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EMPOWERING OR IMPAIRING? THE EFFECT OF GENERATIVE AI ON CLASS TEAMWORK, LEARNING AND ENGAGEMENT

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Abstract

Generative Artificial Intelligence (GAI) is transforming industries and daily life, prompting discussions about its implications for student learning in higher education. GAI tools support brainstorming, writing, and research processes, yet they may also lead to overreliance that undermines students' critical thinking, collaborative engagement, and independent problem-solving. This study used a quasi-experimental design to investigate the effects of AI-assisted teamwork on learning outcomes in undergraduate courses at a U.S. university. We compared students' performance on identical assignments in two course sections: one required using GAI tools in team projects, while the other restricted AI use. Results indicated that AI integration reduced team performance but enhanced creativity. These findings contribute to the ongoing discourse on AI in collaborative learning and offer guidance for institutional policies that balance innovation with meaningful educational experiences.

Keywords: *Generative Artificial Intelligence (GAI), collaborative learning, Social Interdependence Theory (SIT), Socio-Technical Systems* (STS) *Theory, andragogy.*

1. Introduction

As Generative Artificial Intelligence (GAI) reshaped industries and daily experiences, its influence on higher education became increasingly prominent and controversial. Educational institutions, educators, students, and policymakers grappled with the potential benefits and unintended consequences of integrating GAI into the classroom (Schneider & Haried, 2024). They weighed its potential advantages against concerns about reduced critical thinking, overreliance, weakened team dialogue, and diminished independent problem-solving (Schneider & Haried, 2024).

This study explored GAI's impact on teamwork, learning, and engagement in an undergraduate management course at a public university in the United States. Using a quasi-experimental design, the research compared outcomes from two, course sections taught during the spring 2025 semester. One group used GAI in team assignments, while the other did not. Both groups completed the same standardized team project with identical evaluation criteria.

The study examined seven key variables. Researchers collected data through structured surveys with Likert-scale items and through evaluations by three independent graders. They applied interrater reliability to ensure scoring consistency. Content analysis further evaluated the role and relevance of AI-generated contributions to team collaboration.

Guided by a combined theoretical framework, the study offered insights into how emerging technologies shaped collaborative learning (Mujtaba, 2024). The findings aimed to inform institutional policies and instructional strategies that integrated AI while preserving critical thinking, interpersonal collaboration, and cognitive development.

2. Theoretical framework

This study employs Social Interdependence Theory (SIT) and Socio-Technical Systems (STS) Theory to analyze the effects of Generative Artificial Intelligence (GAI) on collaborative learning in undergraduate teams. These theories, when viewed through the lens of andragogy, provide a comprehensive framework for understanding how adult learners engage with peers, technology, and the learning process. As GAI becomes increasingly integrated into educational environments, it is essential to examine its functional contributions and its more profound impact on the social and cognitive processes that underpin effective teamwork (Hu et al., 2024).

Social Interdependence Theory posits that the structure of interdependence among individuals within a group determines the nature of their interactions and their influence on one another's outcomes (Gheorghe et al., 2023). When individuals perceive their goals as positively interdependent, they are more likely to engage in promotive interaction, which includes mutual support, shared responsibility, and collaborative problem-solving. In educational contexts, such positive interdependence has been consistently associated with deeper learning, higher motivation, improved reasoning, and stronger interpersonal relationships (Johnson & Johnson, 2009; Bate et al., 2014).

SIT identifies three interrelated forms of interdependence: outcome, means, and boundary. Outcome interdependence refers to shared goals and rewards among group members. Means interdependence involves mutual reliance on resources, roles, and coordinated efforts to achieve team objectives. Boundary interdependence pertains to the delineation of team membership and the behaviors that either support or obstruct the pursuit of collective goals. These dimensions foster accountability, collaborative competence, and social cohesion, which are essential for effective team-based learning (Paradis and Whitehead, 2018).

The introduction of GAI into team-based learning environments adds new complexity to each form of interdependence. As a shared cognitive tool, GAI influences means interdependence by altering how tasks are distributed, how roles evolve, and how team members communicate. Boundary interdependence may be affected as the use of GAI challenges traditional norms of authorship and contribution, potentially diminishing individual accountability. Likewise, outcome interdependence may shift as teams recalibrate their understanding of success considering algorithmic assistance.

To further explore these dynamics, the study incorporates Socio-Technical Systems Theory, which emphasizes the interplay between a team's social and technical subsystems. According to STS Theory, team effectiveness, and creativity result from the joint optimization of both domains. The social subsystem includes interpersonal relationships, communication patterns, roles, and norms, while the technical subsystem encompasses tools, platforms, and processes such as GAI. This framework encourages investigation into how students prompt and interpret AI-generated content, develop or withhold trust in machine assistance, and maintain or relinquish creative agency. The alignment or misalignment between these subsystems may enhance or inhibit divergent thinking, coordination, and performance (Baxter & Sommerville, 2011).

