Exploring AI in Undergraduate Learning: Insights from a Human Physiology Course

Linda Nguyen[1] and David Therriault[2]

[1]Department of Applied Physiology and Kinesiology, College of Health and Human Performance, [2]School of Human Development and Organizational Studies in Education, College of Education, University of Florida, Gainesville, FL

Introduction

- Artificial intelligence (AI) tools, especially LLMs are increasingly being used by students in higher education
- While existing research often highlights academic integrity concerns (Kasneci et al., 2023; Cotton et al., 2023), fewer studies have explored how structured, intentional use of generative AI can promote deeper understanding, critical thinking, or digital literacy in STEM education.
- AI literacy is increasingly becoming a critical skill, encompassing the ability to formulate effective prompts, interpret AI-generated content, and evaluate its accuracy and limitations (Long & Magerko, 2020; Cuhadar, 2022).
- In physiology education, which is often content-dense and conceptually complex, AI may serve as a supplemental learning tool
- This study aims to explore the impact of scaffolded AI assignments on students' AI literacy, their ability to critically evaluate AI outputs, and their perceptions of AI as a tool for learning physiology.
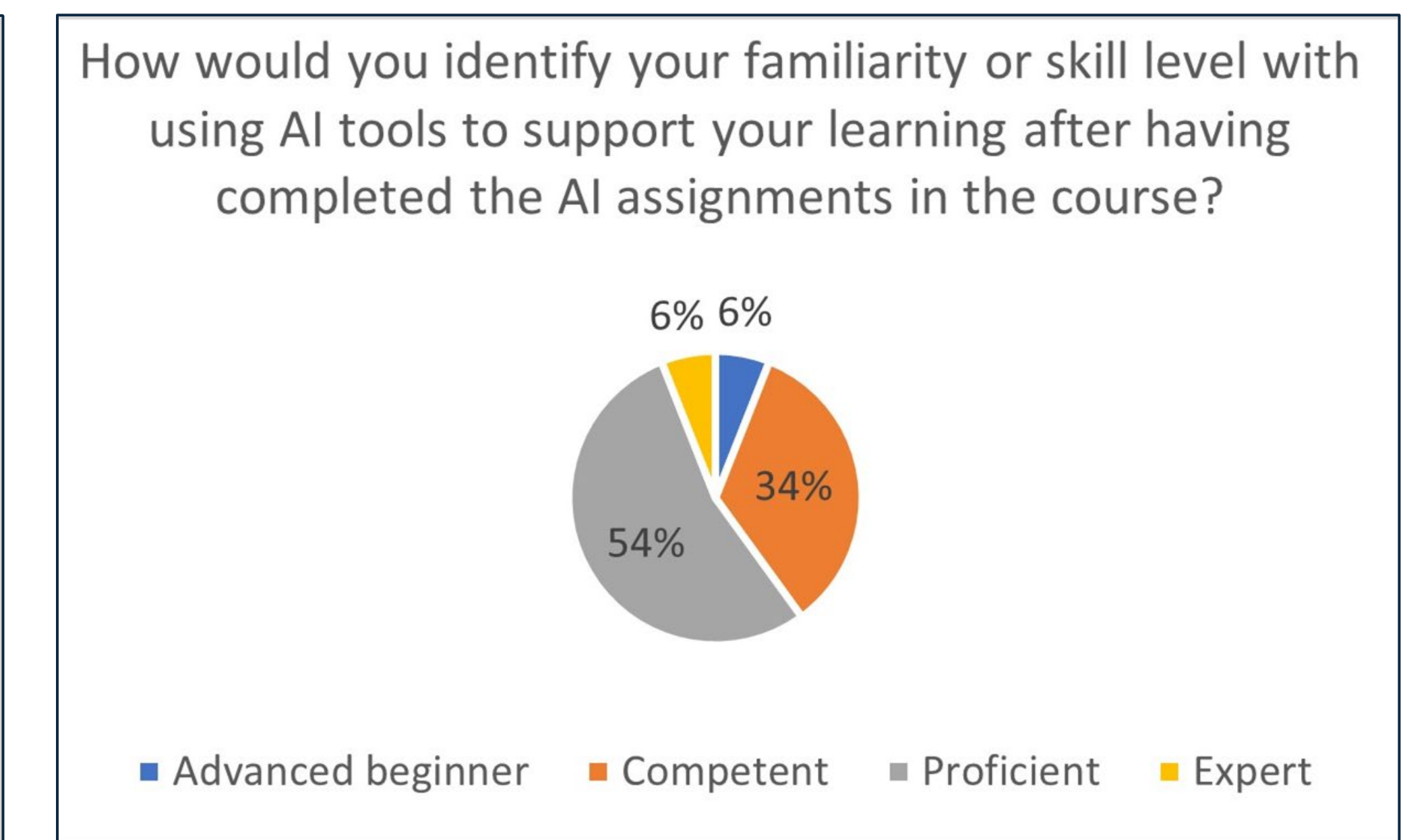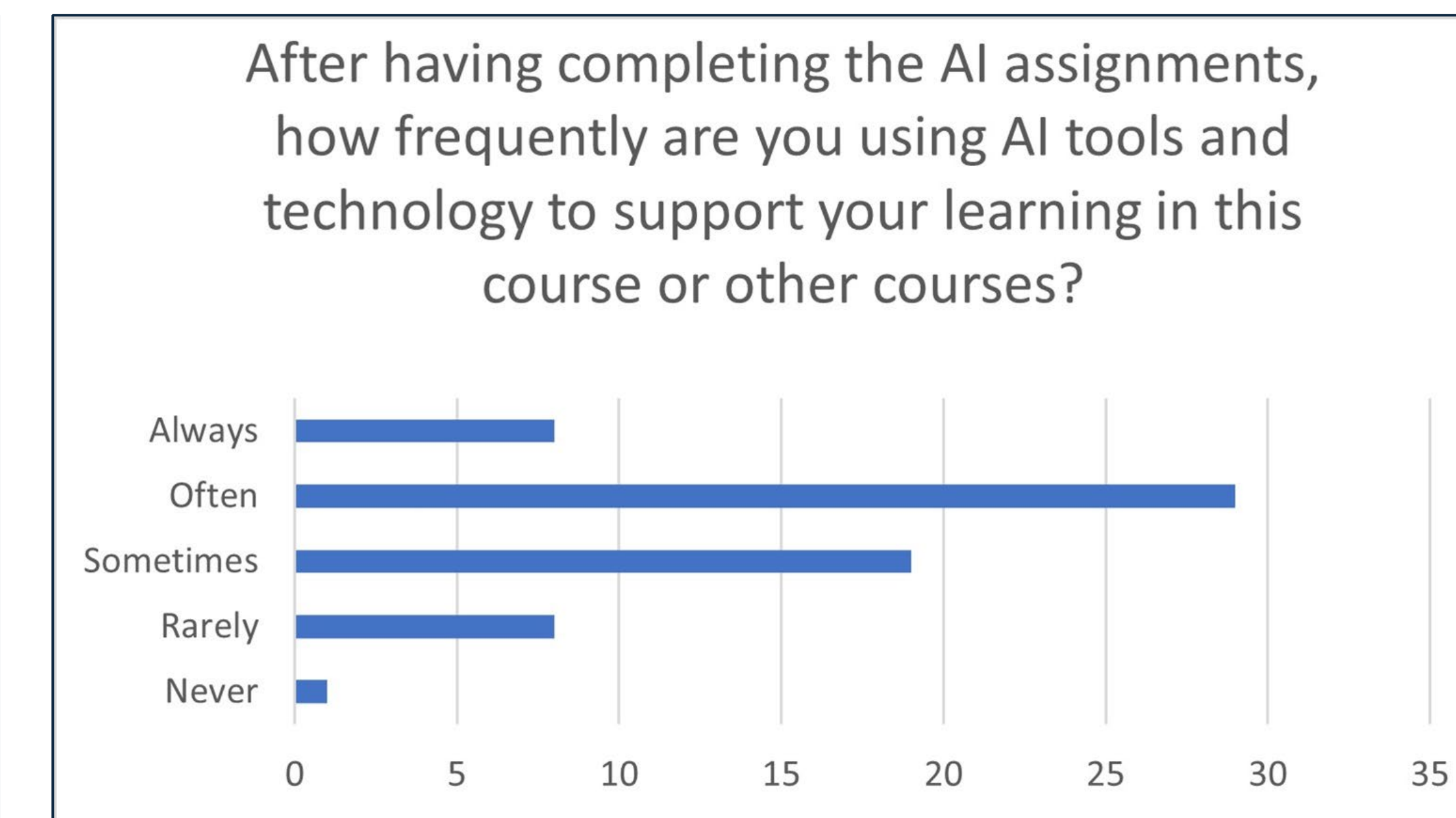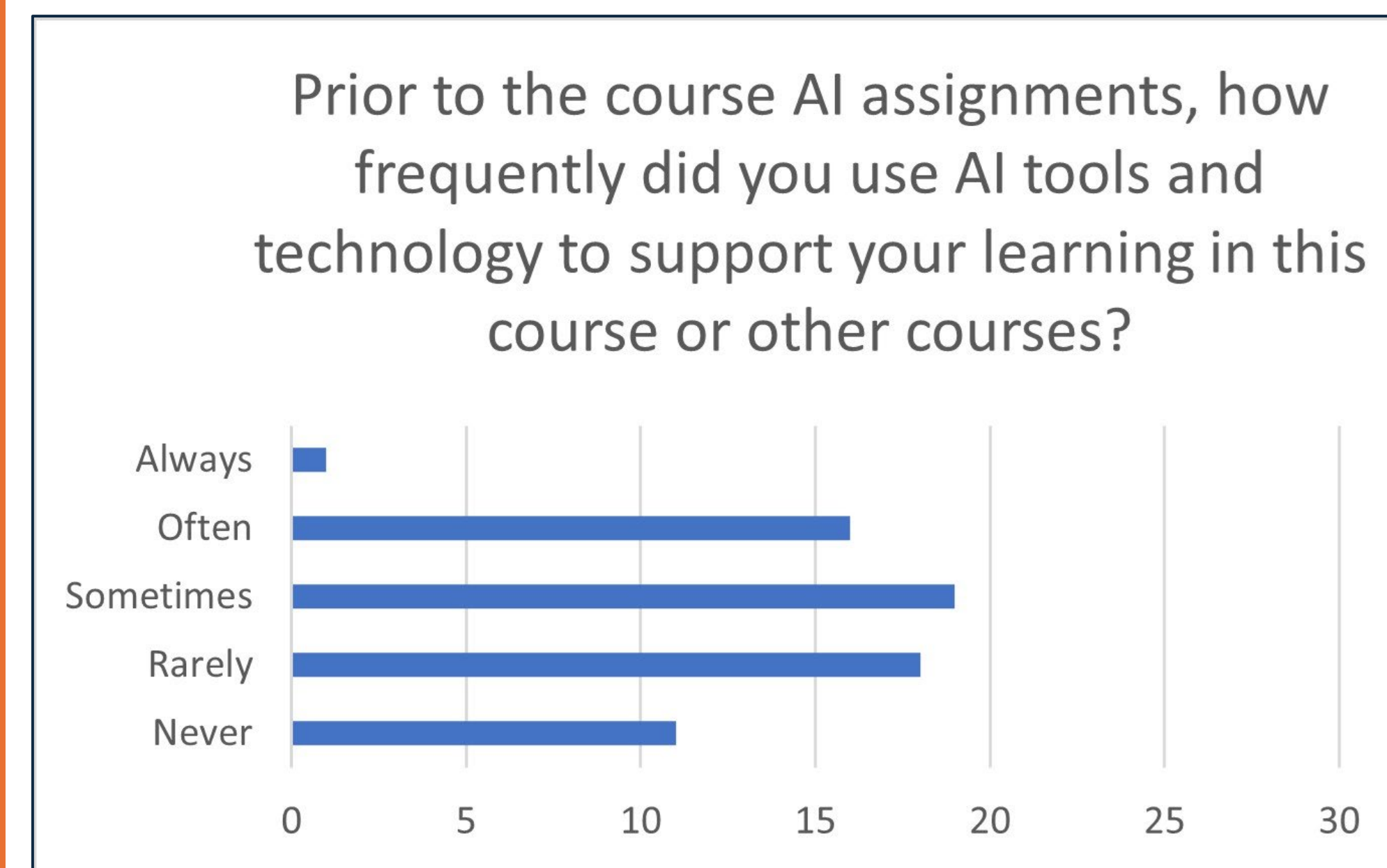
Research Questions

