

THE ILLUSION OF UNDERSTANDING: HOW MIDDLE-SCHOOL STUDENTS FAIL TO REGULATE INQUIRY WITH CHATGPT DURING A SCIENCE TASK

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BACKGROUND

- **Effortful Inquiry** is a key mechanism in **science learning**.
- It allows autonomous **exploration, discovery**, and is associated with higher **learning outcomes**.
 - Can students still implement such behaviors with **Generative AI (GenAI)** where such effort is not encouraged and can be easily bypassed ?

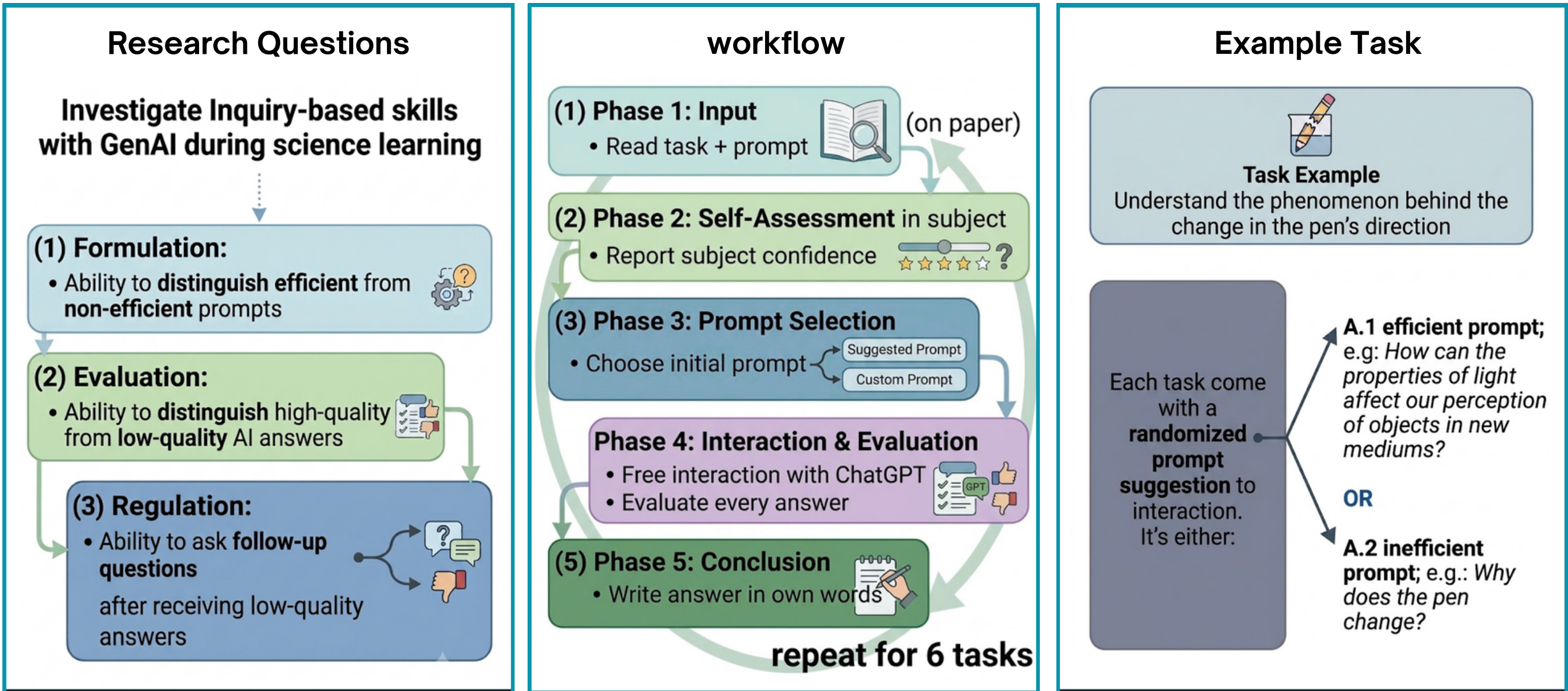
Effortful Inquiry-Based Scientific Steps

FORMULATE learning needs → **EVALUATE** resulting answers → **REGULATE** future steps



Translation into GenAI Interactions

Use **efficient** prompts: → **Detect** → **Ask**
• clear learning need → **unsatisfying** → **follow-up**
• sufficient context → **AI answers** → **questions**



MAIN FINDINGS

We calculated for: **N= 63 , age 14-15**

- The prompt quality sensitivity index
- The AI-answer quality sensitivity index
- The follow-up/clarification frequency
- The task performance score