These theoretical lenses are particularly relevant in andragogical contexts. Adult learners bring prior knowledge, workplace experience, intrinsic motivation, and a preference for relevant, problem-centered learning to the classroom (Knowles, Holton, & Swanson, 2015). Andragogy emphasizes autonomy, practical application, and purposeful learning. GAI can enhance task relevance, innovation, and engagement when integrated with intention. However, if instructors fail to align GAI use with adult learning principles, there is a risk of encouraging passive participation, eroding critical thinking, and undermining interpersonal development.

This study investigates whether using GAI enhances or impedes the processes of social interdependence within team learning. Specifically, it examines whether GAI improves the efficiency of collaborative tasks without diminishing meaningful peer-to-peer engagement or whether it fosters dependency and weakens the quality of team interaction. By applying SIT and STS Theory in a comparative analysis of collaborative learning environments that either permit or restrict the use of GAI, the study offers a conceptual foundation for interpreting differences in team and individual outcomes.

At the team level, the research examines variations in creativity and overall performance. At the individual level, it assesses student perceptions of interest, learning value, practicality, quality of team discussions, and accountability. Grounded in andragogical principles, the study evaluates GAI for its technological utility and alignment with adult learners' developmental needs. Through this approach, the study aims to inform instructional practices that integrate emerging technologies while preserving the essential goals of higher education: the cultivation of critical thinking, personal responsibility, and interpersonal competence.

3. Methodology

3.1. Research design and participants

This quasi-experimental study involved students enrolled in two sections of the same core course in a public U.S. university's Bachelor of Business Administration program. A quasi-experimental design was chosen due to the absence of a pretest, which is consistent with Neuman (2011). The course was taught by the same instructor using identical pacing, content, and instructional strategies across both sections. The intervention was introduced in the final team project: students in the experimental group were required to use AI prompts as part of their assignment, whereas the control group received no such requirement. Specifically, the experimental group's rubric included an additional 10-point criterion requiring students to

submit four AI prompts, the associated outputs, and explanations of how those outputs were used. Participants included 94 students enrolled in the Organizational Behavior course, evenly split between the experimental (n = 47) and control (n = 47) groups. Gender demographics were as follows: [insert breakdown once available]. Participation was voluntary, with a minor incentive of 10 extra credit points (out of 1,000 total course points). The study was approved by the university's Institutional Review Board.

3.2. Procedures

This study took place during the 16-week Spring 2025 semester. In week 2, students formed teams and stayed in those teams for the duration of the course. They completed three preliminary team assignments in weeks 4, 7, and 9. In week 10, the instructor released the final project guidelines and rubric. At that point, the instructor introduced the intervention: one section received an added rubric criterion worth 10 points that required teams to use four AI prompts to support project development. Teams documented each prompt, the AI tool used, the AI-generated output, and a brief explanation of how it informed their project. They included this section after the references but did not present it in class. In week 14, the instructor invited all students to complete a voluntary post-project survey and gave them one week to respond.

3.3. Study measures

Group-level outcomes included creativity and overall performance, assessed through content analysis of the final team projects. Three independent raters evaluated each submission using standardized rubrics. Creativity was scored on a 5-point scale (1 = minimal, 5 = exceptional) based on detailed descriptors. Performance was rated using a similar 5-point scale (1 = deficient, 5 = exceptional). In cases of scoring disagreement, raters discussed their assessments until consensus was achieved.

The individual dependent variables in the study are interest in the assignment, perceived learning value, perceived practicality, team discussion quality, and sense of accountability. Each was measured with four items on a 5-point Likert scale. Sample items used are: "The assignment topic was meaningful to me" (interest in the assignment); "This assignment helped me understand the subject matter better" (perceived learning value); "I learned new skills working on the assignment" (perceived practicality); "Team members actively shared and debated different ideas" (team discussion quality); and "I put in effort to ensure our team produced high-quality work" (sense of accountability).

The prompts submitted as part of the assignment in the experimental group were evaluated by the same reviewers for their quality and relevance. Quality was assessed as 1=basic (repeats studied content), 2=applied (related to analysis, comparison, or problem-solving linked to course concepts), and 3=innovative (related to evaluation or creation). Relevance was assessed as 1=low (prompt does not address the core objectives), 2=moderate (prompt addresses the core objectives but without nuanced search for meaning), 3=high (prompt searches for ways to address higher-order execution of the core objectives).

