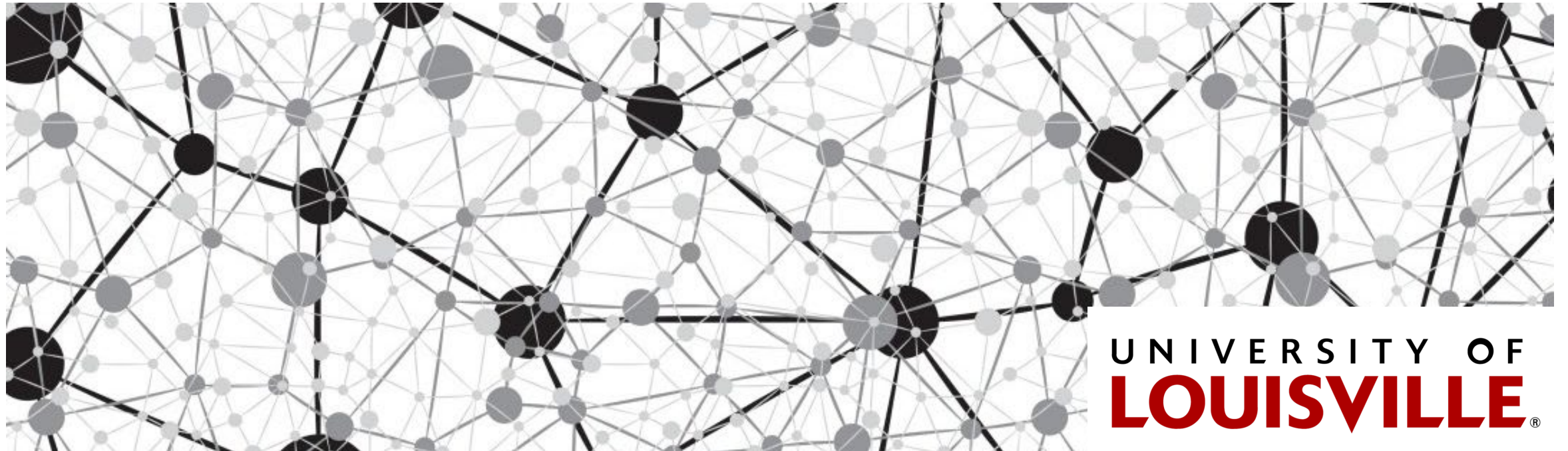


# Teaching First-Year Engineering Students to Use GenAI Ethically: Surveys and Course Developments

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# Overview:

**November 22, 2022**

OpenAI released ChatGPT

**Survey results:** Greater use of ChatGPT.  
**Course adaptation:** Integrated ChatGPT into more projects, with the intention of teaching students to **use ChatGPT ethically**.

Fall 2022

Spring 2023

Fall 2023

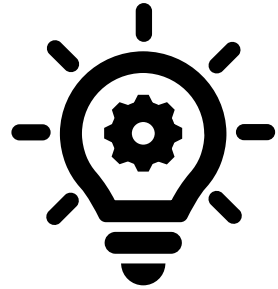
**Survey results:** Some first-year engineering students are using ChatGPT for HW.  
**Course adaptation:** Integrated ChatGPT into a final team project.

# GenAI and Education

***“Artificial-intelligence tools present the greatest creative disruption to learning that we’ve seen in my lifetime”***

Sarah Eaton, Academic Integrity Researcher &  
Associate Professor of Education, University of Calgary

# Potential Impacts of GenAI on Learning



## Learning Enhancements

- Asking conceptual questions
- Exploring related ideas
- Live, on-demand tutoring
- Improve learning of difficult concepts



## Learning Threats

- ~~Completing entire assignments~~
- ~~Copy and paste~~
- Reduce recall practice
- Reduce thinking

