

Designing Experiential Learning Activities with Generative Artificial Intelligence Tools for Authentic Assessment

Generative Artificial Intelligence (GenAI), acknowledged for human-like content generation, sparks interest across domains, posing concerns on reliability, ethics, and impact. This article examines GenAI in experiential learning for authentic assessment in Higher Education, exploring its transformative capabilities and limitations. Employing "thing ethnography," the study interviews ChatGPT 3.5, probing its perspectives on conceptual clarity, GenAI integration, and practical application. Findings highlight GenAI's potential to enhance reflective thinking, hands-on learning and genuine assessments, emphasizing responsible use. The study showcases ChatGPT 3.5 in operations management education as applied to lean healthcare, concluding with insights into GenAI's transformative capability and proposing future research directions.

Keywords: authentic assessment; ChatGPT; experiential learning; GenAI; higher education; lean healthcare; operations management

Introduction

Higher Education (HE) is experiencing a transformative shift with the emergence of Generative Artificial Intelligence (GenAI). However, integrating GenAI tools into the educational realm has challenges and concerns. GenAI has ignited debates in academic circles because of diverse issues like academic integrity, intellectual property, and plagiarism up to the potential impact on students' learning, skill development, and knowledge acquisition, (Chinonso *et al.*, 2023; Eke, 2023; Stokel-Walker and Van Noorden, 2023). Furthermore, GenAI tools have led to concerns about homogenizing knowledge, redefining learning outcomes assessments, and shaping higher-order thinking processes (Chiu, 2023). Hence, given these challenges, the responsible use of GenAI in education becomes crucial. This involves ensuring a pedagogically appropriate interaction between learners and GenAI tools, with consideration for human agency, intrinsic learning motivation, technology control, and human-GenAI interaction fostering

contribution to human needs, learning effectiveness, higher-order thinking, interactive engagement, and accountability for AI-generated content (UNESCO, 2023).

Nevertheless, GenAI tools can also be employed to enhance task clarification, student learning, aiding in answering questions, assignment preparation, quality improvement, and personalized, self-directed learning (Alemdag, 2023; Fuchs, 2023; Smith *et al.*, 2023). Previous research has highlighted the benefits of information technology in education, especially when used in hands-on and directed experiences (Kassens-Noor *et al.*, 2023; Turney *et al.*, 2009). For instance, ranging from artificial neural networks predicting academic performance to web-enabled self-regulated learning (Kokoç and Altun, 2021). Referring to artificial intelligence, this technology is claimed to help in the augmentation of human and machine intelligence for supporting learning and teaching and supporting formative and summative assessments (Ifenthaler and Schumacher, 2023). In reciprocal interaction, tasks can be distributed between humans and the AI to process and analyze large datasets to detect patterns or structures that can be used for intelligent human decision making and problem solving in learning and teaching situations.

Hence, an alternative approach to integrating GenAI in education is to create engaging learning environments that complement traditional pedagogical methods with tools like ChatGPT. This approach promotes knowledge acquisition, addresses concerns about plagiarism and academic integrity, and requires effective teacher guidance (Crawford *et al.*, 2023; Geerling *et al.*, 2023).

A research gap exists in the literature regarding specific actionable alternatives for integrating GenAI tools into active learning activities aimed at achieving intended learning outcomes. Current studies of GenAI predominantly focus on its use as virtual tutors (Amedu and Ohene-Botwe, 2024; Lin, 2023), aids for data search and problem-

solving (Hamid *et al.*, 2023), prompt tools for enriching learning experiences (Albert and Li, 2023), sources of theoretical knowledge and learning content (Avello-Sáez and Estrada-Palavecino, 2023), and feedback tools in skills development (Escalante *et al.*, 2023; Volante *et al.*, 2023). Additional applications include assignment elaboration (Sane *et al.*, 2023), designing teaching materials (Meron and Tekmen Araci, 2023), and performing teaching tasks (Koh *et al.*, 2023). However, there is a need for further work to address this gap and provide a framework guiding the incorporation of GenAI tools into pedagogical designs.

Experiential learning, which goes beyond repetition and memorization to foster a deeper understanding of academic subjects through reflective and practical activities, plays a pivotal role in this context (Geerling *et al.*, 2023). Assessments that evaluate higher-level cognitive skills like analysis, creation, and evaluation, offer meaningful learning experiences that challenge GenAI tools (Crawford *et al.*, 2023). From a constructionist perspective, GenAI tools can act as agents for interactive and engaging learning experiences (Santos, 2023). This view fosters deeper understanding, critical thinking, and hands-on activities among students, making it a valuable addition to presence and online teaching.

To harness the potential of GenAI in education, instructional designers and teachers need to develop experiential learning practices and authentic assessment. Experiential learning is a theory of learning that emphasizes what students must do to construct their knowledge and achieve their intended learning outcomes (Kolb and Kolb, 2018, 2017). On the other hand, authentic assessment refers to the examination of student performance on worthy intellectual tasks (Wiggins, 1990).

This article explores alternatives and provides actionable recommendations for incorporating GenAI tools into HE, emphasizing experiential learning and authentic

assessment. The central research question in this work is: "What alternatives can be identified for including GenAI tools in learning activities while concurrently considering experiential learning and authentic assessment?" This question entails clarifying the notions of authentic assessment and experiential learning using GenAI tools, investigating alternatives for their use in specific learning activities, and exemplifying their use in a learning experience. In this sense, this work contributes to pedagogical aspects of "how to learn" rather than defining "what to learn". Therefore, the incorporation of GenAI tools into learning activities aligns with specific learning objectives and intended learning outcomes (Biggs, 1996).

Due to the multidisciplinary scholarly inclinations of the authors, this work primarily showcases the integration of GenAI tools within the field of operations management as applied to lean healthcare. This perspective is adopted to facilitate the validation of response adequacy throughout the research endeavor.

The article unfolds in five additional sections to guide this exploration, reviewing key conceptual constructs, detailing the methodology, summarizing results, discussing findings and limitations, and concluding with insights and future directions.

Background

In the context of integrating GenAI tools into education and their potential to enhance student learning outcomes, it is essential to clarify and integrate the foundational concepts of experiential learning and authentic assessment, which underpin this work.

Experiential Learning

HE requires pedagogical approaches that mirror real-world situations, enabling students to gain relevant knowledge and develop the skills needed for their future professional careers (Benkert and van Dam, 2015). Moreover, these approaches should facilitate

enduring learning across diverse environments and perspectives (Salinas-Navarro *et al.*, 2020). Experiential learning, characterized by its emphasis on meaningful, experience-based, reflective, and problem-solving activities, emerges as a highly effective alternative for fostering high-impact learning (Kolb and Fry, 1975). It encourages students to construct knowledge that is deeply meaningful to them.

