

InsPIRE Insight

Measuring Undergraduate Students' Reliance on Generative AI during Problem-Solving: Scale Development and Validation

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KEY IMPLICATIONS

- Reliance on Generative AI is not a binary state but manifests as four distinct behavioral patterns: reflective, cautious, thoughtless, and collaborative use.
- Student reliance behaviors are context-dependent; technical tasks (like coding) may elicit significantly different engagement levels compared to conceptual tasks (like policy writing).
- Educators can use the newly validated "Reliance Behaviors Scale" to unobtrusively diagnose student interactions with AI and tailor pedagogical interventions to reduce thoughtless reliance.

BACKGROUND

In higher education, Problem-Based Learning (PBL) is valued for engaging students in real-world challenges. The integration of Generative AI (GenAI) into PBL offers opportunities for knowledge generation and idea exploration, but it also introduces the risk of "over-reliance," where students passively accept AI suggestions without cognitive engagement. Traditional measures of AI reliance typically focus on decision-making outcomes (e.g., whether a user accepts or rejects AI advice). However, these binary measures fail to capture the complex, non-linear, and often invisible cognitive behaviors involved in open-ended problem-solving processes.

FOCUS OF INITIATIVE

This study aimed to develop and validate a self-report scale to measure undergraduate students' reliance behaviors on GenAI during problem-solving tasks. The initiative sought to move beyond outcome-based metrics to understand *how* students interact with AI across three problem-solving stages: problem identification, information exploration, and solution generation. The goal was to provide a validated instrument that can distinguish between

productive, reflective collaboration with AI and detrimental, passive dependence.

KEY OUTCOMES

The study successfully identified and validated four distinct dimensions of student reliance on GenAI:

- **Reflective Use:** Students critically engage with the tool, revising prompts to obtain desired outputs, reading responses critically, and using AI to improve their own initial drafts.
- **Cautious Use:** Students exhibit healthy skepticism, actively spotting errors, acknowledging AI imperfections, and occasionally discarding AI outputs.
- **Thoughtless Use:** Students demonstrate passive reliance, such as copying task descriptions directly into the AI or pasting AI outputs into their solutions without major changes.
- **Collaborative Use:** Students integrate AI use with peer collaboration, discussing AI outputs with group mates and helping one another spot errors or modify AI suggestions.

The scale demonstrated adequate model fit (Confirmatory Factor Analysis) for two problem solving tasks. Notably, the study found that reliance behaviors varied significantly by task. "Reflective," "Thoughtless," and "Collaborative" uses were all significantly higher in a 3D Maze (coding/game design) activity compared to a Policy Drafting activity.

SIGNIFICANCE OF OUTCOMES

- **Implications for practice:**
The "Reliance Behaviors Scale" offers educators a practical diagnostic tool. It enables educators to measure students' reliance on Generative AI tools unobtrusively after problem-solving activities and identify potential issues in students' use behaviors, such as high levels of thoughtless use. Educators can leverage the scale results to encourage critical thinking and productive reliance behaviors in problem-based learning contexts.
- **Implications for policy:**
Educational policies should move beyond binary "allow/ban" directives toward fostering specific AI literacy skills. The study highlights that "Reflective" and "Cautious" uses are distinct, desirable competencies. Policies and curricula should consider how to shift students from "Thoughtless" reliance to "Reflective" use.
- **Proposed follow-up activities:**
Future research would focus on 1) generalising the measure for other contexts such as K12 education and other higher education contexts, as well as 2) other forms of AI for education context, and 3) validating responses beyond high performance student group. The instrument can also be further improved as it might not have adequately captured some constructs such as AI reliance for problem identification and cautious use.

PARTICIPANTS/SCOPE

The study involved first- and second-year undergraduate students enrolled in a digital literacy course at an Asian university.

- **Exploratory Factor Analysis:** 800 student responses from a 3D Maze activity.
- **Confirmatory Factor Analysis:** 730 responses from the 3D Maze activity and 1,173 responses from a Policy Drafting activity.

METHODOLOGY/APPROACH

The researchers employed a rigorous quantitative approach to scale development:

1. **Item Generation:** Questionnaire items were developed by mapping learning behaviours with AI to problem-solving stages (identification, exploration, solution) and reliance targets (AI, self, peers).
2. **Factor Analysis:** Exploratory Factor Analysis (EFA) was used to identify the four underlying behavioral dimensions. Confirmatory Factor Analysis (CFA) was then conducted to validate the model's structure across two distinct types of problem-solving tasks.
3. **Qualitative Validation:** To ensure the self-reported survey data was accurate, the researchers cross-referenced high-scoring groups' responses with their actual chat histories with the GenAI tool.

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