1. How does students' familiarity with and usage of AI tools for learning change after completing scaffolded AI assignments?
2. How effectively can students critically evaluate AI-generated outputs for accuracy and relevance in the context of human physiology?
3. What are students' perceived benefits of using AI as a tool for learning, and how do these perceptions relate to its impact on their learning?
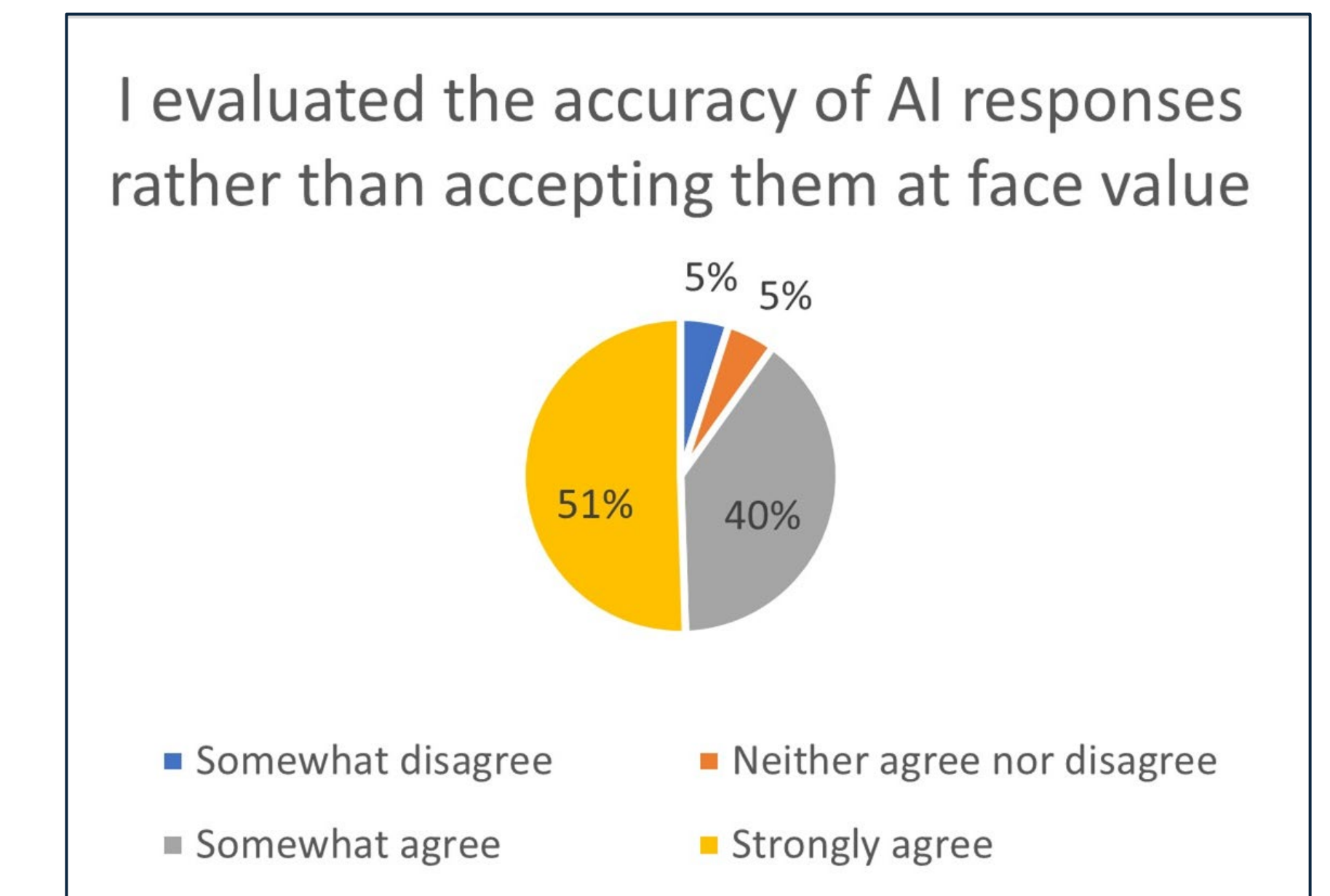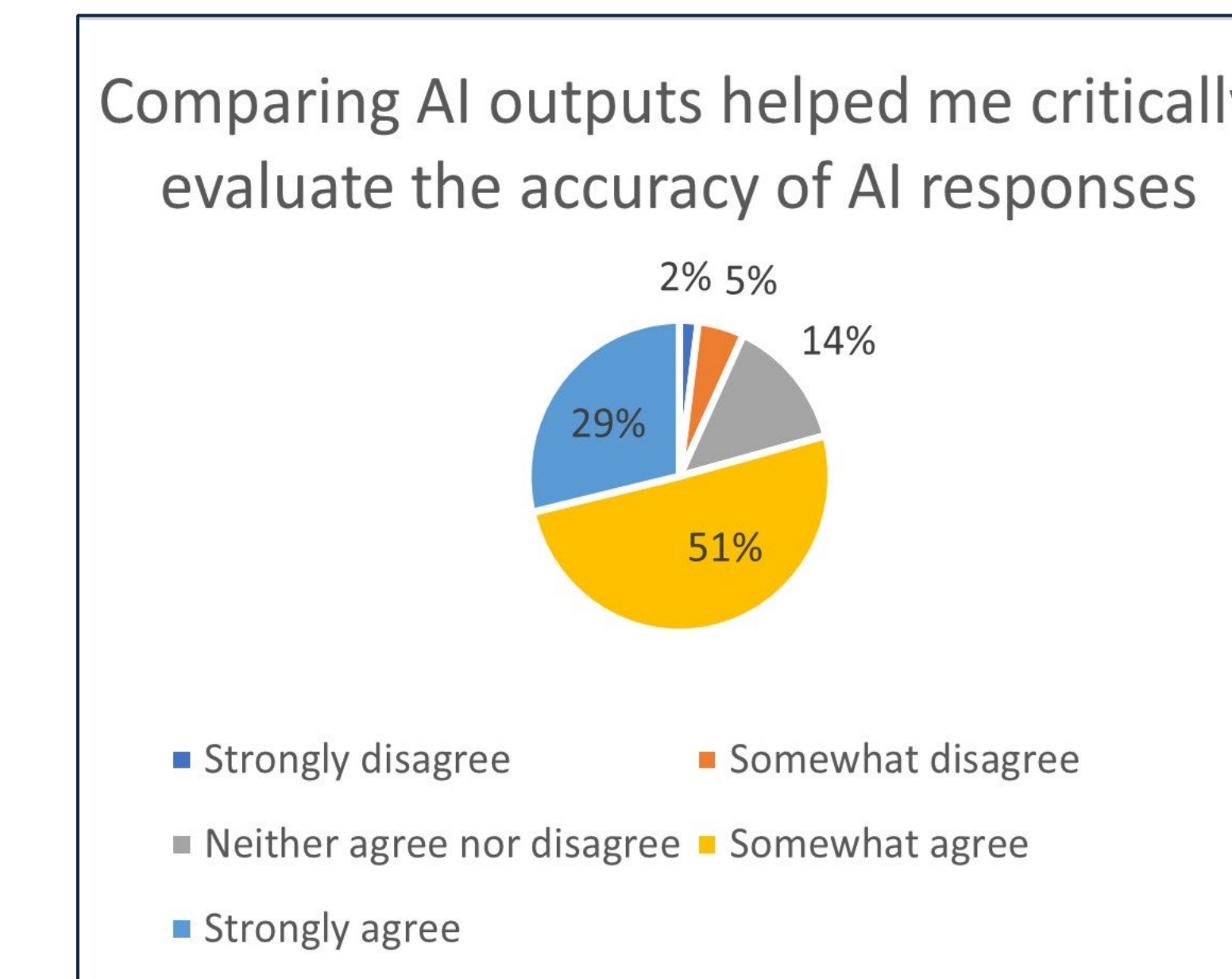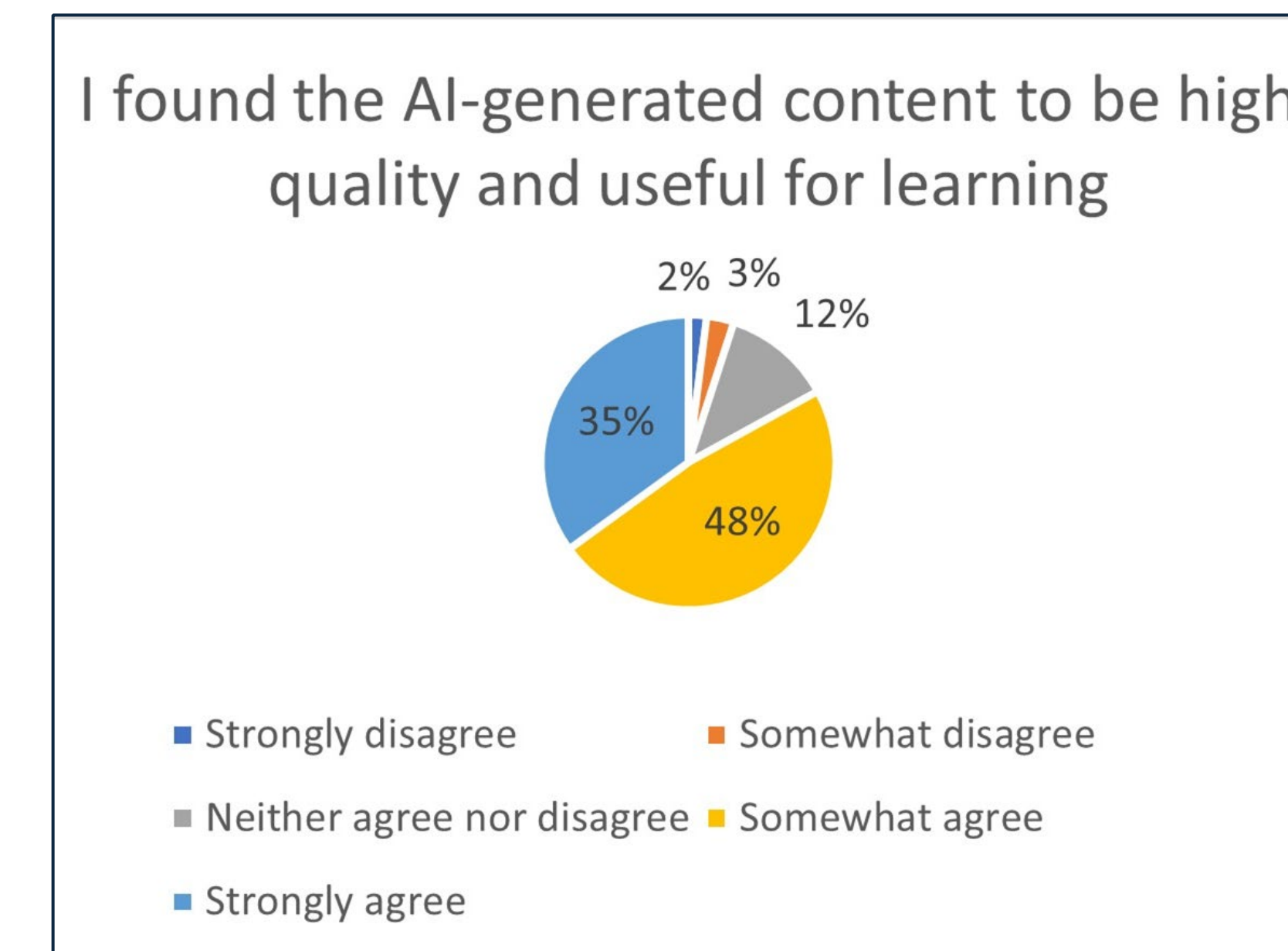
Methods