**Academic  
Dishonesty**

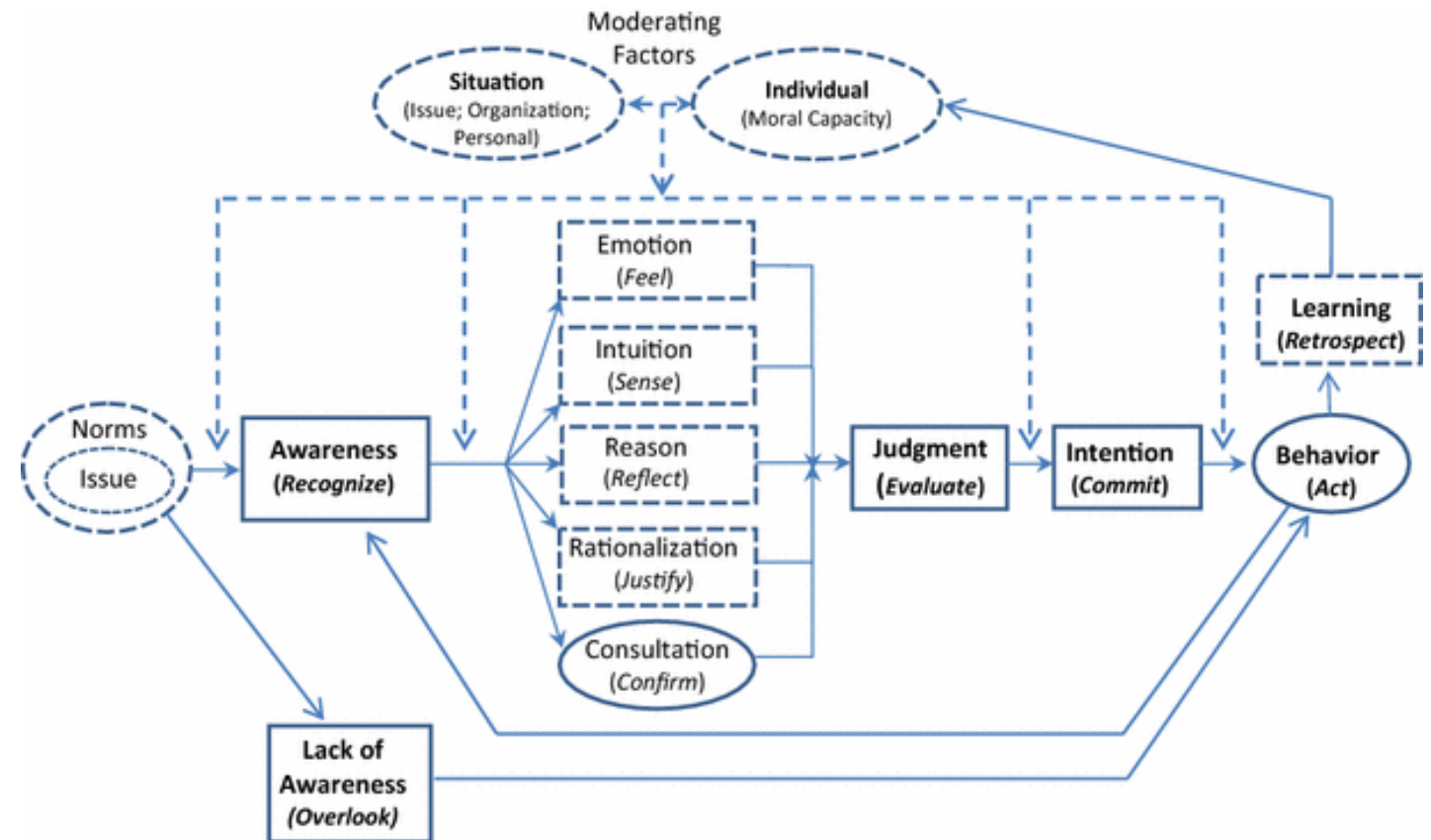
# How will GenAI be used by undergraduate engineering students?

## What we know about engineering school:

- Engineering students have high workloads.
- Some may feel pushed to choose the quickest path towards assignment completion to avoid failure.
- Some students sometimes choose academically dishonest ways to complete their work.

# Theory: Ethical Decision-Making

- Awareness > **Judgement** > Intention > Behavior
- Judgement is based on individual factors like **feelings** and **values**
- Because we have not yet established **Norms** and **Standards** for GenAI, and the **disruption of Norms due to COVID-19**, we need to look at students' incoming feelings and values to understand their ethical decision-making.

