

Prompting Competency in Web Programming Education: Is Prompting a Skill, or Just Typing?

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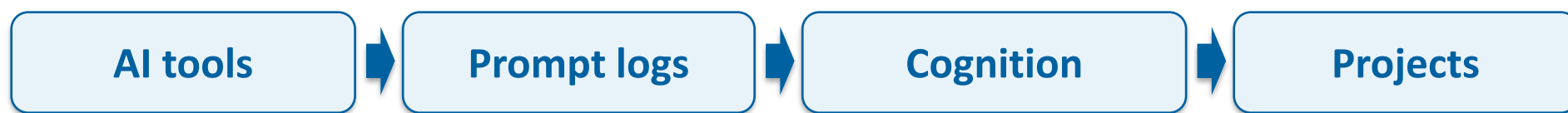
INTRODUCTION & AIM

Why this study?

Generative AI is now embedded in coding tasks. Prompting is increasingly viewed as an instructional and metacognitive practice in AI-supported programming education (Rani & Kasinathan, 2026). In web development courses, students increasingly use AI to generate, refine and debug code, raising the question of whether “prompting” is a cognitive skill or just tool use.

Research question

How can prompting competency be observed, assessed, and related to student project performance in undergraduate web programming?



Prompting Competency Index (PCI)

Five observable dimensions used to score students' AI-assisted programming behaviour.

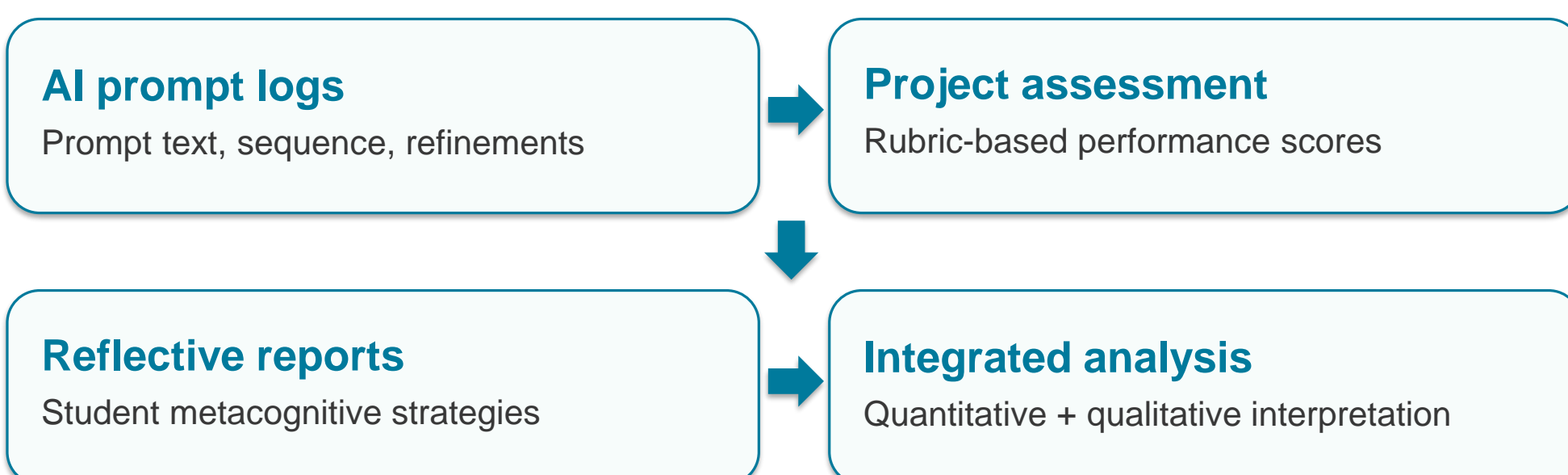


METHOD

Study context

Undergraduate web development course. Students individually designed and developed an educational hybrid game.

Mixed-methods evidence chain



Operationalisation

PCI scores are derived from coded prompt logs across the five dimensions, then compared with project performance. Qualitative reflections explain how students plan, test, debug, and evaluate AI outputs.