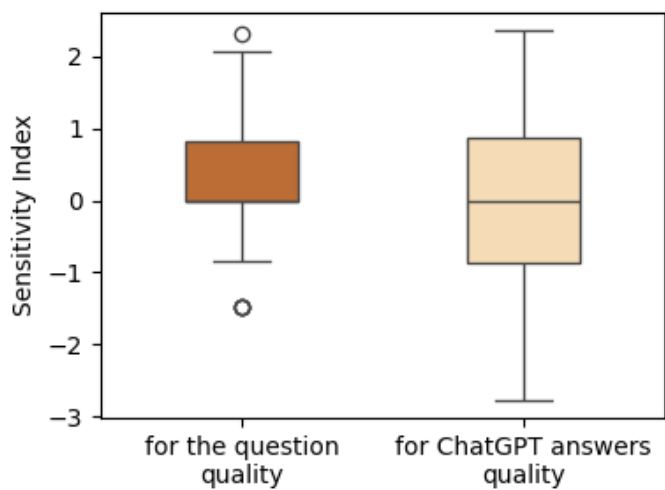


Fig. Students' sensitivity to the suggested prompts' quality and ChatGPT answers was low at average (M ~ 0).

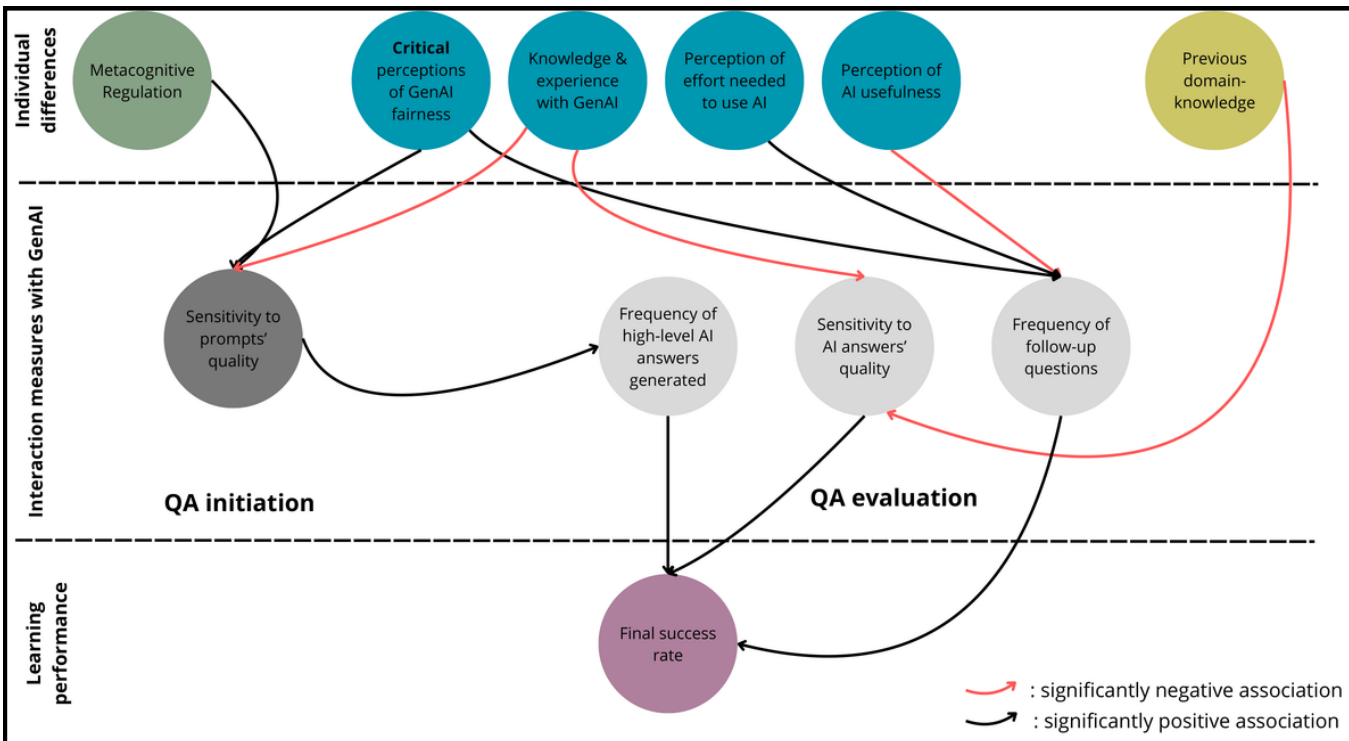


Fig. Relations between individual differences, inquiry-based interaction patterns, and task performance

DISCUSSION & CONCLUSION

- Training students' AI knowledge and their metacognitive skills seems important to help them better regulate their use of AI and make efficient learning with it.
- Students should be introduced to effortful AI use to ensure efficient AI-based science investigations.

SELECTED REFERENCES

1.Chin, C., Osborne, J.: Students' questions: a potential resource for teaching and learning science. Studies in science education 44(1), 1-39 (2008)

2.Zhai, C., Wibowo, S., Li, L.D.: The effects of over-reliance on ai dialogue systems on students' cognitive abilities: a systematic review. Smart Learning Environments 11(1), 28 (2024)