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Generative-AI use and study habits of college students in fully remote, hybrid and fully onsite courses: a simulated comparative study

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ABSTRACT

Simulated cross-sectional survey of 612 undergraduates comparing weekly generative-AI use and study habits across fully remote, hybrid and fully onsite course delivery, and their relation to final grade.

Keywords: generative AI, remote learning, hybrid learning, study habits

Introduction

Universities moved large parts of teaching online during the pandemic and have kept many hybrid formats since [1]. At the same time, generative AI assistants became freely available to students [2]. Remote learners work with less external structure, so they may lean more on AI tools for explanation and drafting [3]. Whether that reliance helps or harms learning is an open question [4,5]. We ask three questions: how does AI use differ across remote, hybrid and onsite delivery; how do study habits differ; and how are both related to course outcomes?

Methods

Design and participants

We simulated a cross-sectional survey in one semester. Participants were 612 undergraduates taking the same three introductory courses delivered in three formats. Group sizes are given in Table 1. Students self-reported demographics, weekly hours of AI tool use, planning habit (a mean of five items on a 1–5 scale), study sessions per week and procrastination (1–5). Final course grade was taken from the registry.

Statistical analysis

Group differences were tested with one-way analysis of variance and described with eta-squared. Pairwise differences use Welch intervals. Grade was modelled by ordinary least squares with delivery mode, AI use, AI use squared and planning habit; onsite delivery was the reference. All data were generated with a fixed random seed, and the analysis script is available from the corresponding author.

Results

Participants

Table 1 summarises the three groups.

Delivery mode	n	AI use, h/week	Planning (1–5)	Sessions/week	Final grade, %
Fully remote	204	4.2 (2.2)	3.37 (0.66)	5.2 (1.4)	71.1 (7.6)
Hybrid	211	2.9 (1.7)	3.56 (0.65)	6.3 (1.4)	75.2 (7.2)

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Delivery mode	n	AI use, h/week	Planning (1–5)	Sessions/week	Final grade, %
Fully onsite	197	2.1 (1.3)	3.57 (0.64)	6.0 (1.5)	74.0 (7.6)

Table 1. Participants and outcomes by delivery mode. Values are mean (standard deviation).

AI use by delivery mode

Weekly AI use differed by delivery mode (F = 67.0, eta-squared = 0.18; Figure 1). Remote students used AI 2.0 h/week more than onsite students (95% CI 1.7 to 2.4).

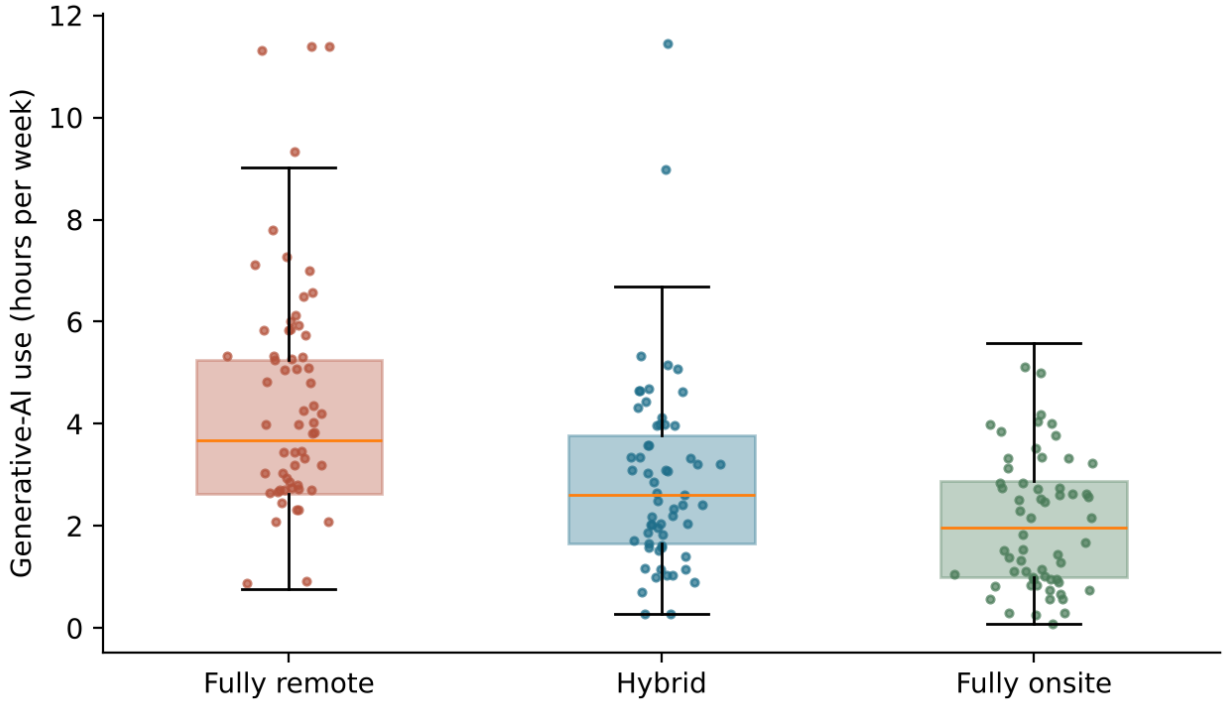


Figure 1. Weekly generative-AI use by delivery mode. Boxes show the median and interquartile range; dots are a random sample of 60 students per group.