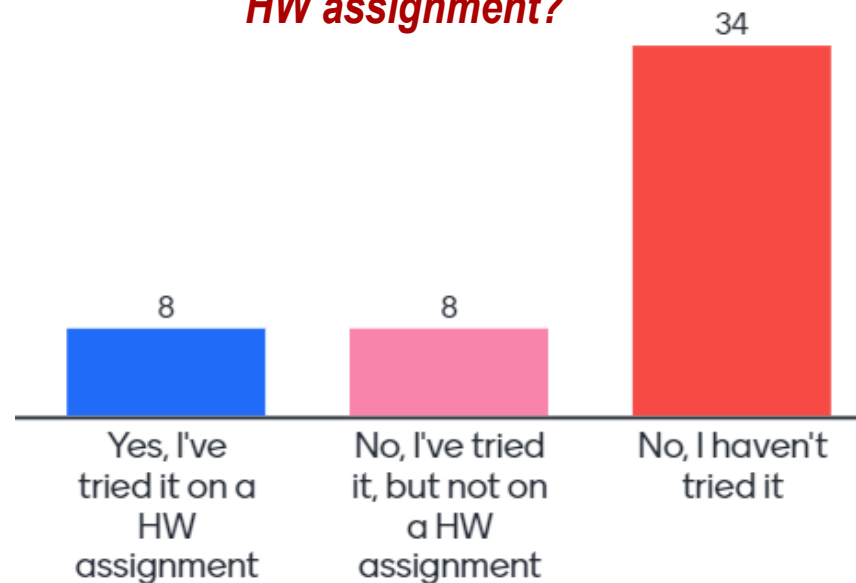


# Survey 1: February, 2023

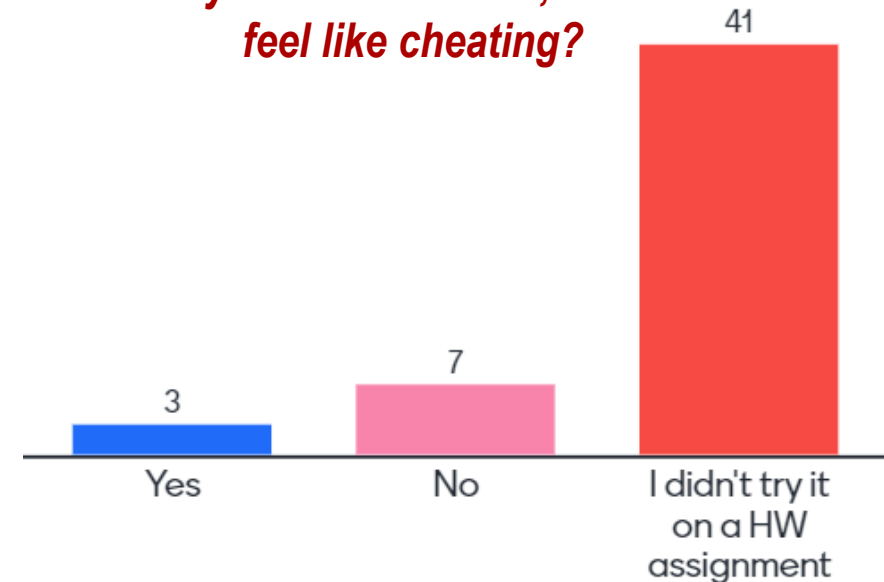
Participants: 52 students in ENGR 110 – Engineering Tools, Methods, and Practice I

Method: An in-class survey via Mentimeter (an anonymous, live survey platform), following a lecture on ethics and the engineering profession.

