

AI-mediated instructional guidance: Mixed-method quasi-experimental study on Socratic AI for supporting research question development

Two AI guidance designs

ST: Socratic questioning

nST: Pedagogically uninstructed

n = 65
students

ST / nST
allocation

Pre-test

Initial research question
(RQ) development

AI-supported
refinement

Survey +
interview*

Near and far
transfer tasks

Analysis

Three iterations encompassed

Methodology

Pre-test
Subscale of the Ko-WADiS
instrument for research question
formulation competency.

RQ assessment
Using the PICOT-framework as basis
for evaluation by two independent
raters.

Interviews
Content-structuring qualitative
analysis with a-priori deductively
developed interview guide and
inductive generation of themes from
the material.

Survey
Construct based mainly on Unified
Theory of Acceptance and Use of
Technology.

ST: Socratic AI tutor



Asks guiding questions
Prompts to clarify,
justify, revise

↑ reflection / independent,
critical thinking

nST: pedagogically uninstructed chatbot

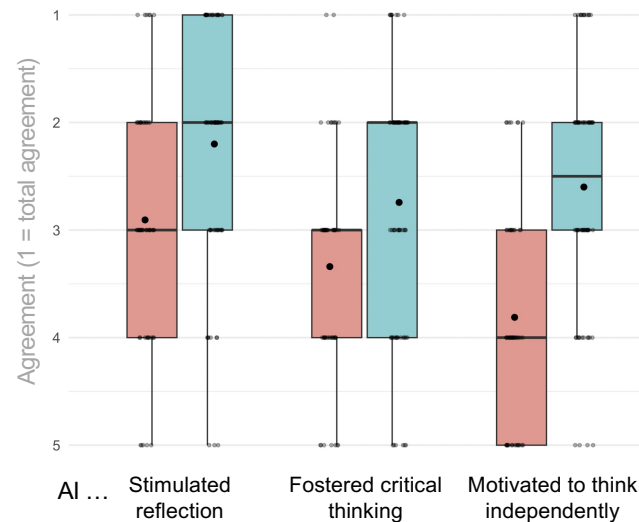


Suggests / reformulates
Provides direct answers

↑ speed & immediate
usefulness

Reference to be integrated, if being published: Degen, P.-B. (2026). (...)

Selected outcomes from survey



Themes from interviews

Perception and learning process

Initial
irritation



Socratic AI as
reflection
partner



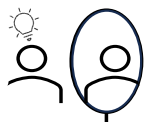
Research question competence



Improvement through
step-by-step reflection

Perceived learning facilitation

Socratic AI triggering
thoughts about own
cognitive processes



Attitude toward AI



Usage uncritical if being
guidance rather than
replacement

Conclusion

AI-mediated instructional
guidance shaped learning
processes more than
immediate outcomes, with
Socratic questioning
significantly fostering
reported reflection,
independent thinking,
critical engagement, and
self-regulation.

Research-question quality
improved descriptively in
both conditions, with no
statistically detectable
between-condition
differences. Transfer
outcomes likewise showed
statistically clear overall
advantage.

*Interview conducted only at session 2