Study habits

Planning habit differed by delivery mode (F = 6.1, eta-squared = 0.02), with remote students lowest and hybrid and onsite students similar. Hybrid students reported the most study sessions per week, and remote students reported the most procrastination (Figure 2).

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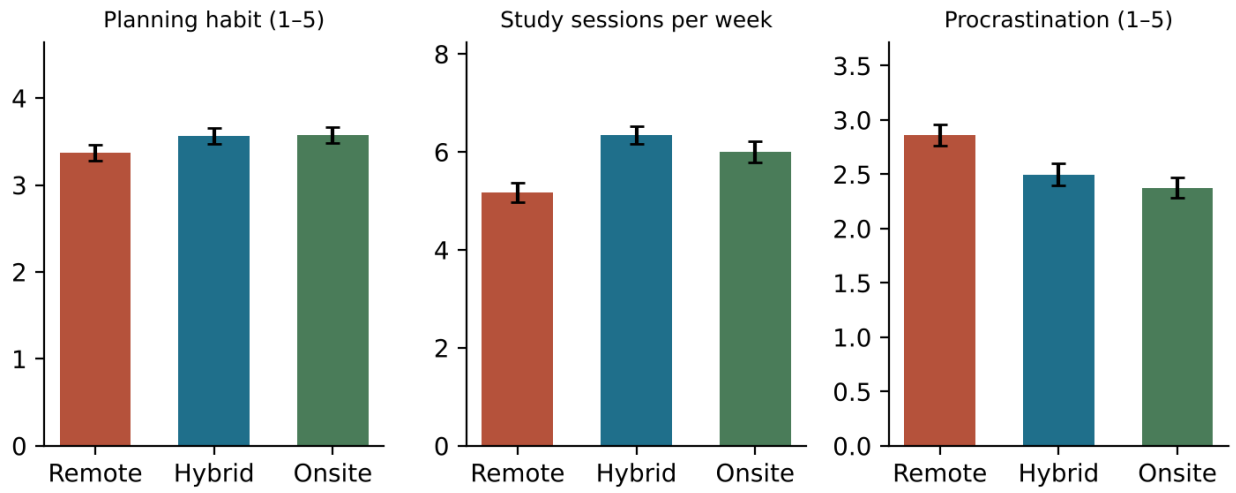


Figure 2. Study habits by delivery mode: planning habit, study sessions per week and procrastination. Bars show means with 95% confidence intervals.

AI use and course grade

Grade rose slightly with AI use in the raw data, and the fitted curves for the three modes were similar in shape but offset in height (Figure 3). After adjustment the association was not distinguishable from zero.

