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Integrating AI-Driven Negotiation into Experiential Operations and Supply Chain Education

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Abstract

Generative AI tools are increasingly integrated into Operations and Supply Chain Management (OSCM) education and practice. While experiential learning has been demonstrated to enhance students' cognitive engagement, conceptual understanding, and reflective thinking, the pedagogical potential of AI in experiential learning remains underexplored. This study addresses this gap by investigating how an AI-Enabled Negotiation Simulation (AI simulation) influences student engagement, the depth and quality of reflection, and students' perceptions of such activity. Guided by Kolb's Experiential Learning Theory (ELT), this AI simulation was designed and implemented in an undergraduate OSCM course. The assignment aligned well with all four stages of Kolb's ELT (concrete experience, reflective observation, abstract conceptualization, and active experimentation), and the learning is reinforced through multiple negotiation rounds. Using a qualitative case study design, data were collected from student reflection reports and discussion board posts for the AI simulation and from discussion board posts for a non-AI 5S Lean Simulation (5S simulation). In addition, a post-assignment survey captured students' perceptions of the value and usefulness of both simulations. Findings indicate that the AI simulation generated higher cognitive engagement and deeper conceptual understanding, consistent with Kolb's model. However, students rated the AI simulation lower than the 5S simulation, illustrating a common discrepancy between perceived ease and actual learning. This study contributes to OSCM pedagogy by offering insights into how AI can be responsibly integrated into experiential learning to balance technical and durable skills, and by highlighting the importance of meaningfully designing "desirable difficulties" that deepen learning despite initial student discomfort.

Keywords: Experiential Learning, Kolb's Experiential Learning Theory, AI-Enabled Negotiation Simulation, Operations and Supply Chain Education, Qualitative Case Research, Generative AI

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1. INTRODUCTION

Generative artificial intelligence (AI) tools are widely available, which has raised a pressing question on how to integrate them into education to make teaching and learning more effective. While educators see the benefits, challenges remain in how to incorporate AI tools into education properly and responsibly to maximize its advantages and minimize potential risks such as plagiarism, misinformation, over-dependence, and digital divide (Kurtz et al., 2024; The Oxford University Press, 2023; Tu, 2024; Wang et al., 2024).

Meanwhile, the rapid evolution of AI is transforming the labor market, compelling education systems to adapt accordingly. According to LinkedIn (2025), 70% of the skills required for most jobs will change by 2030. Since 2019, the demand for AI-related skills has been growing at a rate of 21%, with compensation for these skills increasing by 11% annually (Bain, 2025). To complement this, human skills such as creative thinking, resilience, flexibility, agility, curiosity, and lifelong learning also continue to rise in importance (LinkedIn, 2025; The World Economic Forum, 2025). Ryan Roslanksy, CEO of LinkedIn, emphasizes that despite AI advances, human empathy, ethical judgment, and leadership remain irreplaceable (LinkedIn, 2025). Organizations globally face significant challenges in finding talent with the optimal combination of technical and durable human skills (LinkedIn, 2025). This directly connects to the fundamental question: how can we effectively and responsibly integrate AI tools into classroom teaching and learning to equip students with the right mix of those skills?

A meta-analysis on integration of AI into education (Kurtz et al., 2024) advocates fundamental shifts from traditional passive models where students passively receive information to approaches that emphasize students' active engagement and critical thinking. It demands self-directed learning as students interact with generative AI, receiving instantaneous feedback and responses that enable personalized learning while requiring critical thinking to evaluate information and formulate subsequent prompts (Kurtz et al., 2024; Muscanell & Robert, 2023; Raptis, 2024). Aladsani (2025) claims that students develop critical thinking competencies when utilizing generative AI as a collaborative learning partner, assistant researcher, proofreader, and private tutor. Raptis (2024) emphasizes that with AI advancement, educational curricula increasingly need to cultivate durable skills (e.g., asking critical questions or developing a growth mindset) (Association to Advance Collegiate Schools of Business [AACSB], 2023; Raptis, 2024). Rather than viewing AI as a threat, education should strategically utilize AI tools to facilitate interactive and dynamic engagement with educational materials (AACSB, 2023).

AI Application in Operations and Supply Chain Management (OSCM)

Given this emphasis on preparing students for AI-driven work environments, OSCM offers a compelling context for exploring how AI can be integrated into experiential learning. Shalpegin and Nguyen (2024) argue that AI provides an important competitive advantage in OSCM education and thereby enhances areas such as logistics, forecasting, and customer service efficiency. The authors argue that incorporating AI education provides opportunities for leaders to upgrade their skills in technology and emerging technologies, including automation. They find that AI education enhances student engagement and satisfaction. Students with previous AI exposure perceive AI class activities as more valuable and offer innovative ways for student learning, strengthening their AI adaptation and application in the professional world (Shalpegin & Nguyen, 2024).

In another study by Poo and Qi (2023), the authors posit that AI technologies, such as machine learning algorithms, optimization models, and simulation tools, provide an opportunity for increasing the impact and significance of the quality and effectiveness of laboratory experiments and thereby implicitly impact teaching. The authors examine topics, including logistics, inventory management, demand forecasting and procurement. They conclude that the AI-powered class sessions empower students with problem-solving skills and an innate understanding of real-world supply

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chain challenges. Meanwhile, the authors find that AI-driven experiments create dynamic and adaptive learning environments that foster student engagement and critical thinking. Similarly, they conclude that the impact of the AI sessions is not limited to the classroom but also provides students with the opportunity to think beyond academic settings.