Experiential learning is considered a more effective alternative than any other educational approach for high-impact learning as it enhances students' motivation to construct meaningful learning (Kolb and Kolb, 2018; Kong, 2021). This type of learning necessitates moving from a knowledge-broadcasting type of teaching, where students passively sit and listen, to a constructivist alternative in which students learn by thoughtfully executing tasks while immersed in a meaningful situation. There is the assumption that by providing students with experiential learning, they will have the motivation and engagement to achieve their expected learning results (Bradberry and De Maio, 2019). Hence, experiential learning turns into a first-hand alternative to support active learning. Experiential learning, situated in specific contexts, involves a continuous process of meaning-making, where students recognize the relevance of their personal and environmental experiences in learning. This process is structured around Kolb's experiential learning cycle, encompassing four key stages: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE) (Kolb and Fry, 1975). Each cycle stage depends on its predecessor and follows a continuous logical pattern step-by-step (Morris, 2012). CE refers to a new contextually rich experience or situation that triggers a stimulus to actively engage in a task, rather than merely reading or watching. RO is about critically reflecting on the new experience and recognizing any possible discrepancies and gaps between the learner's understanding and the experience. AC concerns new ideas or modified thoughts coming out from a

contextually-specific reflection. It also includes interpreting and updating experiences from new knowledge. Finally, AE refers to what the learner pragmatically applies to the outer world. It is also known as the testing stage to apply conclusions to new experiences.

According to Kolb (Kolb and Kolb, 2018, 2017; Kolb and Fry, 1975), learning spontaneously occurs as part of a continuous meaning-making process through personal and environmental experiences in which the learner experiences, reflects, thinks, and acts in a situation. Accordingly, experiential learning involves defining and organizing learning activities following the recursive cycle.

Hence, experiential learning can emphasize an iterative cycle process about, for instance, problem-solving or decision-making. This approach involves covering situational observations, problem assessment, solution design, testing, and validation, which increase students' capacity for effective action in a contextual situation. This approach can involve situational observations, problem assessment, solution design, and validation, which increase students' capacity for effective action in a contextual situation (Reyes and Zarama, 1998).

This framework guides learners through intellectual activities that inform their actions, with practical tasks providing feedback that refines their conceptual knowledge within specific contexts. Such an approach systematizes reflective practice, enabling hands-on engagement with meaningful activities in real-world settings and ultimately contributing to developing students' learning outcomes (Lalley and Miller, 2007).

Some arguments against experiential learning arise from claims of lack of learning cycle clarity, especially, in the CE stage definition (Morris, 2020), people's willingness to learn, and unequal and unbalanced relations towards learning/knowledge construction (Vince, 2022). Additionally, it is claimed insufficient attention to social, historical, and cultural differences; the contextual conditions of learners and educators; people's

emotions; learning modes; learner types; learning styles; how learning processes connect to knowledge acquisition; and whether learning occurs in identifiable stages (Bergsteiner *et al.*, 2010; Holman *et al.*, 1997). However, scholars also recognize its popularity, wide use in teaching practice, and rarely seen as problematic (Bergsteiner and Avery, 2014; Holman *et al.*, 1997).

Authentic Assessment

As defined by Wiggins (1990), authentic assessment involves directly evaluating student performance on substantial intellectual tasks instead of relying on indirect or simplified assessments that yield valid inferences. Authentic assessments challenge learners to address real-world tasks, ambiguity, and genuine intellectual complexities, thus encouraging them to critically engage with theories, assumptions, and practical applications. This approach views student understanding as the capacity to explore, critique, or extend knowledge, with demonstrated knowledge application and reflective know-how. Authentic assessments are inherently performance-based, requiring students to construct extended responses, complete tasks, or produce tangible products (Koh, 2017).

In this perspective, authentic assessment promotes more sophisticated and effective applications of knowledge, particularly in contextualized problem-solving and decision-making scenarios, thereby nurturing complex and critical thinking (Wiggins, 1990). Moreover, authentic assessments rely on performance standards that mirror real-world competence, incorporating multifaceted scoring systems to evaluate students' achievements (Koh, 2017). Such assessments align with the priorities and challenges in academic disciplines and professional practice, often simulating real-world tests of ability (Picault, 2021).

Authentic assessment comprises crucial principles in pedagogical design (Villarroel *et al.*, 2018, 2019). It incorporates realism by presenting situations or scenarios of real-life or professional contexts, accompanied by pertinent and relevant questions. Additionally, it entails a cognitive challenge aimed at fostering higher-order skills such as knowledge application, decision making, and problem solving. Through authentic assessments, students showcase understanding, retrieve prior knowledge, establish connections between theories and practice, formulate solutions, draw conclusions, and delineate subsequent steps or actions. Lastly, authentic assessment involves evaluative judgment, encouraging students to establish criteria and standards for assessing their own performance, thereby promoting self-regulated learning.

In brief, authentic assessment surpasses traditional methods by being multifaceted and dynamic (Merrett *et al.*, 2023; Wiggins, 2011). Grounded in multiple criteria, it focuses on student's progress toward mastery, presenting realistic, contextualized, and complex intellectual challenges. Unlike fragmented tasks, authentic assessment identifies strengths rather than serving as punitive measures.

Methodology

To address the research question, this study treats GenAI tools as subjects of investigation due to their unique ability to generate human-like responses and engage in seamless conversations with humans (Michel-Villarreal *et al.*, 2023). Previous research in artificial intelligence has demonstrated the feasibility of interviewing GenAI, particularly ChatGPT, to elicit information and insights on various topics (Asch, 2023; Iskender, 2023; Karakose *et al.*, 2023; Tülübaş *et al.*, 2023).

Using GenAI tools as subjects implies co-performing daily practices with users and recognizing their impact on human interactions. This different-from-human perspective acknowledges the reciprocal relationship between humans and objects,

challenging anthropocentric views and providing new insights into things, people, and their practices (Cila *et al.*, 2015; Giaccardi *et al.*, 2016).

A fitting methodological approach for this purpose is “thing ethnography”, which allows for exploring GenAI's interaction and participation in human activities, including their social and cultural dimensions, from the tools' perspective (Giaccardi *et al.*, 2016, 2020). Thing ethnography involves collecting and interpreting things' viewpoints from everyday data and trajectories. It entails stepping into the "shoes" of things, such as GenAI tools, to understand their attributes and experiences. Moreover, in this sense, “interviews with things” can help to access and illustrate the things’ subjectivities and agency by looking at the particular views and contexts of their experience (Chang *et al.*, 2017).

This study considered a research methodology based on interviewing GenAI tools, specifically ChatGPT 3.5, using written conversations. This widely used GenAI conversational chatbot was chosen for its accessibility and performance despite known limitations, such as hallucinations and limited access to internet databases (Mollick, 2023; Rudolph *et al.*, 2023).