*Have you tried ChatGPT on a HW assignment?*



*If you tried it on HW, did it feel like cheating?*

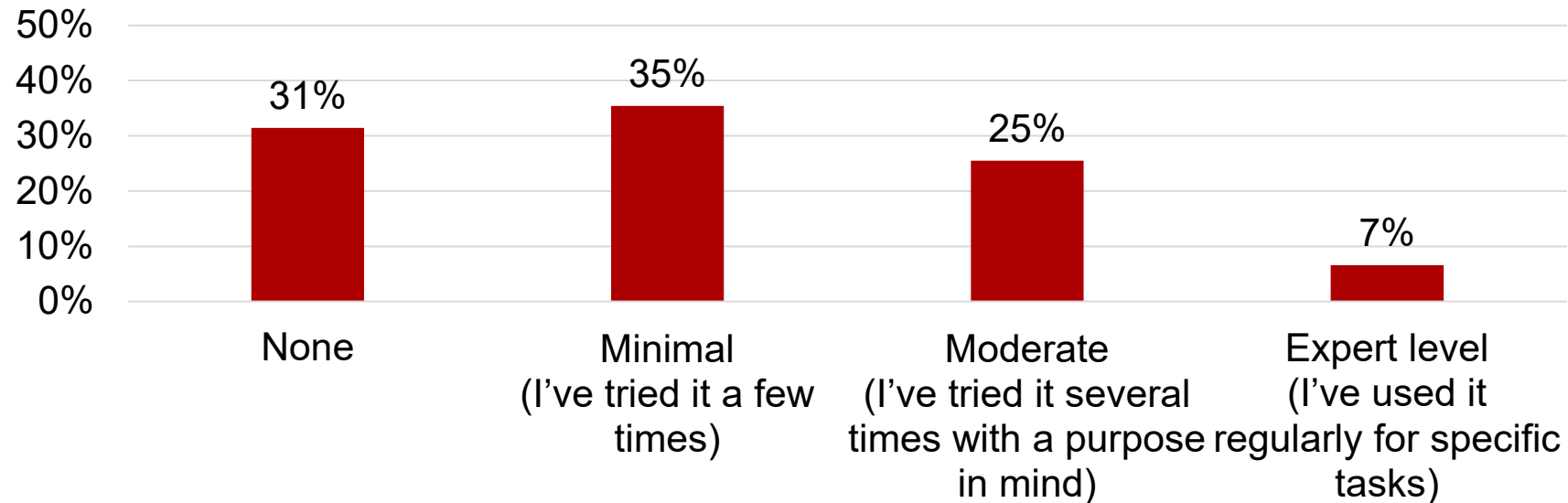


# Survey 2: September, 2023

Participants: 455 students in ENGR 110 – Engineering Tools, Methods, and Practice I

Method: Blackboard survey, prior to any discussion of ethics or GenAI.

*How much experience have you had interacting with ChatGPT?*





**If some students are using  
ChatGPT on their homework, let's teach  
all students to use it ethically.**

# Course Integration 1: Final Team Project, Spring 2023

## Original Assignment:

*Create a Python program that repeatedly offers the user a menu of three functions, performs whichever function is selected, and ends when the user enters “exit.”*

## Integration of GenAI:

1. **Plan the menu structure**
  - Identify input/output, loops, and branching structures needed
  - Plan the order of execution
2. **Use ChatGPT to write the syntax**
3. Compare the generated code with the original plan
4. Test the code
5. Write a code documentation file describing 1-4