Analysis

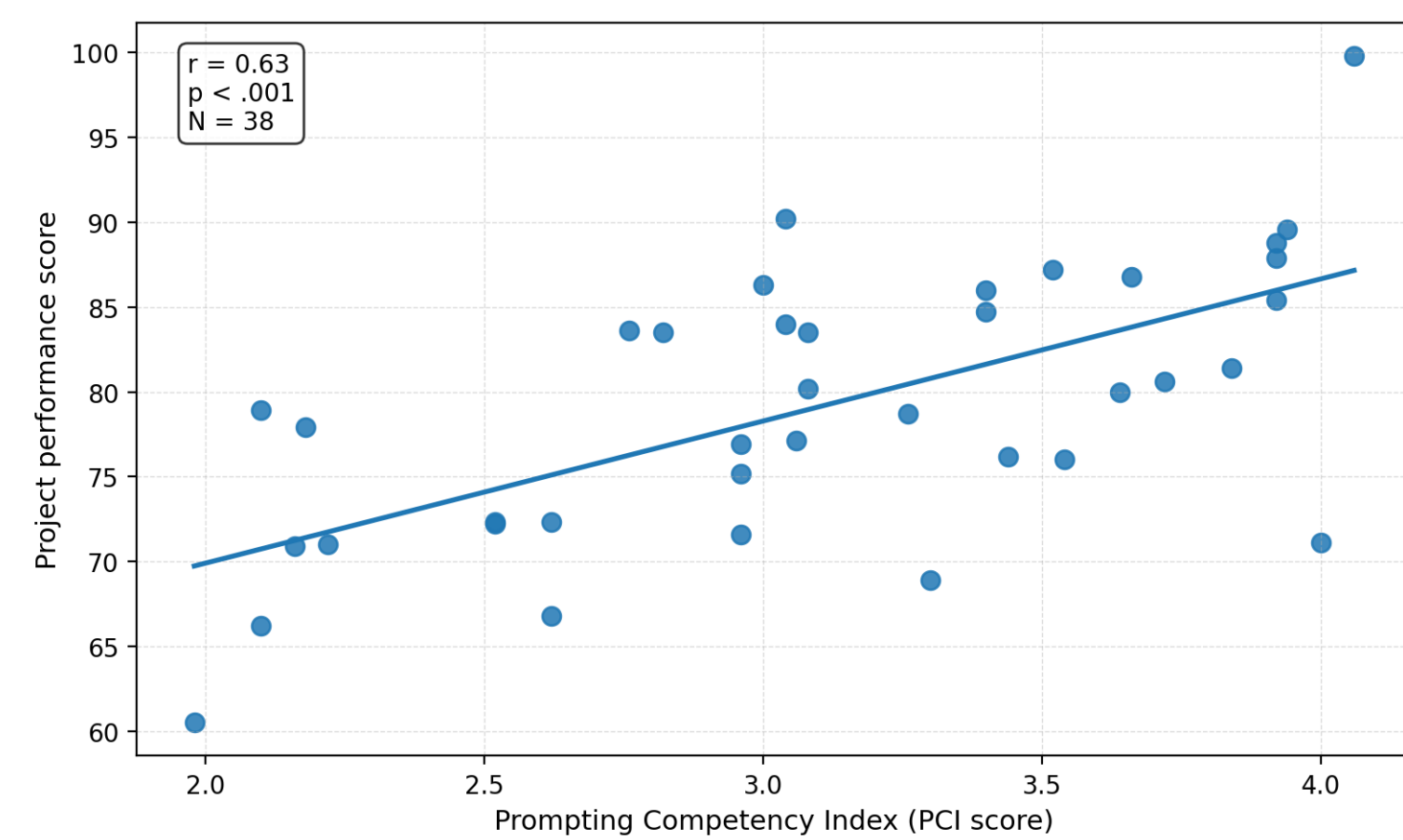
Quantitative: examine association between PCI and project performance.
Qualitative: identify metacognitive prompting strategies and patterns of reflective AI use.

Reference:

Rani, M., & Kasinathan, V. (2026). Prompt-based instructional design in artificial intelligence-supported programming education. *Millenium - Journal of Education, Technologies, and Health*, 2(30), e45667. <https://doi.org/10.29352/mill0230.45667>
Kasneji, E., et al. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274.
Becker, B. A., et al. (2023). Programming is hard—or at least it used to be: Educational opportunities and challenges of AI code generation. *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 1*.
Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41(2).

RESULTS & DISCUSSION

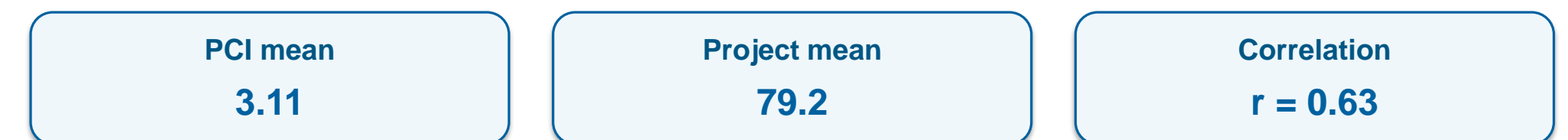
PCI vs Project Performance Chart



$R^2 = 0.40$, meaning PCI explains about 40% of the variance in project scores. Regression equation: Project score = 53.1 + 8.4(PCI)

Key quantitative finding

PCI was positively associated with project performance, $r = 0.63$, $p < .001$, $N = 38$, indicating a moderate-to-strong relationship.



Qualitative insight

Higher-scoring projects tended to include structured prompts, iterative testing, systematic debugging, and reflection on AI output before integration.

"I tested several prompts, compared the outputs, and kept only the parts I could explain."

Reflection themes

Tool-dependent prompting: 11 students, 29%
Emerging structure: 10 students, 26%
Iterative debugging: 9 students, 24%
Strategic evaluation: 8 students, 21%

Observed prompting behaviours



Interpretation

Prompting appears to function as more than mechanical input: it reflects computational thinking, self-regulated learning, debugging practice, and critical AI literacy.

CONCLUSION & FUTURE WORK

Main takeaway

Prompting competency can be positioned as an assessable capability in AI-assisted programming education.

Pedagogical implication

Teach prompting explicitly: context-setting, iteration, debugging, and critical evaluation should be embedded into coding instruction and assessment.