The threefold process of interviewing ChatGPT 3.5 included data collection, data organization and analysis, and interpretation (Chang *et al.*, 2017; Huang *et al.*, 2021). In the data collection stage, semi-structured interviews were conducted using a set of questions and themes (King and Horrocks, 2010; Saunders *et al.*, 2007). Additionally, incremental prompting was employed by breaking down the research topic into smaller specific components, one after the other (Eager, 2023; Köhn, 2018). Therefore, interview questions as multiple prompts to ChatGPT 3.5 were used to encourage engagement, clarify concepts, and guide outputs towards desired responses. This process helps the GenAI tool to understand the nuances of a subject matter and focus on complex topics

that require deeper understanding, accuracy, and comprehensiveness in responses. Accordingly, an interview was conducted with Chat GPT 3.5 considering incremental prompts related to understanding experiential learning, authentic assessment, and their relation, and finally, promptings referring to the integration of GenAI tools into experiential learning for authentic assessment and their exemplification. Summing up, the interviewing process considered the following steps.

- (1) Input an initial prompt concerning conceptual clarification on experiential learning to outline the general context and study topic.
- (2) Input an incremental prompt about authentic assessment to gradually provide additional information and guidance to ChatGPT 3.5. This stepwise input provided further information or context.
- (3) Input an iterative refinement prompt based on the generated content to explore the relation between experiential learning and authentic assessment.
- (4) Obtain a comprehensive and contextualized final output by combining the incremental steps regarding the integration of GenAI tools into experiential learning activities for authentic assessment.
- (5) Incorporate user feedback to refine the obtained responses for further exploration, clarification or exemplification.

The second stage involved familiarizing with the collected data and preparing it for analysis. A thematic analysis, informed by the study's theoretical approach (i.e. experiential learning stages) and research questions, was employed to review responses systematically, identifying patterns and similarities (Braun and Clarke, 2006). The analysis themes focused on Kolb's four experiential learning cycle stages and the three authentic assessment principles guiding the integration of GenAI tools into learning activities.

In the final stage, researchers immersed themselves in the perspectives of GenAI tools, interpreting the responses in the context of pedagogical theories to answer the research question. This interpretation aimed to shed light on how GenAI tools could enhance experiential learning for authentic assessment and integrate into HE learning experiences (Giaccardi *et al.*, 2020).

The validity of this study was addressed by considering the animistic nature of GenAI tools and comparing interview results with existing literature (de Zeeuw, 1996; Vahl, 1997; LeCompte and Goetz, 1982) and comparing results with previous work in experiential learning and authentic assessment for operations management education (Montesinos *et al.*, 2023). Reliability was ensured through a step-by-step methodology for consistent data collection and reporting. The limitation of transferability was acknowledged, as GenAI tools' views might not generalize to other contexts or subjects, requiring further data collection and validation (Eisenhardt, 1989).

Results: How ChatGPT 3.5 Responded

This section presents key excerpts from the interviews conducted with ChatGPT 3.5 (see data set at (Salinas-Navarro, 2023)), emphasizing its conceptual grasp of GenAI tools and their relevance to the central research question. These interview extracts have been summarized to elucidate the themes that have emerged during the interaction. In this way, this work seeks to provide a concise, yet comprehensive overview of the insights garnered from these interviews.

By delving into these dialogues, we can gain a deeper understanding of how ChatGPT 3.5 may contribute to the broader discourse on leveraging GenAI for educational enhancement.

A Conceptual Clarification as Explained by ChatGPT 3.5

Three questions were initially prompted for clarification purposes concerning the notions of Kolb's experiential learning and Wiggins' authentic assessment as follows:

- What is Kolb's experiential learning about?
- What is Wiggins' idea of authentic assessment about in learning and teaching activities?
- How can the use of Kolb's experiential learning cycle contribute to authentic assessment?

The provided answers appropriately revolved around those definitions provided in Sections 2.1 and 2.2, which tested ChatGPT 3.5's understanding of the topics. The specific answers are available in the corresponding data set. Overall, ChatGPT 3.5 summarizes the link between experiential learning and authentic assessment as follows:

[...] By integrating Kolb's Experiential Learning Cycle into authentic assessment practices, educators can create a more holistic and effective approach to evaluating students' abilities in real-world contexts, promoting deeper learning, critical thinking, and practical application of knowledge and skills.

The Integration Alternatives of GenAI as Explained by ChatGPT 3.5

Interviewer:

What different alternatives can be identified to integrate GenAI tools into the learning activities associated with each of the four stages of Kolb's experiential learning cycle, all while aligning with the principles of authentic assessment proposed by Biggs and Tang?

ChatGPT 3.5:

Integrating GenAI (Generative AI) tools into learning activities associated with each of the four stages of Kolb's experiential learning cycle while aligning with the principles of authentic assessment proposed by Biggs and Tang offers a comprehensive approach to designing engaging and meaningful learning experiences. Here are alternative methods for each stage:

- Concrete Experience (CE):
 - Scenario-Based Simulations: Create realistic simulations using GenAI tools that immerse students in authentic scenarios related to the course content. Students engage in hands-on experiences that mirror real-world situations, aligning with Biggs and Tang's authentic assessment principles.
 - AI-Enhanced Virtual Field Trips: Utilize AI to enhance virtual field trips or tours by providing interactive elements and real-time information. This allows students to explore real-world environments and gather concrete experiences within a controlled online setting.
 - [...] AI-Enhanced Virtual Reality (VR) Experiences: Create immersive VR experiences using GenAI tools that allow students to explore historically significant places, scientific simulations, or cultural events. Students can interact with the VR environment to gain concrete experiences[...].
 - AI-Generated Scenario Challenges: Use GenAI to generate complex, real-world scenarios or problems students must solve. These scenarios can simulate challenges faced in specific professions or industries, providing concrete experiences for problem-solving [...].
- Reflective Observation (RO):
 - AI-Powered Discussion Forums: Implement AI-powered discussion forums where students engage in reflective discussions on their concrete experiences. AI can assist in moderating discussions, summarizing key points, and providing prompts for deeper reflection.
 - AI-Generated Reflection Prompts: Use GenAI tools to generate personalized reflection prompts based on students' experiences. These prompts can encourage students to think critically about their experiences and align with the principles of authentic assessment by promoting self-reflection.
 - [...] AI-Powered Reflective Journaling: Implement AI-powered journaling platforms that help students reflect on their experiences. AI

can provide prompts based on their concrete experiences, guiding them to deeper reflection.