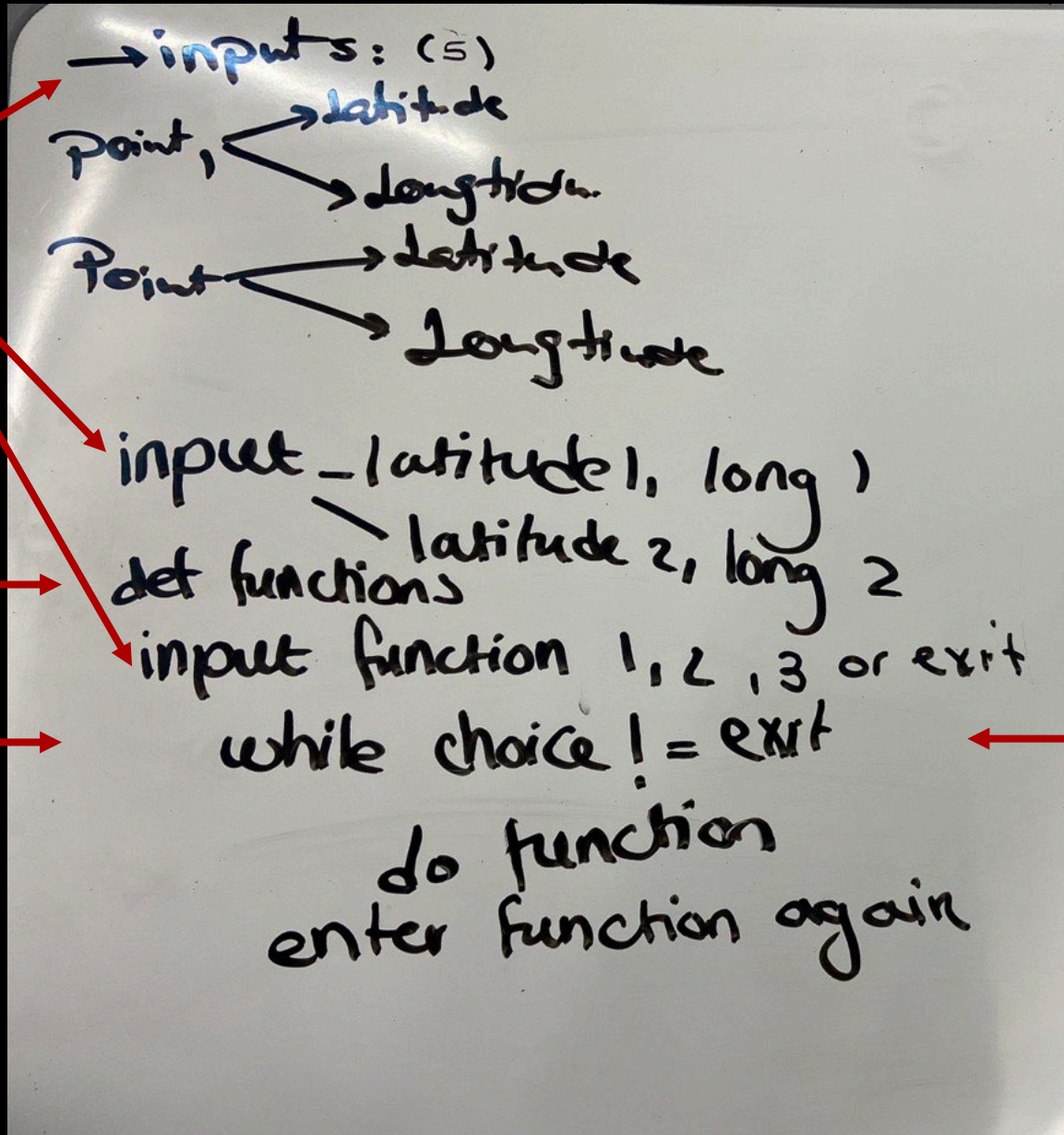
**Engineering Design**

# Plan Example

Inputs

Functions

Loop



Sentinel value

# ChatGPT syntax Example

Appropriate functions

Appropriate loop

Appropriate branching

Additional functionality

```
python Copy code  
  
def option_one():  
    print("You selected option one.")  
  
def option_two():  
    print("You selected option two.")  
  
def option_three():  
    print("You selected option three.")  
  
while True:  
    print("\nMenu:")  
    print("1. Option One")  
    print("2. Option Two")  
    print("3. Option Three")  
    print("Enter 'exit' to quit.")  
  
    choice = input("Enter your choice: ")  
  
    if choice == '1':  
        option_one()  
    elif choice == '2':  
        option_two()  
    elif choice == '3':  
        option_three()  
    elif choice.lower() == 'exit':  
        break  
    else:  
        print("Invalid choice. Please enter a valid option.")
```

Different Sentinel

Good input location

New Function

# Course Integration 1 (Cont'd)

## Python Program Functions:

Function 1: Unit conversion

Function 2: Rough distance calculation

Function 3: Haversine distance calculation

## ChatGPT code:

Function 1: success

**Function 2: failure**

Function 3: success

# Student Reflections

Students came to understand restrictions and limitations of GenAI through this applied assignment.

*“ChatGPT is very strong at assisting in writing code. Using this can increase the speed you create programs and increase your knowledge.”*

*We used ChatGPT as a code check, where we wrote code and asked it to duplicate what we had already written (or something similar). We noticed errors in the “code” that ChatGPT produced.”*

# Course Integration 2: Research Paper, Fall 2023

## Original Assignment:

*Research a Grand Challenge of Engineering. Describe the challenge as well as 3-4 recent engineering solutions in a paper and video, citing relevant sources of information.*

## Integration of GenAI:

1. Test the ability of ChatGPT to generate references
  - (It fails)
2. **Use ChatGPT for ideation**
3. Learn how to cite ChatGPT
  - Personal communication
  - In-text only
  - For example: (ChatGPT, personal communication, 2023-10-05)