From a corporate perspective, AI tools are increasingly recognized as strategic assets in OSCM, driving improvements across forecasting, decision-making, and operational execution (Mohsen, 2023). By leveraging machine learning and data-driven insights, firms are enabled to better anticipate demand patterns, optimize inventory levels, and streamline procurement and logistics operations (Çaylı & Oralhan, 2024; Meyer et al., 2021), allowing them to respond more proactively to market dynamics and customer needs (Kumar et al., 2024). Therefore, AI contributes not only to cost efficiencies but to more agile, data-informed supply chain strategies, becoming a core capability for competitiveness (Abhulimen & Ejike, 2024; de la Roche et al., 2024). However, AI tools are only effective when professionals can interpret and act on their insights (Forbes, 2025). To address the growing skills gap, organizations are investing in training programs to equip employees to work effectively with AI technologies (Cardon, 2023). Despite these investments, there is still limited research on how AI-based learning activities affect students' level of engagement, reflective thinking, and understanding of key concepts in OSCM education.

Building on the workforce's need for both AI literacy and domain-specific skills, this study introduces an AI-Enabled Negotiation Simulation (referred to as "AI simulation"), compares it with a non-AI 5S Lean Simulation (referred to as "5S simulation"), and explores the pedagogical effects of the AI simulation. The following research questions guide this inquiry:

- *RQ1: In what ways does the AI simulation influence student engagement in their learning process, particularly with their cognitive effort and reflective thinking?*
- *RQ2: How does the AI simulation affect the depth and quality of students' conceptual understanding?*
- *RQ3: How do students evaluate the AI simulation compared to the 5S simulation?*

Together, these questions address the gap in how the AI simulation can shape both students' learning processes and their perceptions of OSCM education. To contribute to this area, this study introduces a novel approach by combining an interactive simulation with AI-driven conversation and structured peer reflection, creating a rich, multi-faceted learning process. Additionally, by comparing student experiences in the AI simulation with those in the 5S simulation, this research highlights the trade-off between deeper cognitive engagement and students' perceived satisfaction.

2. THEORETICAL FRAMEWORK

Kolb's Experiential Learning Theory (ELT) is a useful framework to model a continuous and holistic learning cycle of a student. Kolb (1984) described learning as a dynamic process of grasping experiences and transforming them into knowledge through four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This cyclical process, shown in Figure 1, begins with concrete experience, where learning occurs through doing or observing in real or simulated contexts such as fieldwork, labs, or simulations. In reflective observation, students consciously and analyze these experiences, often using brainstorming, discussion, or personal journaling; In abstract conceptualization, they develop theories, models, or hypotheses based on their reflections, drawing meaning from their experiences through logic and analysis; In active experimentation, students test these ideas by planning and applying them in new contexts, which may include further labs, fieldwork, projects, or case studies (Akella, 2010; Bergsteiner et al., 2010; Botelho et al., 2016).

The ELT's dynamic and cyclical nature of the teaching-and-learning process is appropriate for modeling a student's learning of complex phenomena that are nonlinear (Botelho et al., 2016). Learning from concrete experience requires active and critical reflection by observing, a student's effort to understand their experience, followed by the conceptualization of a theory or hypothesis by thinking (Botelho et al., 2016). The continuous process will test this theory/hypothesis, which is connected to another concrete experience (Bell & Bell, 2020; Fewster-Thuente & Batteson, 2018).

Kolb's ELT has been extensively utilized in various fields of education such as business, healthcare, and engineering (Bell & Bell, 2020; Fewster-Thuente & Batteson, 2018; Botelho et al., 2016), especially with the application of simulations.

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Fewster-Thuente and Batteson's (2018) low-fidelity simulation illustrated that Kolb's ELT is a solid framework and enhanced interprofessional competencies in healthcare education, while Wijnen-Meijer et al. (2022) claimed that integrating experience, theory, and simulation is effective in medical education because students can learn from real patient cases and similar simulated cases. In engineering education, Botelho et al. (2016) proposed several pedagogical approaches for computer simulation that include class activities with experiential learning elements beyond lectures and textbook readings. Similarly, Turesky and Wood (2010) supported that Kolb's ELT model is an effective tool for assessing students' past leadership experiences and for envisioning future improvement. These examples demonstrate the widespread use of ELT for educational purposes, in either simplified or fully simulated learning environments.

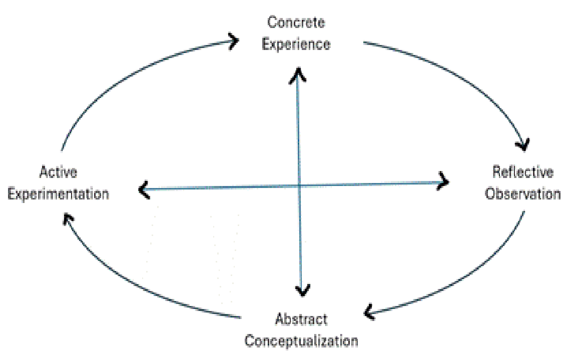

Figure 1: Kolb's Experiential Learning Framework
Note. From *Experiential Learning: Experience as the Source of Learning and Development (p. 21), by D. A. Kolb, 1984, Prentice-Hall. Copyright 1984 by Prentice-Hall.*