- Automated Peer Reflection Facilitation: Use AI to facilitate peer reflection by grouping students and generating reflection questions or discussion topics based on their shared concrete experiences [...].
- Abstract Conceptualization (AC):
 - AI-Driven Concept Mapping: Employ AI-driven concept mapping tools that assist students in organizing and synthesizing their abstract conceptualizations. These maps can help students clarify their understanding and connect concepts, aligning with authentic assessment by demonstrating knowledge construction.
 - AI-Generated Conceptual Analysis Tasks: Utilize GenAI tools to generate analytical tasks that require students to apply abstract concepts to real-world problems. AI can provide data or scenarios for analysis, ensuring alignment with both Kolb's, and Biggs and Tang's principles.
 - [...] AI-Generated Conceptual Exercises: Utilize GenAI tools to create abstract conceptualization exercises that challenge students to connect their concrete experiences to theoretical concepts. AI can provide hints and explanations for concept applications.
 - AI-Personalized Conceptual Quizzes: Generate personalized conceptual quizzes based on students' prior concrete experiences. AI adapts quiz questions to align with the abstract concepts they've encountered, providing an assessment of their understanding [...].
- Active Experimentation (AE):
 - AI-Enhanced Project-Based Learning: Implement project-based learning activities where students actively experiment with applying their knowledge and skills to real-world projects. AI can provide project suggestions, resources, and automated feedback aligned with authentic assessment principles.
 - AI-Adaptive Decision-Making Simulations: Create decision-making simulations using AI that challenge students to actively experiment with various strategies. The AI can adjust the scenarios based on students' decisions, providing a dynamic and aligned learning experience.
 - [...] AI-Simulated Experiment Design: Create AI-driven experiment design platforms where students can plan and execute virtual experiments in a controlled environment. AI can provide real-time feedback on experiment design and outcomes.

- AI-Enhanced Project Collaboration: Implement AI tools that assist student teams in collaborative project work. AI can suggest project milestones, identify potential project risks, and help students actively experiment with project management strategies [...].

These alternative methods leverage GenAI tools to enhance learning activities at each stage of Kolb's experiential learning cycle while adhering to Biggs and Tang's principles of authentic assessment:

- Alignment with Real-World Contexts: The use of simulations, virtual field trips, and decision-making scenarios ensure that learning experiences closely mirror authentic, real-world situations, aligning with the authenticity principle of authentic assessment.
- Reflection and Critical Thinking: AI-powered discussion forums, reflection prompts, and concept mapping tools promote reflective observation and abstract conceptualization, encouraging students to think critically about their experiences and construct meaningful knowledge.
- Practical Application: Project-based learning, AI-aided project suggestions, and adaptive simulations facilitate active experimentation, enabling students to apply their learning in practical ways and aligning with authentic assessment's emphasis on practical skills and knowledge application.
- Personalization and Feedback: GenAI tools can provide personalized prompts, recommendations, and automated feedback tailored to individual student needs and alignment with authentic assessment criteria.

By integrating these alternative methods, educators can create dynamic, technology-enhanced learning experiences that align with both Kolb's experiential learning cycle and Biggs and Tang's authentic assessment principles, ultimately fostering deeper understanding and practical skills development.

An Operations Management Example of the Integration of GenAI Tools in Experiential Learning Activities for Authentic Assessment as Explained by ChatGPT 3.5

Interviewer:

Offer a single instance of GenAI tools for an Operations Management course regarding the topic of Lean Healthcare, seamlessly embedded within Experiential Learning Activities, to facilitate Authentic Assessment, spanning across all four stages of the experiential learning cycle.

ChatGPT 3.5:

- **Concrete Experience (CE):** In the first stage, students are immersed in a realistic AI-generated scenario in a virtual healthcare setting. They take on the role of healthcare administrators in a hospital aiming to implement Lean principles to improve patient care. The scenario presents challenges like long patient wait times, inefficient resource allocation, and high operational costs. Students must make decisions to address these issues. For example, they might need to streamline appointment scheduling, optimize staff allocation, and reduce non-value-added activities in the healthcare processes. This scenario provides students with practical experience in applying Lean Healthcare principles.
- **Reflective Observation (RO):** After completing the CE, students move on to the RO stage. Here, they reflect on their decisions and actions during the scenario. They analyze the impact of their choices on patient care, operational efficiency, and cost savings. They consider whether their decisions aligned with Lean Healthcare principles and identify areas for improvement. This reflection encourages critical thinking and helps students gain a deeper understanding of Lean Healthcare concepts and their practical implications.
- **Abstract Conceptualization (AC):** In the AC stage, students dive into the theoretical aspects of Lean Healthcare. They study relevant course materials, explore Lean Healthcare concepts, and examine case studies. Additionally, they use GenAI tools to access a wealth of information, including scholarly articles, guidelines, and best practices related to Lean Healthcare. The GenAI tools provide explanations, definitions, and practical examples to help students develop a comprehensive understanding of Lean Healthcare principles, which they can then apply to their experiential learning.
- **Active Experimentation (AE):** In the final stage, students return to the virtual healthcare scenario. This time, they apply their enhanced understanding of Lean Healthcare principles and employ strategies based on their reflection and conceptualization. The AI-generated scenario challenge may become more complex, requiring them to further optimize healthcare processes. Students make data-driven decisions, implement improvements, and assess their outcomes. GenAI tools are integrated to provide feedback on their actions and offer suggestions for continuous improvement.

Throughout the experiential learning cycle, students receive feedback on their performance, both from the simulation and the AI. This feedback is based on key

Lean Healthcare metrics such as patient wait times, resource utilization, and cost reduction. The combination of experiential learning activities and GenAI tools ensures that students not only acquire theoretical knowledge but also develop practical skills in Lean Healthcare while being assessed in a real-world healthcare context. This holistic approach encourages deep learning and aligns with the principles of authentic assessment.

Interviewer:

In the context of an Operations Management course, specifically focusing on Lean Healthcare, I would like to explore the integration of GenAI tools within Experiential Learning Activities for Authentic Assessment, taking into account all four stages of the experiential learning cycle. I'm seeking detailed learning activities and authentic assessments for each stage of this educational real-world scenario.

ChatGPT 3.5:

Certainly, here's a detailed breakdown of learning activities and authentic assessments for each stage of the experiential learning cycle in the context of an Operations Management course on Lean Healthcare with GenAI tools:

- Concrete Experience (CE):
 - Learning Activities:
 - Virtual Lean Healthcare Simulation: Students enter a virtual healthcare environment where they act as healthcare administrators. They encounter scenarios like patient backlog, inefficient staff allocation, and resource wastage.
 - Decision-Making Tasks: Students must make decisions to address issues in real time, such as optimizing staff schedules, improving patient flow, and reducing inventory waste.
 - Team Collaboration: Collaborative activities where students work as a team to solve immediate issues, fostering teamwork and communication skills.
 - Authentic Assessment:
 - Performance Metrics: Students are assessed based on key performance metrics such as patient wait times, resource utilization, cost savings, and patient satisfaction. These metrics reflect real-world healthcare KPIs.