# Questions in class – a different conversation

*“Can we use ChatGPT to edit our whole report?”*

*(yes, but remember to check it for correctness!)*

*“How would we cite that?”*

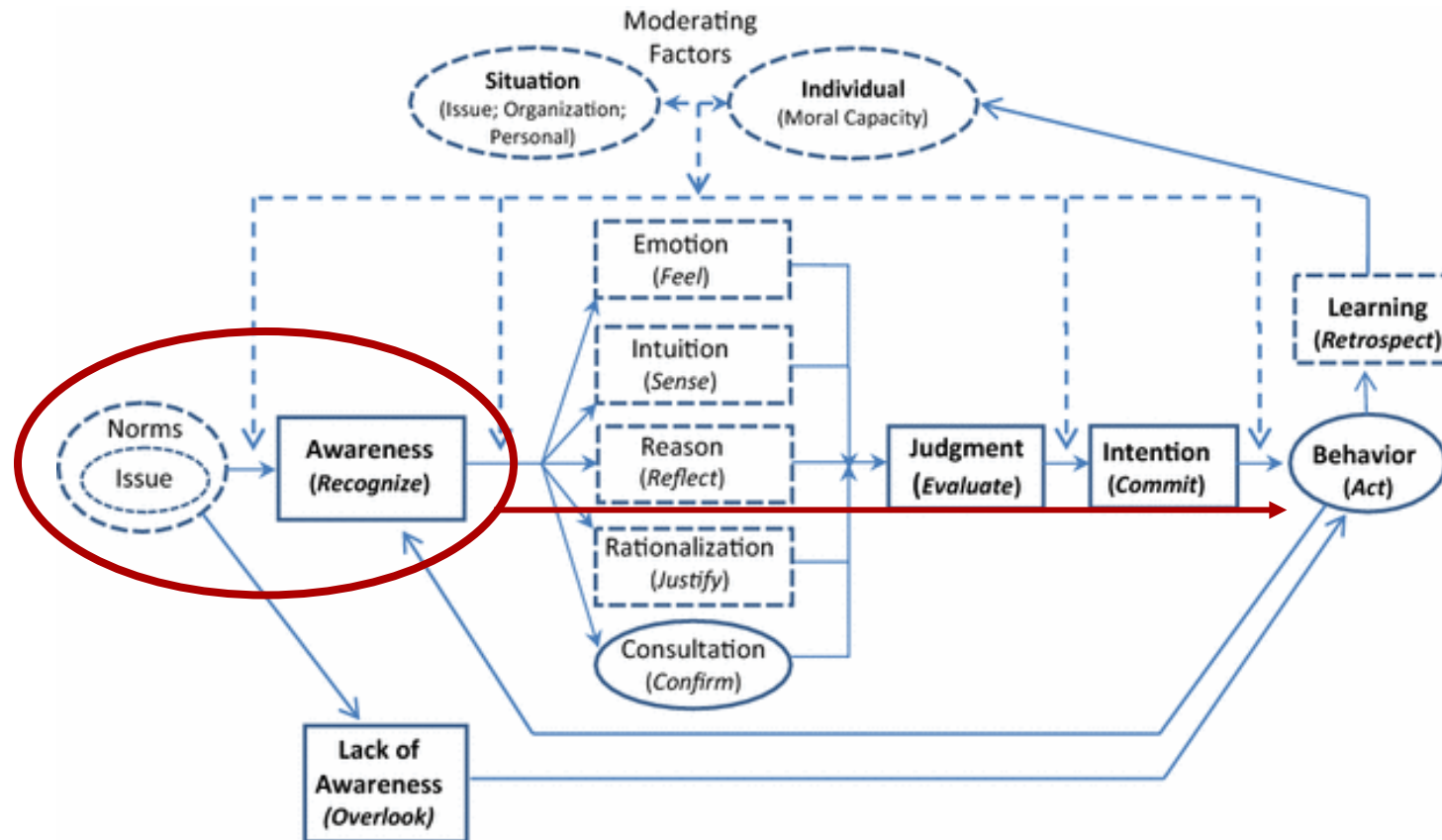
*(an explicit, in-text citation at the beginning or end of the report detailing how it was used.)*

*“What if we use it on one paragraph? How do we cite that?”*

*(write an explicit, in-text citation at the end of the paragraph.)*



# Ethical Decision-Making Theory



Schwartz, M.S. (2016). Ethical Decision-Making Theory: An Integrated Approach. *J Bus Ethics* 139, 755–776 (2016).

<https://doi.org/10.1007/s10551-015-2886-8>

# Ongoing work – Pre/Post Survey, Fall 2023

## **Attitudes** toward GenAI tools

General Internet Attitude Scale\* (adapted for ChatGPT).

## **Trust** of GenAI tools

What is the likelihood that ChatGPT will generate a correct answer to this prompt:  
“What was the exchange rate between the dollar and the euro in 2006?”

## **Ethics** of using GenAI tools

“It is ethical to use ChatGPT to complete entire engineering homework assignments.”  
“It is ethical to use ChatGPT to write programming code in the engineering workplace.”

\*Joyce, M., & Kirakowski, J. (2015). Measuring attitudes towards the Internet: The general Internet attitude scale. *International Journal of Human-Computer Interaction*, 31(8), 506-517.

Questions?