4. Results

We used separate exploratory factor analyses (EFAs) for each of the five measured variables using the Promax rotation option in JASP to analyze the latent structure of the survey items. Investigating the Kaiser-Meyer-Olkin (KMO), Bartlett's Test, eigenvalue, variance explained, and items loading statistics, we found that each variable demonstrated sampling adequacy, supporting single-factor solutions. Each of the five factors explained between 54.7% and 64.3% of the variance. In addition, all the loadings were above the recommended threshold of .60, which provided further evidence that each factor represents a coherent construct. Table 1 reports the results of EFAs, which support the interpretation of five latent variables, and therefore, we proceeded with the consequent analyses using each factor as a single variable.

Table 1. Exploratory Factor Analyses (EFAs) results, conducted in JASP.

Variable	*KMO*	*Bartlett's Test χ^2(df)*	*p-value*	*Eigen-value*	*Variance Explained*	*Factor Loadings (range)*	*Lowest Loading Item*
Interest	0.791	111.86 (6)	< .001	2.861	62.4%	0.727 – 0.883	Q1.3 (0.471)
Learning Value	0.774	83.40 (6)	< .001	2.609	54.7%	0.570 – 0.861	Q2.3 (0.570)
Practicality	0.691	118.09 (6)	< .001	2.853	62.0%	0.725 – 0.839	Q3.1 (0.725)
Discussion Quality	0.697	89.91 (6)	< .001	2.631	54.9%	0.626 – 0.826	Q4.1 (0.626)
Accountability	0.781	122.22 (6)	< .001	2.909	64.3%	0.680 – 0.906	Q5.1 (0.680)

We then performed two sample t-tests to compare the means of the study variables between the control and experimental groups. We found that students in the control group (M=4.24, SD=1.21, n=29) achieved significantly higher performance than the students in the experimental group (M=2.93, SD=1.48, n=30); t(57)=3.70, p<0.001, d=0.96. This result suggests that students prompted to use AI achieve lower performance than those who are not. Conversely, we found that the team creativity of the control group (M=2.28, SD=0.70, n=29) is lower than that of the experimental group (M=2.93, SD=1.14, n=30) with t(57)= -2.65, p<0.01, d=-0.69. We did not find any statistically significant differences in the means for the other variables—interest in the assignment, perceived learning value, perceived practicality, team discussion quality, and sense of accountability.

Next, we performed a correlation analysis of the study variables to determine if there were significant relationships. The results are presented in Table 2 and indicate some notable findings. It showed that team performance positively correlated with assignment interest, learning value, assignment practicality, team discussion quality, accountability, and gender, but negatively with AI use. The analysis revealed strong positive correlations among the individual-level outcomes, especially between assignment interest and learning value, team discussion quality, and accountability. Notably, AI use shows significant relationships with team performance and team creativity, but did not significantly correlate with individual-level outcomes, indicating it did not influence students' perceptions of interest, value, practicality, discussion quality, or accountability.

Table 2. Correlations between study variables.

Variable	TP	TC	AI	LV	AP	DQ	A	G	AIU
TP	_								
TC	0.221*	_							
AI	0.431***	0.168	_						
LV	0.433***	0.221*	0.857***	_					
AP	0.370**	0.087	0.780***	0.808***	_				
DQ	0.432***	0.148	0.818***	0.771***	0.648***	_			
A	0.463***	0.076	0.752***	0.704***	0.652***	0.845***	_		
G	0.277**	-0.237**	0.0490	-0.055	-0.141	0.118	0.209	_	
AIU	-0.440***	0.331*	-0.050	-0.064	-0.081	0.013	-0.154	-0.255**	_

Note: n=59; *** = p<.001; ** = p<.005; * = p. <.10; TP= team performance; TC = team creativity; AI = assignment interest; LV = learning value; AP = assignment practicality; DQ = discussion quality; A = accountability; G = gender (dummy variable, 0 = female, 1 = male); AIU = AI use.

Analyzing AI prompts for quality and relevance among the eight experimental teams revealed significant variation in how effectively students used generative AI to support their presentations. Three trained raters independently evaluated each team's prompts using a standardized rubric. The few differences in grades were addressed collaboratively until agreement was reached between the three reviewers. Only two teams consistently produced high-quality, relevant prompts that received top scores. These teams demonstrated a strong ability to craft aligned and innovative inputs, reflecting a better understanding of how to prompt AI for academic tasks that go beyond what is learned in the classroom and search for synthesis, evaluation, creation, or other higher-order actions that can inform their research in a novel way. In contrast, the majority of the teams submitted mostly low-level, repetitive, and surface-level prompts, which frequently received the lowest possible scores; an example is “What are companies that can compete with Google?” One of the teams in the experimental group did not submit prompts, so the analysis excluded them. On average, prompt quality varied widely, with only a few teams demonstrating effective use of AI and others struggling to generate purposeful inputs and consequently to receive meaningful outputs. These results highlight the need for scaffolded instruction in prompt engineering. To use AI effectively in academic settings, students must learn to write clear, strategic prompts that align with learning goals and stimulate higher-order thinking. Without structured guidance and opportunities for practice, students are unlikely to fully benefit from AI as a tool for collaborative learning and presentation development.