- Reflection Journals: Students maintain journals to record their experiences, challenges faced, and the decisions they made during the simulation. These journals will be used for reflection and discussion in later stages.
- Team Feedback: Peer assessments and team feedback contribute to the evaluation of teamwork, collaboration, and problem-solving abilities.
- Reflective Observation (RO):
 - Learning Activities:
 - Group Reflection Sessions: Students participate in group discussions where they reflect on their experiences in the simulation. They discuss challenges, successes, and the impact of their decisions.
 - Case Studies: Analyzing real-world case studies related to Lean Healthcare to understand the application of Lean principles in actual healthcare settings.
 - Guided Self-Reflection: Students are provided with reflective prompts or questions to guide their introspection about their decision-making in the CE stage.
 - Authentic Assessment:
 - Reflective Essays: Students write reflective essays or reports based on their journal entries and group discussions, focusing on what they learned and how their perspectives evolved.
 - Case Analysis: Students analyze real-world Lean Healthcare case studies and relate them to their experiences in the simulation, demonstrating their understanding of theory and practice.
 - Peer Review: Peer assessment of reflective essays encourages students to provide constructive feedback to their peers, promoting critical thinking and communication skills.
- *Abstract Conceptualization (AC):*
 - *Learning Activities:*
 - Online Resources: Students use GenAI tools to access academic articles, research papers, and authoritative sources related to Lean Healthcare.
 - Conceptual Workshops: Virtual workshops or lectures that introduce students to Lean Healthcare principles, including

value stream mapping, waste reduction, and continuous improvement.

- Synchronous Discussions: Engaging in online discussions with peers and instructors about the theoretical aspects of Lean Healthcare.
- *Authentic Assessment:*
 - Conceptual Quizzes: Assessing students' understanding of Lean Healthcare concepts through quizzes or knowledge assessments, with questions generated by GenAI tools.
 - Case-Based Assignments: Assignments require students to apply Lean Healthcare concepts to hypothetical scenarios, demonstrating their ability to connect theory to practice.
 - Knowledge Synthesis Papers: Students write papers that synthesize their understanding of Lean Healthcare principles and how these principles apply to real-world healthcare challenges.
- *Active Experimentation (AE):*
 - *Learning Activities:*
 - Return to the Simulation: Students return to the virtual healthcare simulation, armed with their enhanced understanding of Lean Healthcare concepts.
 - Advanced Scenario Challenges: The AI generates more complex scenarios, requiring students to optimize healthcare processes further and apply advanced Lean methodologies.
 - Continuous Improvement: Students implement changes, collect data on their outcomes, and monitor key metrics to assess the effectiveness of their Lean initiatives.
 - *Authentic Assessment:*
 - Performance Metrics and Feedback: Students' actions and decisions in the advanced simulation scenarios are assessed using performance metrics. Feedback is provided by the AI, offering insights into their efficiency and areas for improvement.
 - Process Improvement Reports: Students create reports detailing the changes they implemented, the impact on healthcare operations, and an analysis of their continuous improvement efforts.

- **Peer Evaluation:** Peer evaluations involve students assessing the effectiveness of their teammates' Lean strategies and offering constructive feedback.

This comprehensive approach, seamlessly integrating experiential learning activities with GenAI tools and authentic assessments, ensures that students not only gain a deep theoretical understanding of Lean Healthcare but also develop practical skills that can be directly applied to real-world healthcare scenarios. It also promotes critical thinking, teamwork, and reflection throughout the learning process.

Discussion

Findings on the Conceptual Clarification

The interpretations offered by ChatGPT 3.5 consistently reveal a grasp of Kolb's experiential learning framework. They acknowledge the cyclical nature of the learning process, albeit with varying levels of theoretical depth and illustrative examples. These interpretations underscore the integral role of practical experience, supplemented by reflection, abstract conceptualization, and active experimentation.

The ChatGPT 3.5's explanation of authentic assessment reflects a shared comprehension of its underlying principles. However, it does exhibit differences in terms of depth and exemplification. These explanations emphasize the significance of curriculum and assessment design, and assessing competencies in authentic, real-world contexts, emphasizing the promotion of meaningful learning and the preparation of students for future challenges.

In the context of integrating experiential learning into authentic assessment, ChatGPT 3.5 converges on the idea of comprehensive learning. This highlights student engagement, learning relevance, and the incorporation of real-world experiences and activities aligned with the experiential learning cycle. Additionally, there's an emphasis on the value of reflective practice and the acquisition of real-world skills and lifelong learning. The iterative nature of the experiential learning cycle and authentic assessment

supports continuous feedback and improvement, enabling students to enhance their understanding and skills continually.

Findings on the Integration of GenAI Tools

The insights gathered from the interview shed light on the transformative potential of GenAI tools in redefining learning activities at various stages of the experiential learning process, spanning from concrete experiences to abstract conceptualization and active experimentation. These tools possess the capacity to catalyze deeper learning by stimulating reflective and critical thinking, as well as the development of practical skills. Consequently, integrating GenAI tools into AI-enabled experiential learning can invigorate educational experiences, making them more dynamic and enriching, all while maintaining a focus on authentic assessment.

Delving into the proposals presented by ChatGPT 3.5, this tool can be exceptionally versatile, spanning across multiple stages of the experiential learning cycle and offering a wide array of functionalities. Notably, it highlights possibilities related to personalization, interactive learning elements, feedback mechanisms, reflection processes, dynamic adaptation, real-world applications, support for collaborative learning, and the seamless integration of assessment and evaluation features. These aspects collectively contribute to an enriched experiential learning environment, which can be applied across diverse educational settings. ChatGPT 3.5 provides practical, explicit examples to guide the effective incorporation of these tools into educational settings.

In response to the research question, several alternatives emerged for integrating GenAI tools into learning activities while considering experiential learning and authentic assessment:

- (6) *Comprehensive support for experiential learning:* GenAI tools can seamlessly support AI-enhanced activities across the various stages of the experiential learning cycle. They facilitate the integration of diverse pedagogical approaches and strategies, including adaptive learning, project-based learning, learning challenges, internships, field trips, collaborative learning, journaling, and gamification. Furthermore, these tools cater to individual and group activities, fostering independent and supervised learning, thereby promoting the development of learning outcomes. AI-enhanced activities extend to decision-making, problem-solving, modeling, and simulations, enabling the cultivation of high-level cognitive skills within real-world or simulated scenarios. GenAI tools thus offer an integrative approach to experiential learning activities, aligning them with the authentic assessment of intended learning outcomes.
- (7) *Agents-to-learn-with:* GenAI tools can function as active agents within the learning process, engaging with learners as AI-enabled participants in their educational pursuits. They provide support, feedback, and genuine assessment of learners' accomplishments. This perspective underscores the need for pedagogical interventions to support learners and their interactions with GenAI tools, ultimately enhancing their learning experiences and achievements.