- Participants were undergraduate students enrolled in APK2105c (Applied Human Physiology), a large-enrollment STEM gateway course at the University of Florida (n =81).
- The sample consisted of 81.25% females and 17.5% males, and 1.25% non-binary/third gender, with an average age of 18-24 years. Participants identified as primarily White/Caucasian (63%), followed by Asian/Pacific Islander (16%), Black/African American (11%), and other (10%).
- Over the course of three modules, students completed scaffolded AI assignments designed to promote AI literacy while reinforcing difficult physiology concepts.
- For each assignment, students:
  - Selected a challenging topic from recent course modules
  - Generated an AI prompt using an LLM (e.g., ChatGPT, CoPilot, Perplexity, Gemini)
  - Submitted their original prompt, the AI-generated response, and a written critical evaluation of the output's accuracy, completeness, and clarity
  - Reflected on whether the AI response helped clarify their understanding and how they might revise the prompt for improved results
- The surveys included a mix of Likert-scale and ranking, and open-ended items; data were analyzed descriptively.
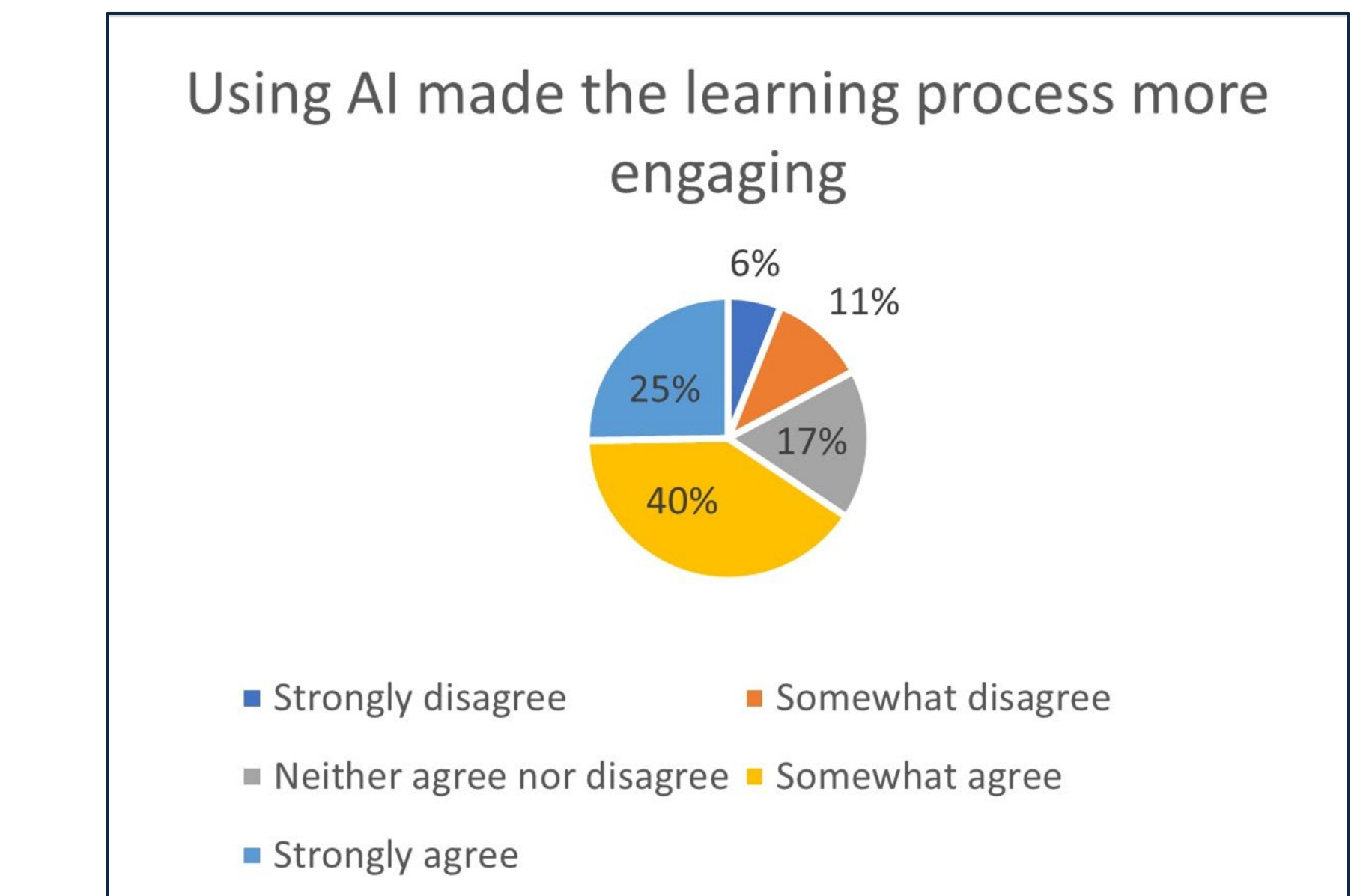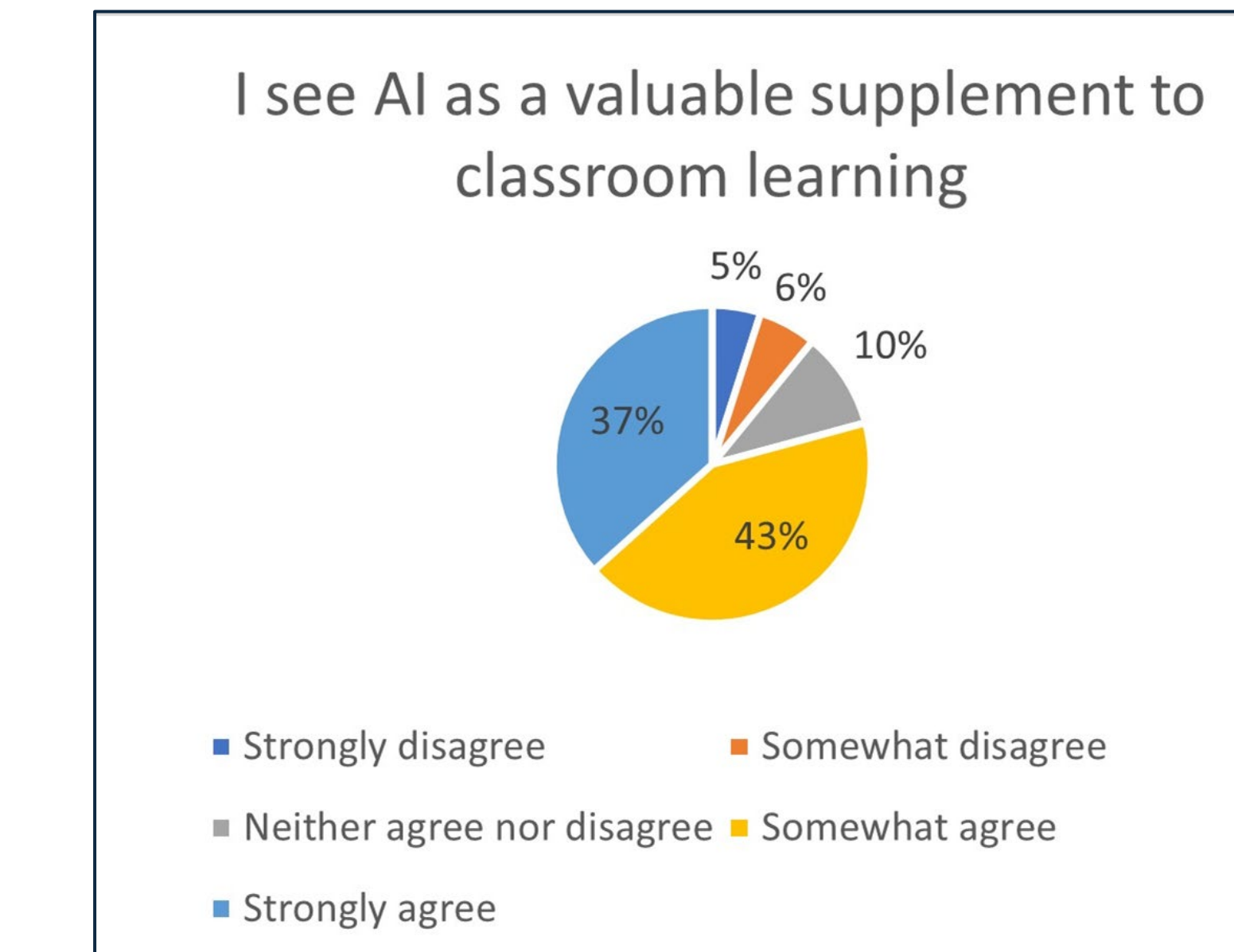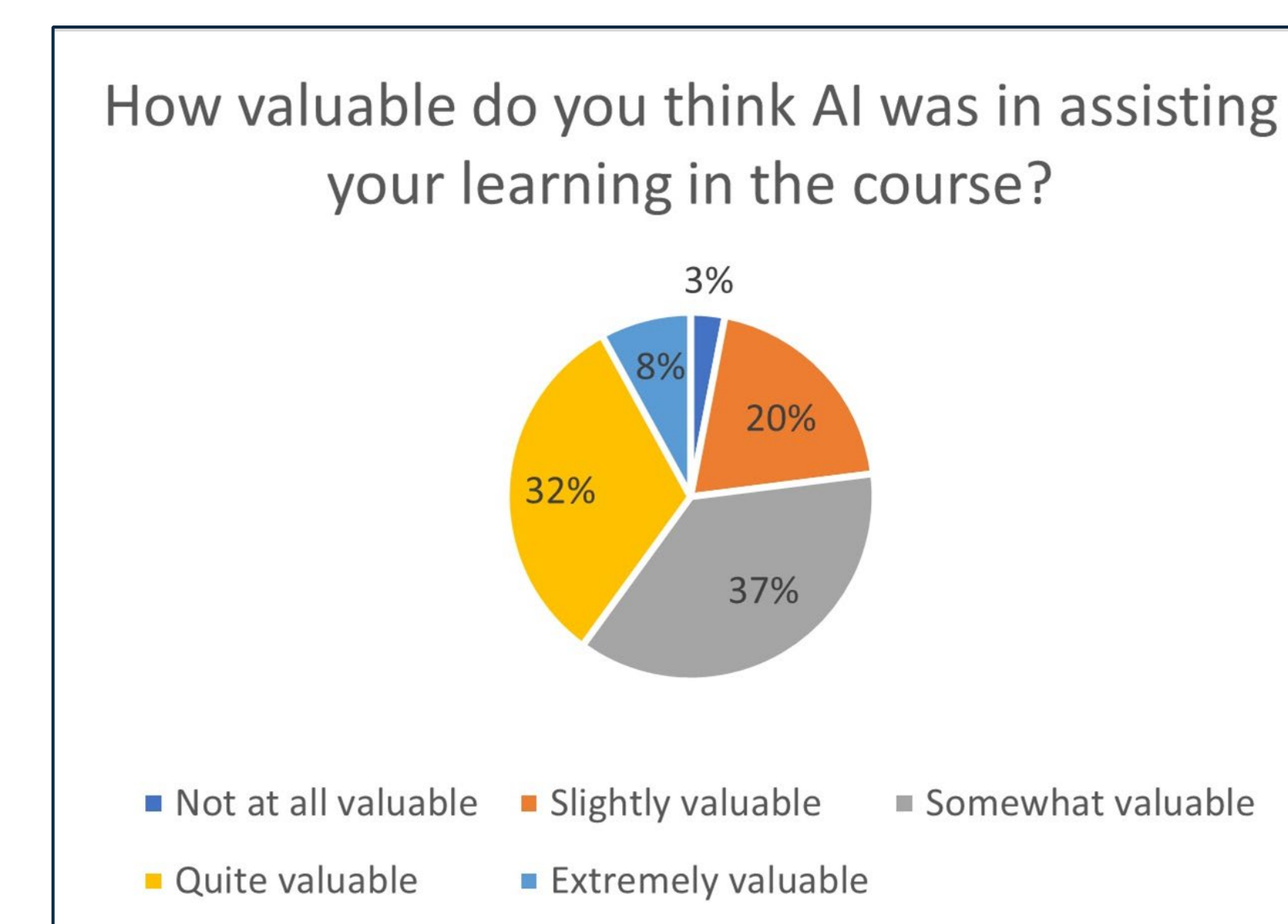
Results

