistency of the results of the AI tool.

Contributions

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Understanding how student identity affects how they choose to interact with AI tools.

Understanding how student identity affects how they learn with AI tools.

Understanding how student identity affects students' perception of AI tools.

Impact:

Decisions on where AI can be included constructively in courses and where we need to install guardrails.

Equitable access to AI.

Disclaimer /Call to action

— — —

- Significance tests are not possible with small sample
- Need for more studies
- Intersectional analysis produces smaller cohort numbers
- Qualitative analysis provides insights rather than generalizable or replicable results

Conclusion

H1: Student Identity has an impact on the way students **interact** with AI tools such as ChatGPT and Co-pilot.

- Coding Student Interaction
- Based on Prompt/Response
- Based on Student Behavior

H2: Student Identity has an impact on student **perception** of using AI as a tool for learning how to program.

- Coding the Reflective Survey/Interview

Using an Intersectional Lens to
build Student Cohorts
for data analysis

— — —

- How is an intersectional analysis relevant to your teaching or workplace?
- How is AI perceived in your educational or professional environment?
- Do you think identity is relevant to the uptake of AI tools?
- Do you think identity is relevant to the benefits of AI tools?