In summary, integrating GenAI tools into experiential learning activities holds great promise for creating dynamic, learner-centered educational experiences and authentic assessment practices. ChatGPT 3.5 stands out for its versatility and practical guidance, making it a valuable instrument in advancing pedagogical innovations. Table 1 succinctly outlines the alignment between the proposed integration of GenAI tools, experiential learning stages, and authentic assessment principles. The table demonstrates

a cohesive correspondence, indicating consistency between the research findings and the underlying theoretical framework.

[Insert Table 1 near here]

Findings on the Operations Management Example

The conceptual example coherently integrated GenAI tools into operations management, aligning with the principles of experiential learning and authentic assessment. Students can engage in a virtual healthcare setting spanning all four stages of the experiential learning cycle. GenAI tools support reflection and provide access to theoretical knowledge and models, fostering critical thinking and practical skill development. The authentic assessment aspect is evident as students make real-world operational decisions within the scenario, and the integration of GenAI tools enhances the assessment's authenticity and encourages complex problem-solving, reflective practice, and continuous improvement. This example demonstrates how GenAI tools can effectively contribute to experiential learning and authentic assessment in an educational context. However, further details on the virtual-generated scenario and specific tasks of each stage are still needed, which require other promptings, investigation, or development. This deficiency may hinder its implementation because of the lack of knowledge or experience of researchers for its development.

There is also a need to validate the examples provided by ChatGPT 3.5. For instance, ChatGPT 3.5 provided a hypothetical instance to create a Virtual Lean Healthcare simulation. However, when asked to develop the simulation, ChatGPT 3.5 acknowledged that there were no specific GenAI tools available that could create such a complex scenario (see dataset (Michel-Villarreal, 2023)):

ChatGPT:

While GenAI tools can assist with generating content and providing information, including simulated scenarios, they are not typically used for creating complex, interactive, and dynamic healthcare simulations that encompass all aspects of ED operations. Instead, dedicated simulation software is more appropriate for such tasks.

Accordingly, we can compare the example above with a previous implementation of experiential learning and authentic assessment in an undergraduate course (Montesinos *et al.*, 2023). This comparison may illustrate the validity of using GenAI tools to support teachers in designing learning experiences and authentic assessments. This implementation occurred in an elective course on hospital management for last-year biomedical engineering undergraduate students. The learning experiences incorporated in this course followed Kolb's experiential learning cycle to improve healthcare operations. Table II shows a comparison of these two possibilities.

[Insert Table II near here]

Some similarities are observed between the GenAI-generated and human-designed learning experiences. First, both involve students in scenario immersions in healthcare settings and ask them to identify challenges and issues that can be potentially solved by implementing lean healthcare principles and tools. Moreover, both ask students to apply the knowledge acquired during the course by proposing countermeasures to the issues identified.

Nevertheless, there are also some differences between the human and GenAI-generated learning experiences. While the human-designed activities involve students in real-life healthcare settings, the GenAI-designed suggests immersing students in virtual environments simulating those settings, which can represent a limitation or an opportunity. Integrating GenAI tools via simulated scenarios can level the playing field for teachers and institutions with scarce resources. These approaches could represent a cost-effective and accessible alternative, making experiential learning and authentic

assessment more attainable, reducing resource-related inequalities and ensuring that all students have equal access to more valuable educational experiences.

The human-designed learning experiences ask students to prepare an implementation plan for the countermeasures proposed above, whereas the GenAI-designed learning experience asks students to implement their proposals in the simulated environment, which can represent an advantage of this approach as students get to see the effects of the proposals they made, furthering their learning.

Limitations

This study encompasses both methodological limitations and ethical concerns that deserve careful consideration.

In methodological terms, the use of thing ethnography to give voice to objects, such as GenAI tools, is underpinned by the assumption of their animistic nature. While GenAI tools can respond in human-like language, potential limitations and biases may exist when regarding them as subjects capable of providing valid responses during interviews. The accuracy and relevance of GenAI responses should be verified through cross-referencing with authoritative sources. Furthermore, it is essential to acknowledge that GenAI responses may only sometimes encompass the full spectrum of opinions and approaches within a given field. The results suggest that while ChatGPT 3.5 responses concerning fundamental notions were generally consistent with the existing literature, differences in detail, scope, and exemplification were observed. While these variations contribute to the research's validity and transferability, responses to research questions demand further empirical investigation in real-world educational contexts.

Regarding using GenAI tools, viewing them as supplementary resources and applying their insights responsibly, focusing on a human-centered and context-specific approach is crucial. Human thinking and expertise remain irreplaceable. Therefore,

GenAI tools should serve as sources of information and feedback to be continuously tested and validated through real-world feedback from students and colleagues. In this sense, staying informed about the latest developments in AI is essential.

In learning terms, the accuracy and reliability of GenAI's responses must be rigorously assessed to prevent misinformation or erroneous guidance provided to students, which can impact their learning experience. There is also a risk of overreliance on GenAI, potentially reducing the depth of critical thinking and problem-solving skills developed.

From an ethical perspective, this work highlights concerns related to the accessibility and inclusivity of GenAI tools for all potential users and issues surrounding data privacy and security in alignment with relevant data regulations. Transparency regarding how GenAI tools are used, and their intended purposes is paramount. Transparency about GenAI's capabilities and limitations should be maintained to avoid unrealistic expectations. These considerations underscore the need for a reflective teaching practice that effectively anticipates and addresses potential risks. An ethical dimension also pertains to the responsible use of GenAI tools, particularly information quality and utilization. GenAI tools must always be applied within the framework of human interpretation, judgment, and decision-making. They should be viewed as supportive resources rather than substitutes for human decisions. The responsible use of GenAI to ensure students retain control of their learning is crucial. In this way, the ethical dimensions of using GenAI tools are upheld, ensuring responsible integration into educational practices.

Future Work

Several critical areas should be further explored to advance the integration of GenAI tools into experiential learning activities and authentic assessment. These directions encompass

validation, application in real-world educational contexts, and the development of clear guidelines to address limitations and ethical concerns.

- (1) *Validation and testing of integration options:* Future research should focus on validating and testing the proposed integration options for GenAI tools in experiential learning and authentic assessment. This involves empirical studies to assess the effectiveness and impact of these integration methods on learning activities, achievements, assessments, and learners. Additionally, exploring the compatibility of GenAI tools with other active pedagogical approaches is essential.
- (2) *Application to real-world educational contexts:* Practical implementation of GenAI tools in real-world educational contexts is imperative. Research should create application cases as instances for further research, discussion, and dissemination. The integration of GenAI tools into teaching and learning activities must be thoroughly investigated in diverse educational settings to uncover practical implications, potential benefits, and limitations that may arise from their use. This real-world application will provide insights into how GenAI tools can be harnessed effectively in educational practices.
- (3) *Ethical considerations and guidelines:* Beyond the academic concerns related to academic integrity, intellectual property, and plagiarism, there is a pressing need to address ethical issues associated with using GenAI tools. Future research should explore new approaches to ensure the reliability, responsible use, accessibility, inclusion, privacy, and security of these tools. Additionally, transparency regarding the purposes and applications of GenAI tools is paramount. This research agenda calls for developing preventive guidelines and

actionable plans to promote the appropriate and ethical use of GenAI tools in education.