RQ1: Familiarity with AI Tools After AI Assignments

Prior to the course AI assignments, how frequently did you use AI tools and technology to support your learning in this course or other courses?

After having completing the AI assignments, how frequently are you using AI tools and technology to support your learning in this course or other courses?

How would you identify your familiarity or skill level with using AI tools to support your learning after having completed the AI assignments in the course?
- 6% Advanced beginner
- 34% Competent
- 54% Proficient
- 6% Expert

RQ2: Ability to Critically Evaluate AI Outputs

I found the AI-generated content to be high quality and useful for learning
- 2% Strongly disagree
- 3% Somewhat disagree
- 12% Neither agree nor disagree
- 48% Somewhat agree
- 35% Strongly agree

Comparing AI outputs helped me critically evaluate the accuracy of AI responses
- 2% Strongly disagree
- 5% Somewhat disagree
- 14% Neither agree nor disagree
- 51% Somewhat agree
- 29% Strongly agree

I evaluated the accuracy of AI responses rather than accepting them at face value
- 5% Somewhat disagree
- 5% Neither agree nor disagree
- 40% Somewhat agree
- 51% Strongly agree

RQ3: Impact on Learning

How valuable do you think AI was in assisting your learning in the course?
- 3% Not at all valuable
- 20% Slightly valuable
- 37% Somewhat valuable
- 32% Quite valuable
- 8% Extremely valuable

I see AI as a valuable supplement to classroom learning
- 5% Strongly disagree
- 6% Somewhat disagree
- 10% Neither agree nor disagree
- 43% Somewhat agree
- 37% Strongly agree

Using AI made the learning process more engaging
- 6% Strongly disagree
- 11% Somewhat disagree
- 17% Neither agree nor disagree
- 40% Somewhat agree
- 25% Strongly agree

Takeaways

RQ1: Structured AI assignments increased students' familiarity and confidence in using AI tools to support their learning

RQ2: Students demonstrated the ability to critically evaluate AI-generated outputs for accuracy and relevance in human physiology

RQ3: Students perceived AI as a high-quality, helpful tool that enhanced their understanding of complex course concepts.