The ELT theory aligns closely with the fundamental transformation of teaching and learning in the age of AI, as both emphasize student-centered approaches that promote self-directed learning while fostering interactive and dynamic cognitive engagement with educational content. In this study, the terms "engagement" and "cognitive engagement" are used interchangeably and refer to the mental effort and strategic thinking students invest in learning tasks (Fredricks, Blumenfeld, & Paris, 2004). The key elements of ELT theory that demonstrate this alignment include the following, as discussed by Kolb and Kolb (2009) and Morris (2020):

- Learning is grounded in experience. The AI simulation provides an ideal environment for students to develop a stronger sense of themselves as learners by negotiating procurement contracts with an AI supplier. This activity immerses students through four stages in the ELT model.
- Metacognitive capabilities involve learners' awareness of their learning processes, recognition of challenges, and strategies for improving learning. The AI simulation supports the development of these capabilities by prompting students to identify obstacles and reflect on ways to enhance their learning.
- Learning is a cyclical process, where concrete experiences are continuously enriched through reflection, conceptualization, and active experimentation. The AI simulation reinforces this cycle, as reaching an agreement typically requires multiple negotiation rounds. Each round builds on the previous one, a spiral of increasingly sophisticated understanding.
- The effectiveness of experiential learning depends on context. The AI simulation provides a rich, discipline-specific environment that reflects real-world negotiation challenges in OSCM. This context informs students' experiences, sharpens their conceptual thinking, and shapes how they perceive and internalize what they learn.

To examine how these experiential learning elements unfold in practice, this study used a qualitative case study approach to compare two simulations (i.e., AI simulation and 5S simulation) and explored how the AI simulation impacted student learning.

3. METHODOLOGY

Research Design

According to Baxter and Jack (2008), the qualitative case study provides guidance for developing clear research questions to define the focus of the study, emphasizes theoretically informed propositions to guide data collection and analysis, stresses the importance of "binding the case" by setting clear boundaries for what will and will not be studied, and requires multiple sources of evidence to support triangulation and strengthen the study's credibility. By defining clear research questions, bounding the case, and drawing on multiple sources of evidence, the qualitative case study method can help researchers generate rich, contextual insights that can inform practice or future interventions.

The qualitative case study approach, combined with Kolb's experiential learning theory, was well suited for this research as it placed students in authentic contexts where they could develop and apply critical thinking, problem-solving,

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negotiation, and prompt engineering skills. This methodological design ensured that the research questions regarding student learning processes and experiences were explored holistically, in line with the study's aim to understand how AI tools influence applied OSCM education. The study remained bounded within the scope of a single undergraduate OSCM course with clearly defined assignments, aligning with Baxter and Jack's (2008) guidance for maintaining a focused case. Two simulations (AI simulation and 5S simulation) generated rich qualitative data through individual reflection reports, Blackboard discussion posts, and peer replies on the discussion board. These multiple data sources enabled triangulation and supported a credible chain of evidence.

Participants Recruitment

This study was conducted in a private urban university in the northeastern United States. Participants included 40 students enrolled in an introductory course on OSCM, which is part of the business core curriculum. The sample represented a range of business-related majors, such as finance, marketing, applied business, sports management, biomedical marketing, and business undecided, as well as non-business majors, including radiologic science and health science. Participants were sophomores, juniors, and seniors.

Data Collection

The data were collected through two simulation assignments and a post-assignment survey. Both simulations followed an experiential learning approach to actively engage students with OSCM concepts. The key difference was that one simulation integrated AI while the other did not, allowing for a comparison of their impacts on engagement and perceived learning.

The AI simulation used a generative AI tool (e.g., ChatGPT) to integrate inventory cost analysis with procurement negotiation techniques. This assignment combined technical skills (e.g., cost modeling) with durable skills (e.g., negotiation, communication, and problem-solving). Students first reviewed how to compare ordering policies and how purchasing terms affect inventory costs, then engaged in multiple negotiation rounds with an AI-simulated supplier. For this simulation, each student submitted an individual reflection report, posted key results and strategies on a Blackboard discussion board, and replied to another student's post.

The 5S simulation, hosted on a traditional website, helped students internalize the core Lean principles: Sort, Set in Order, Shine, Standardize, and Sustain (Randhawa & Ahuja, 2017). Through an interactive online game (5S Alphabet Game, 2014), students completed simple sorting and error-finding tasks across six scenarios, experiencing incremental improvements in task efficiency. For this activity, students posted their simulation results and a brief reflection on the discussion board, along with a reply to a classmate's post.

In addition, a post-assignment survey collected student numerical ratings on "perceived usefulness and value" of each simulation assignment. Students evaluated how much they liked each assignment, considering how interesting it was and how much it helped them understand OSCM concepts.

Data Coding Procedure

For qualitative data, such as the reflection report and discussion posts and replies, a thematic analysis was conducted. This widely used method in qualitative research helps to identify, analyze, and interpret patterns (or "themes") (Braun & Clarke, 2006), making it well-suited for exploring students' learning experiences and perceptions in an educational context.