In summary, these research directions may contribute to a better understanding of how GenAI tools can enhance experiential learning and authentic assessment while ensuring their responsible and ethical use in education.

Conclusions

This work has illuminated the intricate relationship between GenAI tools and experiential learning for authentic assessment. By integrating GenAI tools within the experiential learning cycle, we have offered valuable insights and practical illustrations in response to the research question.

Our contributions extend far beyond the conventional roles of GenAI tools to serve as catalysts for reflective thinking and as “agents-to-learn-with” in experiential learning activities for authentic assessment. These revelations emphasize the transformative potential of GenAI tools in enhancing the efficacy and effectiveness of teaching and learning. Additionally, it is noteworthy that GenAI tools have the potential to contribute across various aspects of instructional design. These tools can aid in defining learning objectives, intended outcomes, and the overall structure of teaching, learning activities, and assessment methods. Thus, GenAI should be viewed not merely as a tool for isolated tasks but as an integral component of comprehensive educational design, offering support to both teachers and learners while addressing existing concerns and limitations.

Nonetheless, it is essential to recognize the utmost importance of the responsible use of GenAI tools. We must acknowledge the significance of employing GenAI effectively, asking precise questions to avert AI-generated inaccuracies and

misinformation. Furthermore, we must conscientiously address the ethical considerations and potential risks associated with GenAI tools, ensuring that human agency and learning requirements remain at the forefront.

While this work has laid the groundwork for comprehending the promise of GenAI tools in education, we recognize the necessity of further practical implementation and real-world application to validate their contributions to the learning process. This ongoing exploration of GenAI's role in education is pivotal for achieving learning objectives and outcomes while thoughtfully integrating pedagogical approaches that cater to the unique needs of learners. In this ever-evolving educational landscape, the responsible use of GenAI stands as a cornerstone, supporting human interactions and the broader mission of education.

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The authors declare that there is no conflict of interest.

Supplementary Materials

The data set supporting this study is available at:
<https://data.mendeley.com/datasets/68tym5fx9t/2> and
<https://data.mendeley.com/datasets/wwbtfwwfwn/1>

References

- Albert, D. and Li, T. (2023), “Insights from Teaching with AI: How ChatGPT Can Enhance Experiential Learning and Assist Instructors”, *SSRN Electronic Journal*, doi: 10.2139/ssrn.4516801.
- Alemdag, E. (2023), “The effect of chatbots on learning: a meta-analysis of empirical research”, *Journal of Research on Technology in Education*, pp. 1–23, doi: 10.1080/15391523.2023.2255698.
- Amedu, C. and Ohene-Botwe, B. (2024), “Harnessing the benefits of ChatGPT for radiography education: A discussion paper”, *Radiography*, Vol. 30 No. 1, pp. 209–216, doi: 10.1016/j.radi.2023.11.009.
- Asch, D.A. (2023), “An Interview with ChatGPT About Health Care”, *Catalyst Non-Issue Content*, Vol. 4 No. 2, doi: 10.1056/CAT.23.0043.
- Avello-Sáez, D. and Estrada-Palavecino, L. (2023), “ChatGPT and its impact on competence training in occupational therapists: a reflection on academic integrity”, *Cadernos Brasileiros de Terapia Ocupacional*, Vol. 31, p. e3534, doi: 10.1590/2526-8910.ctoen271035342.
- Benkert, C. and van Dam, N. (2015), “Experiential learning: What’s missing in most change programs”, *Operations*, McKinsey & Company.
- Bergsteiner, H. and Avery, G.C. (2014), “The twin-cycle experiential learning model: reconceptualising Kolb’s theory”, *Studies in Continuing Education*, Vol. 36 No. 3, pp. 257–274, doi: 10.1080/0158037X.2014.904782.
- Bergsteiner, H., Avery, G.C. and Neumann, R. (2010), “Kolb’s experiential learning model: critique from a modelling perspective”, *Studies in Continuing Education*, Vol. 32 No. 1, pp. 29–46, doi: 10.1080/01580370903534355.
- Biggs, J. (1996), “Enhancing Teaching through Constructive Alignment”, *Higher Education*, Springer, Vol. 32 No. 3, pp. 347–364.

- Bradberry, L.A. and De Maio, J. (2019), “Learning By Doing: The Long-Term Impact of Experiential Learning Programs on Student Success”, *Journal of Political Science Education*, Vol. 15 No. 1, pp. 94–111, doi: 10.1080/15512169.2018.1485571.
- Braun, V. and Clarke, V. (2006), “Using thematic analysis in psychology”, *Qualitative Research in Psychology*, Vol. 3 No. 2, pp. 77–101, doi: 10.1191/1478088706qp063oa.
- Chang, W.-W., Giaccardi, E., Chen, L.-L. and Liang, R.-H. (2017), “‘Interview with Things’: A First-thing Perspective to Understand the Scooter’s Everyday Socio-material Network in Taiwan”, *Proceedings of the 2017 Conference on Designing Interactive Systems*, presented at the DIS ’17: Designing Interactive Systems Conference 2017, ACM, Edinburgh United Kingdom, pp. 1001–1012, doi: 10.1145/3064663.3064717.
- Chinonso, O.E., Theresa, A.M.-E. and Aduke, T.C. (2023), “ChatGPT for Teaching, Learning and Research: Prospects and Challenges”, *Global Academic Journal of Humanities and Social Sciences*, Vol. 5 No. 02, pp. 33–40, doi: 10.36348/gajhss.2023.v05i02.001.
- Chiu, T.K.F. (2023), “The impact of Generative AI (GenAI) on practices, policies and research direction in education: a case of ChatGPT and Midjourney”, *Interactive Learning Environments*, pp. 1–17, doi: 10.1080/10494820.2023.2253861.
- Cila, N., Giaccardi, E., Tynan O’Mahony, F., Speed, C. and Caldwell, M. (2015), “Thing-Centered Narratives: A study of object personas”.
- Crawford, J., Cowling, M., Central Queensland University, Australia, Allen, K.-A., and Monash University, Australia. (2023), “Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI)”.

Journal of University Teaching and Learning Practice, Vol. 20 No. 3, doi:
10.53761/1.20.3.02.

Eager, B. (2023), "Achieving Better Results from ChatGPT Using Incremental Prompting", *Bron Eager*, available at: <https://broneager.com/incremental-prompting-ai-chatgpt#:~:text=Best%20Practices%20for%20Using%20Incremental%20Prompting%201%20Be,and%20error%20to%20refine%20prompts%20over%20time%20> (accessed 12 January 2023).