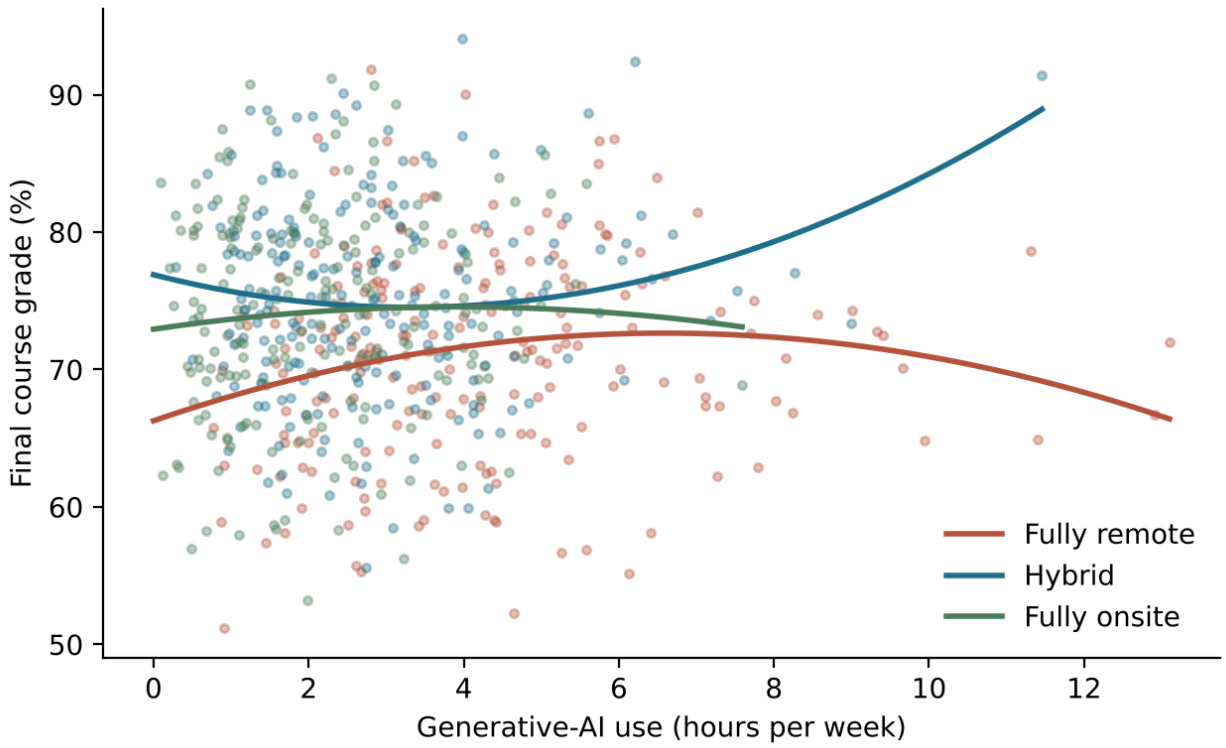


Figure 3. Final course grade against weekly AI use. Points are individual students; lines are quadratic fits for each delivery mode.

Table 2 and Figure 4 give the adjusted model. Relative to onsite delivery, remote students scored about three points lower, and the hybrid difference was small. The coefficients for AI use and AI use squared both had confidence intervals that included zero.

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Term	Coefficient	95% CI
Intercept (onsite, reference)	62.71	59.21 to 66.21
Fully remote	-3.02	-4.61 to -1.44
Hybrid	0.90	-0.53 to 2.33
AI use (h/week)	0.42	-0.41 to 1.25
AI use squared	-0.01	-0.10 to 0.07
Planning habit (1–5)	2.94	2.06 to 3.83

Table 2. Linear model of final grade (R-squared = 0.12).

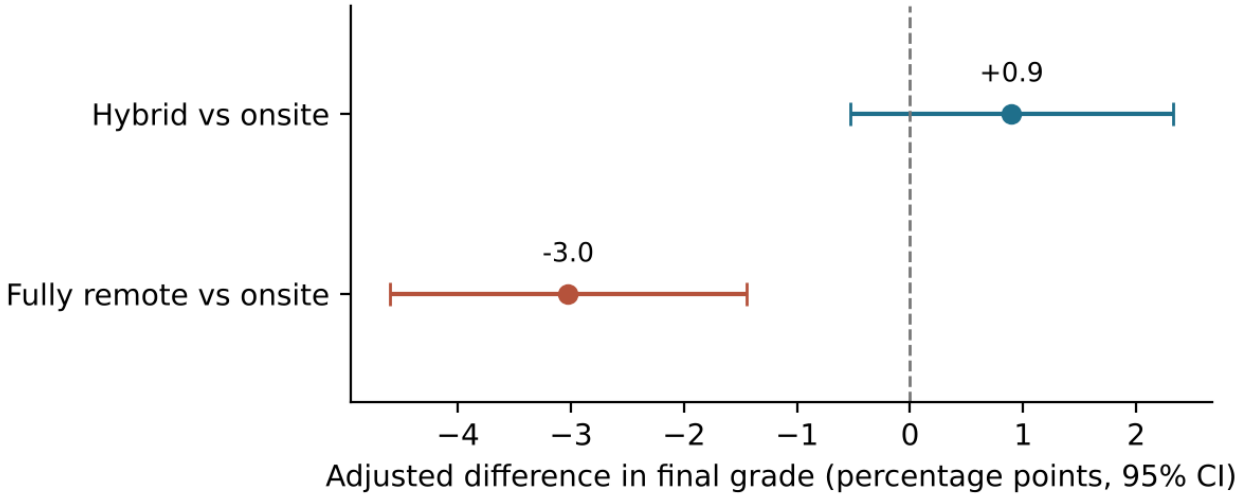


Figure 4. Adjusted difference in final grade for remote and hybrid delivery compared with onsite delivery, with 95% confidence intervals.

Discussion

In this simulated sample, remote delivery went with heavier AI use, weaker planning and more procrastination, while hybrid students studied in the most sessions. The lack of a clear adjusted association between AI use and grade is consistent with the view that the benefit of AI depends on how it is used alongside regular study rather than on how much it is used [4,5]. Because the study is cross-sectional and the data are simulated, no causal claim is made. A real study would need randomisation or longitudinal follow-up, validated habit scales and pre-registered analyses [6].

Limitations

The data are simulated, so the effects reflect the assumptions used to generate them. Self-reported AI use is subject to recall error, and students were not randomised to delivery mode.

Data availability

All data are simulated. The generating script and a CSV of the simulated dataset are available from the corresponding author on request.

Ethics statement

No human participants were involved. All records are synthetic.

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Data availability. All data are simulated; the generating script is available on request.
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