Due to the nature of the data collected, the coding was conducted solely by the course instructor, in accordance with the IRB exemption granted for this study. Consequently, inter-rater reliability could not be established and was noted in the conclusion section. Instead, to ensure the intra-rater reliability, the course instructor conducted the coding, with a one-month interval between sessions. The coding process involved careful review of students' reflection reports, discussion posts, and peer replies; extracting relevant keywords; categorizing them into groups; aggregating these groups into themes; and iteratively refining the themes and coding criteria throughout the analysis. To maintain consistency and contextual accuracy, the analysis of the AI simulation focused on evidence of students' conceptual understanding and application of inventory management and negotiation principles. In contrast, the analysis of the 5S simulation centered on assessing the application of 5S principles within OSCM contexts. Both analyses examined the depth of students' critical thinking and peer interaction.

4. FINDINGS

Description of Participants

Since the OSCM course is part of the business core curriculum, 95% of the enrolled students were in business majors. Because of the depth

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and specialization of the content knowledge required for the course, no freshman students enrolled in the course. As shown in Table 1, the participants' top three majors were finance (32.5%), marketing (22.5%), and applied business (17.5%), which are the common majors among business students in sophomore, junior, and senior classes.

Major	**Number of Students**	**Percent**
Finance	13	32.5%
Marketing	9	22.5%
Applied Business	7	17.5%
Accounting	3	7.5%
Entrepreneurship	2	5%
Other Business Majors (Biomedical Marketing, Business Analytics, Sports Management, Business Undecided)	4	10% (2.5% each)
Non-Business Major (Radiologic Science, Health Science)	2	5% (2.5% each)
Total	40	100%
Class Standing		**Percent**
Sophomore	24	60%
Junior	12	30%
Senior	4	10%
Total	40	100%

Table 1: Distribution of Student Majors and Class Standing

Although 40 students were enrolled in the OSCM course, 11 students who did not complete all required components (e.g., missing a reflection report, a discussion post, or a reply) were excluded from the following analysis to ensure an accurate representation of student engagement and understanding. Thus, only 29 participants were included in the remaining parts of the findings.

Final Coding Schema

This research focused on comparing the cognitive engagement and depth of understanding demonstrated in reflection reports and two discussion boards. Therefore, a unified coding schema (Appendix A), including *Reflective Insight, Conceptual Understanding, and Peer Response Quality*, was applied to each student's reflection report and discussion board posts and replies. The theme *Reflective Insight* was identical for all assignments. To maintain the unique context of the AI Simulation and the 5S simulation, the focus of *Conceptual Understanding* for the AI simulation was on students' understanding and application of inventory management and negotiation principles, such as Economic Order Quantity (i.e., EOQ), inventory costs, negotiation strategies, and contractual terms, while the focus for the 5S simulation was on the key Lean philosophy and 5S principles. *Peer Response Quality* was identical to both simulations but only applied to the two discussion boards (Appendix A).

Each theme within the coding rubric had its own scale, so the same numeric level indicates different evidence depending on the theme. For example, level 2 for *Reflective Insight* reflected a student's discussion of specific experiences, challenges, or learning outcomes, whereas level 2 for *Conceptual Understanding* indicated partial application or explanation of one or more concepts (e.g., cost calculation, negotiation approach, or 5S principles). Similarly, level 3 for *Reflective Insight* demonstrated meaningful, personal insights with clear connections to growth or future professional practice. Level 3 for *Conceptual Understanding* denoted a comprehensive and thoughtful application of multiple OSCM concepts (e.g., a full cost analysis, a strategic negotiation with clear rationale, and critical thinking in applying 5S principles). In terms of Conceptual Understanding, although the coding rubric specifies different content domains (inventory/negotiation vs. Lean/5S) tailored to each simulation's focus, both were developed to assess the same construct of Conceptual Understanding, which is students' ability to grasp and apply key OSCM principles within the context of each simulation. See Appendix A for the complete coding scale definitions (levels 0–3) and theme descriptions.

Individual Reflection Reports and Discussion Posts

Each student's reflection report and discussion posts for the AI simulation and discussion posts for the 5S simulation were evaluated using a predefined coding schema. No submission received a score of 0 or 1. Therefore, only the frequencies for levels 2 and 3 are shown in Table 2. As summarized in this table, the AI simulation reflection report received the highest average score for both *Reflective Insight* (2.72) and *Conceptual Understanding* (2.79), followed by the AI simulation discussion (2.66 and 2.62, respectively). The 5S simulation discussion

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received the lowest scores in both categories (2.31 for each).

The differences in both themes between the AI simulation reflection report and other assignments were statistically significant ($p < 0.01$). In addition, the differences between the AI simulation discussion and the 5S simulation discussion were also significant with $p < 0.05$ and $p < 0.01$ for *Reflective Insight* and *Conceptual Understanding*, respectively. However, the 5S Lean discussion showed a slightly higher average score for *Peer Engagement* (2.07) compared to the negotiation discussion (2.00), though this difference was not statistically significant ($p > 0.1$).