5. Discussion and conclusion

This study examined whether undergraduate teams using GAI in class projects experienced enhanced or diminished learning and collaboration. Teams that used AI generated more creative ideas but scored significantly lower on overall project evaluations than teams that did not use AI. Students in both

groups reported similar levels of interest, perceived learning, practicality, team discussion quality, and accountability. These findings suggest that while AI can stimulate creativity, it does not automatically improve learning outcomes or strengthen team engagement.

Using Social Interdependence Theory, we found that AI can disrupt the cooperative structures that support effective teamwork. It may reduce outcome interdependence when students rely on AI instead of each other to accomplish goals. It can shift means interdependence by moving responsibilities away from shared tasks toward passive tool use. It may also weaken boundary interdependence when AI-generated content blurs individual contributions. From a Socio-Technical Systems Theory perspective, this misalignment between the technical tool and team dynamics helps explain why creativity improved while overall performance declined.

These results also raise essential considerations through the lens of adult learning theory. Adult learners depend on relevance, autonomy, and collaboration. When instructors introduce AI without thoughtful design, the tool can lower engagement and reduce the benefits of active learning. Although AI offers valuable support, educators must help students use it in ways that enrich rather than replace critical thinking, participation, and team collaboration. Therefore, educators should consider fostering both technical proficiency and collaborative interdependence to help students harness AI as a complement to deeper and meaningful learning.

In conclusion, GAI can empower students by expanding creative possibilities, but it can also impair learning and teamwork when students use it as a substitute for meaningful interaction. Its impact depends on how intentionally instructors integrate it into team-based learning environments. The findings highlight the need for a balanced approach to prioritizing active collaboration alongside technological innovation. To realize AI's potential as an empowering force, students must also learn how to write effective prompts that guide the tool toward thoughtful and relevant contributions. Future research should explore whether structured AI guidelines, prompt-writing education, and scaffolded team tasks can mitigate the challenges we outlined.

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References

Bate, E., Hommes, J., Duvivier, R., & Taylor, D. C. M. (2014). Problem-based learning (PBL): Getting the most out of your students - Their roles and responsibilities: AMEE Guide No. 84. *Medical Teacher, 36*(1), 1-12.

Baxter, G., & Sommerville, I. (2011). Socio-technical systems: From design methods to systems engineering. *Interacting with Computers*, *23*(1), 4-17.

Gheorghe, A., Fodor, O. C., Curșeu, P. L., Trif, S., & Cirebea, L. (2023). The effect of humor and perceived social interdependence on teamwork engagement in student groups. *Current Psychology*, *42*(27), 23830–23841.

Hu, L., Xiao, W., Zhu,W., Zhu, L., & Hu, Y. (2024). Impact of artificial intelligence, smart learning and belief about future on academic performance & moderating effect of desire for knowledge. *El Profesional de La Información*, *33*(4), 1-15.

Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story*:* Social Interdependence Theory and Cooperative Learning. *Educational Researcher*, *38*(5), 365-379.

Knowles, M. S., Holton, E. F., & Swanson, R. A. (2015). *The adult learner: The definitive classic in adult education and human resource development* (8th ed.). London and New York: Routledge.

Mujtaba, B. (2024). Clarifying ethical dilemmas in sharpening students' artificial intelligence proficiency: Dispelling myths about using AI tools in higher education. *Business Ethics & Leadership (BEL), 8*(2), 107-127.

Neuman, W. L. (2011). *Social Research Methods*. Boston: Pearson Education Inc.

Paradis, E., & Whitehead, C. R. (2018). Louder than words: Power and conflict in interprofessional education articles, 1954–2013. *Medical Education*, *52*(4), 422-437.

Schneider, S., & Haried, P. (2024). Use of Artificial Intelligence in Higher Education with Particular Reference to Automated Content Generation, Trust and Anxiety. *Journal of Business & Educational Leadership, 14*(1), 4-21.

Sihi, D., & Ryan, A. (2024). Crafting and evaluating Generative AI prompts: Insights from students, educators, and marketers. *Marketing Education Review*, 1-7.