	AI-Enabled Negotiation Simulation					**Non-AI 5S Lean Simulation**		
Coding Scale	**Reflection Report**		**Discussion Board**			**Discussion Board**		
	Reflective Insight	Conc. Undrstndg for Inv. Mgmt. & Neg. Princ.	Reflective Insight	Conc. Undrstndg for Inv. Mgmt. & Neg. Princ.	Peer Response Quality	Reflective Insight	Conc. Undrstndg for 5S Lean Princ. & Appl.	Peer Response Quality
2	8 (28%)	6 (21%)	10 (34%)	11 (38%)	29 (100%)	16 (55%)	16 (55%)	25 (86%)
3	21 (72%)	23 (79%)	19 (62%)	18 (66%)	0	11 (45%)	11 (45%)	3 (14%)
Total	29 (100%)	29 (100%)	29 (100%)	29 (100%)	29 (100%)	29 (100%)	29 (100%)	29 (100%)
Average	**2.72**	**2.79**	**2.66**	**2.62**	**2.00**	**2.31**	**2.31**	**2.07**

Table 2: Coding Scale Frequencies and Averages for Assignments

	Very poor + Poor	**Fair**	**Good + Excellent**
Non-AI 5S Lean Discussion	1 (3.5%)	1 (3.5%)	27 (93.0%)
AI-Enabled Negotiation Simulation Reflection Report	1 (3.5%)	5 (17.2%)	23 (79.3%)
AI-Enabled Negotiation Simulation Discussion	1 (3.5%)	7 (24.1%)	21 (72.4%)

Table 3: Student Ratings for Assignments

The post-assignment perception survey
An anonymous survey designed by the instructor asked students about their perceptions of the value and helpfulness of each assignment, which were based on the two simulations. Ratings were summarized using descriptive statistics, such as the percentage of responses in "Good" and "Excellent" categories. As shown in Table 3, the discussion for the 5S simulation that is always used in the class was valued as the most interesting and helpful (93% rated it as good or excellent) compared to the two assignments based on the AI simulation (less than 80% of students rated them as good or excellent). Between the two assignments from the AI simulation, the reflection report (79.3% rated it as good or excellent), which required more effort than the discussion (72.4% rated it as good or excellent), was preferred and perceived as more valuable and useful.

5. DISCUSSION

Student Engagement and Cognitive Effort in the AI-Enabled Negotiation Simulation
Compared to the non-AI 5S Lean Simulation, the AI-Enabled Negotiation Simulation elicited a notably higher level of cognitive engagement and reflective thinking in the student learning process. Specifically, the average scores were 2.72 for the reflection report and 2.66 for the discussion based on the AI simulation, compared to 2.31 for the 5S simulation. These scores suggest that students are more actively processing their experiences in the AI simulation, reflecting on challenges, and linking newly learned knowledge to broader learning goals. For example, a student did not reveal the target cost to the supplier in order not to lose "the control in the negotiation," showing the active cognitive effort and strategic thinking about information asymmetry, a real negotiation tactic. Although peer engagement was slightly lower in the AI discussion (2.00) than in the 5S discussion (2.07), this may be attributed to the greater cognitive demands of negotiating with an AI

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agent, which may have limited students' time or motivation to engage more deeply with their peers.

Impact of AI Simulation on Conceptual Depth and Understanding

The AI simulation also supported a deeper and higher quality level of conceptual understanding within its domain (inventory management and negotiation principles) compared to the 5S simulation within its domain (Lean/5S principles). Students' scores were higher in both the AI reflective report (2.79) and discussion posts (2.62) than in the 5S discussions (2.31). This demonstrates that students are able to not only use key OSCM concepts (e.g., inventory management and negotiation strategies) but also integrate them more comprehensively and accurately. For example, many students reflected that the total inventory cost was influenced by multiple factors, and thus, a low-cost deal isn't always the best deal. As one student stated, "strategic adjustments to pricing, order volume, and payment structures can significantly impact overall cost savings." And another student specifically indicated that the "strategically leveraging relationship with the supplier… [to] create some room for negotiating." Students' reflections on strategic decisions and holistic cost analysis demonstrate their insights into the interconnected nature of procurement negotiation and inventory management decisions.

Students' Perceptions: AI Simulation vs. Traditional Experiential Learning

It is interesting to note that students rated the AI simulation lower than the 5S simulation in terms of "perceived usefulness and value," as reflected in the post-assignment survey. The 5S Simulation has a more mechanical nature and has been used for many years in the course, and thus has well-refined instructions. In contrast, the AI simulation is a new and more complex assignment. This unfamiliarity and complexity may have contributed to the lower ratings, despite its richer cognitive demands.

This contrast illustrates a typical example of the "Paradox of Actual Learning" (Soderstrom & Bjork, 2015). As Soderstrom and Bjork (2015) pointed out, learners tend to rate easier, more familiar tasks as more useful, even when more challenging activities yield better understanding and insight. In other words, students' perceptions of learning effectiveness or value often diverge from their actual learning outcomes. In this study, although students perceived the 5S simulation as more useful and valuable, the AI simulation demands more sustained thinking and reflective judgment. This pattern aligns with the "desired difficulties" concept (Bjork, 1994; McDaniel & Butler, 2011), which describes how the meaningful challenges can make the initial learning harder but ultimately improve understanding and retention with deeper cognitive engagement. This divergence between perceived value and actual learning underscores the importance of interpreting student satisfaction surveys with caution, especially when evaluating innovative, cognitively demanding activities, such as the AI simulation.

The Alignment with Kolb's Model

Both AI simulation and 5S simulation align well with Kolb's experiential learning theory, particularly the stages of concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). From Appendix B, the AI simulation demonstrates deeper iterative engagement through repeated negotiation rounds, consistent with findings from students' reflections, and discussion posts. In the concrete experience stage, students received an inventory management scenario with key variables, such as demand, pricing, and cost parameters. They were given practical preparatory materials, including what-if analyses, negotiation tips, and sample AI prompts, before entering a dynamic negotiation with an AI supplier. During the negotiation process, students interacted with the AI supplier for several rounds and experienced trial and error, strategic adjustment, and decision-making under constraints, all of which are core aspects of experiential learning.

Students engaged in the reflective observation stage through each round of negotiation by analyzing both their achievements and setbacks in the simulation. Many students referenced moments of challenge (e.g., rejected offers), which led them to rethink their original strategies. These reflections often progressed into abstract conceptualization, where students formulated general principles about negotiation and inventory cost analysis (e.g., the trade-offs between multiple cost drivers). In the final stage, active experimentation, students applied these insights in subsequent negotiation rounds, adjusting their counteroffers to reflect a more holistic and strategic perspective (e.g., requesting a credit reimbursement to offset the high price or offering longer contract terms in exchange for a lower price).

Overall, the AI simulation engages students across all four stages of Kolb's (1984) model,

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reinforcing deeper cognitive engagement and reflective learning. Importantly, the simulation's iterative design allows students to cycle through Kolb's model multiple times. Since the cost target cannot be reached in a single negotiation round, each new contract outcome becomes part of the next concrete experience, initiating a new round of learning. This spiral learning process deepens student engagement and reinforces the connection between all four stages of Kolb's model, which is not possible in 5S simulation. As a result, the AI simulation not only aligns with Kolb's (1984) framework but also amplifies its learning potential through structured iteration.

6. CONCLUSION AND FUTURE WORK

This study found that the AI-Enabled Negotiation Simulation produced deeper conceptual understanding and more reflective insights than the traditional non-AI 5S Lean Simulation, despite the AI-enabled assignments receiving lower student ratings for perceived value and usefulness. The findings reinforce the previous study (Poo & Qi, 2023) and align well with Kolb's experiential learning cycle (Kolb, 1984), illustrating that involving AI in the OSCM curriculum can increase students' cognitive effort and critical thinking. This highlights the pedagogical value of designing "desired difficulties" in experiential learning to challenge students meaningfully (Bjork, 1994; McDaniel & Butler, 2011). The study extends Kolb's theory by illustrating how the learning cycle can operate in a spiral process through multiple negotiation rounds with iterative reflection. In addition, this research advances OSCM teaching practices by demonstrating how AI can be responsibly integrated to build both technical (e.g., economic order quantity calculation) and durable human skills (e.g., negotiation), preparing students for complex OSCM roles that demand agility, data-driven decision-making, and negotiation competence.

From a practical perspective, the gap between AI tools' availability and the workforce's ability to use them effectively remains a critical challenge for businesses. The AI simulation's impact on student engagement, reflective thinking, and conceptual understanding suggests that educational programs integrating AI literacy and experiential learning can help bridge this skills gap. By preparing future supply chain professionals with practical experience in AI-enabled decision-making, organizations can build a workforce better equipped to leverage AI capabilities for strategic advantage. Practitioners can apply these insights by collaborating with educational partners to design hands-on, AI-enabled simulations that encourage learners to engage deeply, reflect critically, and develop problem-solving strategies relevant to fast-evolving supply chain environments where agility and data-driven strategies are increasingly important.

While this study was conducted as an exploration of a single course implementation, the findings provide a foundation for the future iterative refinement of the AI Simulation and the development of more structured evaluation tools. Building on these insights, future research may strengthen the qualitative case study by refining and standardizing the coding schema to ensure consistency in assessing conceptual understanding across diverse OSCM concepts, expanding the participation sample to enhance homogeneity, and incorporating inter-rater reliability and longitudinal analysis to improve the credibility and robustness of findings over time. These adjustments would enable deeper investigation of the pedagogical impact of AI integration on student learning outcomes in OSCM education and contribute to broader best practices for responsibly embedding AI in applied business curricula.

7. REFERENCES

5S Alphabet Game (2014, January 31). *Playing the 5S Game Overview - 5S Educational Tool*. http://5salphabetgame.blogspot.com/2014/01/playing-5s-game-overview.html

Abhulimen, A. O., & Ejike, O. G. (2024). Solving supply chain management issues with AI and Big Data analytics for future operational efficiency. *Computer Science & IT Research Journal*, *5*(8), 1780-1805. https://doi.org/10.51594/csitrj.v5i8.1396

Akella, D. (2010). Learning together: Kolb's experiential theory and its application. *Journal of Management and Organization*, *16*(1), 100-112. https://doi.org/10.5172/jmo.16.1.100

Aladsani, H. K. (2025). Developing postgraduate students' competencies in generative artificial intelligence for ethical integration into academic practices: A participatory action research. *Interactive Learning Environments*, 1–19. https://doi.org/10.1080/10494820.2025.2487517

Association to Advance Collegiate Schools of Business Thought Leadership (AACSB) (2023, November 29). Business school innovation in

ISSN: 2473-4901
v11 n6404

the age of generative AI. https://www.aacsb.edu/insights/briefings/business-school-innovation-in-the-age-of-generative-ai

Bain (2025). AI: The ambitions are bold, but the talent is scarce. https://www.bain.com/insights/ai-the-ambitions-are-bold-but-the-talent-is-scarce-snap-chart/

Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The qualitative report*, *13*(4), 544-559. https://doi.org/10.46743/2160-3715/2008.1573

Bell, R., & Bell, H. (2020). Applying educational theory to develop a framework to support the delivery of experiential entrepreneurship education. *Journal of Small Business and Enterprise Development*, *27*(6), 987-1004. https://doi.org/10.1108/JSBED-01-2020-0012

Bergsteiner, H., Avery, G. C., & Neumann, R. (2010). Kolb’s experiential learning model: Critique from a modelling perspective. *Studies in Continuing Education*, *32*(1), 29–46. https://doi.org/10.1080/01580370903534355

Bjork, R. A. (1994). Memory and metamemory considerations in the training of human beings. In J. Metcalfe & A. Shimamura (Eds.), *Metacognition: Knowing about knowing* (pp. 185–205). MIT Press.

Botelho, W. T., Marietto, M. Das G. B., Ferreira, J. C. da. M., & Pimentel, E. P. (2016). Kolb's experiential learning theory and Belhot's learning cycle guiding the use of computer simulation in engineering education: A pedagogical proposal to shift toward an experiential pedagogy. *Computer Applications in Engineering Education, 24*(1), 79-88. https://doi.org/10.1002/cae.21674

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Cardon, P., Fleischmann, C., Logemann, M., Heidewald, J., Aritz, J., & Swartz, S. (2023). Competencies needed by business professionals in the AI age: Character and communication lead the way. *Business and Professional Comm. Quarterly*, *87*(2), 223-246. https://doi.org/10.1177/23294906231208166

Çaylı, O., & Oralhan, Z. (2024). Artificial Intelligence-driven inventory management: Optimizing stock levels and reducing costs through advanced machine learning techniques. *The European Journal of Research and Development*, *4*(4), 427–439. https://doi.org/10.56038/ejrnd.v4i4.615

de la Roche, M., Voloder, E., Banerjee, A., et al. (2024). Report on Artificial Intelligence and Blockchain convergences. INATBA Report. https://dx.doi.org/10.2139/ssrn.5023415

Fewster-Thuente, L., & Batteson, T. J. (2018). Kolb’s Experiential Learning Theory as a theoretical underpinning for interprofessional education. *Journal of Allied Health*, *47*(1), 3-8. https://www.jstor.org/stable/48722018

Forbes (2025). The AI skills gap is slowing down supply chains. https://www.forbes.com/sites/kolawolesamueladebayo/2025/04/25/the-ai-skills-gap-is-slowing-down-supply-chains/

Kolb, A. Y., & Kolb, D. A. (2009). The learning way: Meta-cognitive aspects of experiential learning. *Simulation & Gaming*, *40*(3), 297-327. https://doi.org/10.1177/1046878108325713

Kolb, D. A. (1984). Experiential Learning: Experience as the source of learning and development. Prentice-Hall, Upper Saddle River, NJ.

Kumar, P., Amosu, O. R., & Ogunsuji, Y. M. (2024). Revolutionizing sourcing with AI: Harnessing technology for unprecedented efficiency and cost savings. *World Journal of Advanced Research and Reviews*, *23*(2), 925–938. https://doi.org/10.30574/wjarr.2024.23.2.2357

Kurtz, G., Amzalag, M., Shaked, N., Zaguri, Y., Kohen-Vacs, D., Gal, E., Zailer, G., & Barak-Medina, E. (2024). Strategies for integrating generative AI into higher education: Navigating challenges and leveraging opportunities. *Education Sciences*, *14*(5), 503-513. https://doi.org/10.3390/educsci14050503

LinkedIn (2025, January). Work Change Report: AI is coming to work. https://economicgraph.linkedin.com/content/dam/me/economicgraph/en-us/PDF/Work-Change-Report.pdf

ISSN: 2473-4901
v11 n6404

McDaniel, M. A., & Butler, A. C. (2011). A contextual framework for understanding when difficulties are desirable. In A. S. Benjamin (Ed.), *Successful remembering and successful forgetting: Essays in honor of Robert A. Bjork* (pp. 175–198). Psychology Press.

Meyer, D., Brüggenolte, M., Gürpinar, T., & Henke, M. (2021). Assistance for the implementation of AI in procurement - An analysis of maturity models. In *Proceedings of the 30th IPSERA Conference*.

Mohsen, B. (2023) Impact of Artificial Intelligence on Supply Chain Management Performance. *Journal of Service Science and Management*, 16, 44-58. https://doi.org/10.4236/jssm.2023.161004

Morris, T. H. (2020). Experiential learning – a systematic review and revision of Kolb's model. *Interactive Learning Environments*, *28*(8), 1064–1077. https://doi.org/10.1080/10494820.2019.1570279

Muscanell, N., & Robert, J. (2023, February 14). EDUCAUSE QuickPoll results: Did ChatGPT write this report? EDUCAUSE. https://er.educause.edu/articles/2023/2/educause-quickpoll-results-did-chatgpt-write-this-report

Poo, M. C. P., & Qi, B. (2023, December). Review on the Applications of AI in Laboratory Experiments in Supply Chain Management Education. In *2023 4th International Conference on Computers and Artificial Intelligence Technology (CAIT)* (pp. 110-114). IEEE.

Randhawa, J. S., & Ahuja, I. S. (2017), Evaluating impact of 5S implementation on business performance, *International Journal of Productivity and Performance Management*, *66*(7), 948-978. https://doi.org/10.1108/IJPPM-08-2016-0154

Raptis, P. R. (2024). Using generative AI to enhance teaching and learning. *Ohio Communication Journal*, *62*, 53–59.

Shalpegin, T., & Nguyen, A. (2024). AI in Supply Chain Education. In X. O'Dea and D.T.K. Ng (Ed.), *Effective Practices in AI Literacy Education: Case Studies and Reflections* (pp. 71-79). Emerald Publishing Limited https://doi.org/10.1108/978-1-83608-852-320241008

Soderstrom, N. C., & Bjork, R. A. (2015). Learning versus performance: An integrative review. *Perspectives on Psychological Science, 10*(2), 176–199. https://doi.org/10.1177/1745691615569000

The Oxford University Press (2023, October 18). AI in education: where we are and what happens next. https://corp.oup.com/feature/ai-in-education-where-we-are-and-what-happens-next/#a-global-picture

The World Economic Forum (2025, January). Future of jobs report 2025. https://reports.weforum.org/docs/WEF_Future_of_Jobs_Report_2025.pdf

Tu, H. (2024). Responsible use of AI in college teaching and learning: A literature review. *Journal on Excellence in College Teaching*, *35*(4), 41-50.

Turesky E. F., & Wood, D. R. (2010). Kolb's experiential learning as a critical frame for reflective practice. *Academic Leadership*, *8*(3), 1-21. https://doi.org/10.58809/HFJJ1868

Wang, N., Wang, X., & Su, Y. S. (2024). Critical analysis of the technological affordances, challenges and future directions of Generative AI in education: A systematic review. *Asia Pacific Journal of Education*, *44*(1), 139–155. https://doi.org/10.1080/02188791.2024.2305156

Wijnen-Meijer, M., Brandhuber, T., Schneider, A., Berberat, P. O. (2022). Implementing Kolb´s Experiential Learning Cycle by Linking Real Experience, Case-Based Discussion and Simulation. *Journal of Medical Education and Curricular Development*, *9, 1-5*. https://doi.org/10.1177/23821205221091511.

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APPENDIX A

Coding Schema

Theme	Depth Levels			
Conceptual Understanding for Inventory Management and Negotiation Principles (AI-Enabled Negotiation Simulation reflection reports and discussions) Demonstrates understanding and application of key inventory management and negotiation principles, including EOQ and inventory cost analysis, negotiation strategy, and contractual terms.	**0 = Absent** No relevant concepts or strategies mentioned.	**1 = Surface-level** Mentions OSCM concepts (e.g., cost drivers, negotiation tactics, contract terms) without explanation or context.	**2 = Applied** Provides some meaningful applications or insightful explanations of more than one concepts (e.g., cost calculation, negotiation approach, or contract terms).	**3 = Integrated and insightful** Demonstrates a comprehensive and thoughtful application of multiple OSCM concepts (e.g., full cost analysis, strategic negotiation with rationale, and justified contract terms with impact).
Conceptual Understanding for 5S Lean Principles and Application (non-AI 5S Lean Simulation discussions) Demonstrates understanding and application of key lean philosophy and 5S principles.	**0 = Absent** Post does not address the discussion prompt.	**1 = Surface-level** Provides an incomplete response; limited understanding of Lean systems or 5S principles; lacks personal application.	**2 = Applied** Demonstrates a clear understanding of Lean philosophy and 5S; provides clear description of game performance; includes relevant examples of how 5S can be applied in personal or professional contexts.	**3 = Integrated and insightful** Offers a deep, thoughtful analysis of Lean and 5S; connects game experience to real-world scenarios with specific, original insights; shows creativity or critical thinking in applying 5S principles.
Reflective Insight (AI-Enabled Negotiation Simulation reflection reports and discussions, and non-AI 5S Lean Simulation discussions) Reflects on learning, challenges, or implications for professional practice	**0 = Absent** No meaningful reflection provided.	**1 = General** Offers vague or generic reflections.	**2 = Specific** Reflects on particular experiences, challenges, or learning outcomes.	**3 = Deep and personal** Provides meaningful, personal insights with clear connections to growth or future application.
Peer Response Quality (Discussions only) Responds meaningfully to peers, adds new ideas or questions	**0 = Absent** No meaningful response to peers or simply an "I agree" reply.	**1 = Minimal** Responds briefly or superficially to peers.	**2 = Constructive** Responds thoughtfully to peers, acknowledges their ideas, and contributes constructively with relevant comments or clarifying questions.	**3 = Insightful and original** Engages deeply with peers' ideas, offering original insights, thought-provoking questions, or new perspectives that enrich the discussion.

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Appendix B

Alignment of Simulations with Kolb's Experiential Learning Cycle

Kolb's Stage	AI-Enabled Negotiation Simulation	5S Lean Simulation
Concrete Experience	Work with inventory management scenario (demand, pricing, cost variables); engage in multi-round negotiations with an AI supplier using preparatory tools (what-if analyses, negotiation tips, AI prompts).	Perform sorting and error-finding tasks in interactive 5S game scenarios; experience incremental task improvements.
Reflective Observation	After each negotiation round, analyze outcomes, setbacks, and rejected offers; reflect in reports and discussion posts.	Reflect on efficiency gains and mistakes; share brief insights in discussion posts.
Abstract Conceptualization	Formulate general principles about negotiation, trade-offs, and inventory cost drivers; connect to OSCM theory.	Generalize Lean/5S principles; connect task outcomes to workplace organization concepts.
Active Experimentation	Apply revised strategies in subsequent negotiation rounds (e.g., adjust counteroffers, modify contract terms); cycle iteratively through Kolb's stages.	Apply 5S principles in later scenarios or envision applications to daily/work contexts; typically completes a single cycle.