Eisenhardt, K.M. (1989), "Building Theories from Case Study Research", *The Academy of Management Review*, Vol. 14 No. 4, p. 532, doi: 10.2307/258557.

Eke, D.O. (2023), "ChatGPT and the rise of generative AI: Threat to academic integrity?", *Journal of Responsible Technology*, Vol. 13, p. 100060, doi: 10.1016/j.jrt.2023.100060.

Escalante, J., Pack, A. and Barrett, A. (2023), "AI-generated feedback on writing: insights into efficacy and ENL student preference", *International Journal of Educational Technology in Higher Education*, Vol. 20 No. 1, p. 57, doi: 10.1186/s41239-023-00425-2.

Fuchs, K. (2023), "Exploring the opportunities and challenges of NLP models in higher education: is Chat GPT a blessing or a curse?", *Frontiers in Education*, Vol. 8, p. 1166682, doi: 10.3389/feduc.2023.1166682.

Geerling, W., Mateer, G.D., Wooten, J. and Damodaran, N. (2023), "ChatGPT has Aced the Test of Understanding in College Economics: Now What?", *The American Economist*, p. 056943452311696, doi: 10.1177/05694345231169654.

Giaccardi, E., Cila, N., Speed, C. and Caldwell, M. (2016), "Thing Ethnography: Doing Design Research with Non-Humans", *Proceedings of the 2016 ACM Conference*

on Designing Interactive Systems, presented at the DIS '16: Designing Interactive Systems Conference 2016, ACM, Brisbane QLD Australia, pp. 377–387, doi: 10.1145/2901790.2901905.

Giaccardi, E., Speed, C., Cila, N. and Caldwell, M.L. (2020), “Things as Co-Ethnographers: Implications of a Thing Perspective for Design and Anthropology”, in Smith, R.C., Vangkilde, K.T., Kjærsgaard, M.G., Otto, T., Halse, J. and Binder, T. (Eds.), *Design Anthropological Futures*, 1st ed., Routledge, London ; New York : Bloomsbury Academic, an imprint of Bloomsbury Publishing, Plc, [2016], pp. 235–248, doi: 10.4324/9781003085188-19.

Hamid, H., Zulkifli, K., Naimat, F., Che Yaacob, N.L. and Ng, K.W. (2023), “Exploratory study on student perception on the use of chat AI in process-driven problem-based learning”, *Currents in Pharmacy Teaching and Learning*, Vol. 15 No. 12, pp. 1017–1025, doi: 10.1016/j.cptl.2023.10.001.

Holman, D., Pavlica, K. and Thorpe, R. (1997), “Rethinking Kolb’s Theory of Experiential Learning in Management Education: The Contribution of Social Constructionism and Activity Theory”, *Management Learning*, Vol. 28 No. 2, pp. 135–148, doi: 10.1177/1350507697282003.

Huang, Y.-C. (Janet), Cheng, Y.-T., Liang, R.-H., Hsu, J.Y. and Chen, L.-L. (2021), “Thing Constellation Visualizer: Exploring Emergent Relationships of Everyday Objects”, *Proceedings of the ACM on Human-Computer Interaction*, Vol. 5 No. CSCW2, pp. 1–29, doi: 10.1145/3479866.

Ifenthaler, D. and Schumacher, C. (2023), “Reciprocal issues of artificial and human intelligence in education”, *Journal of Research on Technology in Education*, Vol. 55 No. 1, pp. 1–6, doi: 10.1080/15391523.2022.2154511.

- Iskender, A. (2023), "Holy or Unholy? Interview with Open AI's ChatGPT", *European Journal of Tourism Research*, Vol. 34, p. 3414, doi: 10.54055/ejtr.v34i.3169.
- Karakose, T., Demirkol, M., Aslan, N., Köse, H. and Yirci, R. (2023), "A Conversation with ChatGPT about the Impact of the COVID-19 Pandemic on Education: Comparative Review Based on Human–AI Collaboration", *Educational Process International Journal*, Vol. 12 No. 3, doi: 10.22521/edupij.2023.123.1.
- Kassens-Noor, E., Durst, N., Decaminada, T. and Parcell, J. (2023), "Experiencing autonomous futures: Engaged learning with next generation technology", *Active Learning in Higher Education*, Vol. 24 No. 1, pp. 21–36, doi: 10.1177/1469787420982546.
- King, N. and Horrocks, C. (2010), *Interviews in Qualitative Research*, SAGE, Los Angeles.
- Koh, J., Cowling, M., Jha, M. and Sim, K.N. (2023), "The Human Teacher, the AI Teacher and the AId-Teacher Relationship", *Journal of Higher Education Theory and Practice*, Vol. 23 No. 17, doi: 10.33423/jhetp.v23i17.6543.
- Koh, K.H. (2017), "Authentic Assessment", *Oxford Research Encyclopedia of Education*, Oxford University Press, doi: 10.1093/acrefore/9780190264093.013.22.
- Köhn, A. (2018), "Incremental Natural Language Processing: Challenges, Strategies, and Evaluation", arXiv, doi: 10.48550/ARXIV.1805.12518.
- Kokoç, M. and Altun, A. (2021), "Effects of learner interaction with learning dashboards on academic performance in an e-learning environment", *Behaviour & Information Technology*, Vol. 40 No. 2, pp. 161–175, doi: 10.1080/0144929X.2019.1680731.

- Kolb, A. and Kolb, D. (2018), “Eight important things to know about The Experiential Learning Cycle”, *AEL* 40, No. 3.
- Kolb, A.Y. and Kolb, D.A. (2017), “Experiential learning theory as a guide for experiential educators in higher education”, *Experiential Learning & Teaching in Higher Education*, Vol. 1 No. 1, pp. 7–44.
- Kolb, D.A. and Fry, R. (1975), “Towards an Applied Theory of Experiential Learning”, in Cooper, C. (Ed.), *Theories of Group Process.*, John Wiley., London, pp. 33–57.
- Kong, Y. (2021), “The Role of Experiential Learning on Students’ Motivation and Classroom Engagement”, *Frontiers in Psychology*, Vol. 12, p. 771272, doi: 10.3389/fpsyg.2021.771272.
- Lalley, J.P. and Miller, R.H. (2007), “The Learning Pyramid: Does it point teachers in the right direction?”, *Education*, Vol. 128, pp. 64–79.
- LeCompte, M.D. and Goetz, J.P. (1982), “Problems of Reliability and Validity in Ethnographic Research”, *Review of Educational Research*, Vol. 52 No. 1, pp. 31–60, doi: 10.3102/00346543052001031.
- Lin, X. (2023), “Exploring the Role of ChatGPT as a Facilitator for Motivating Self-Directed Learning Among Adult Learners”, *Adult Learning*, p. 10451595231184928, doi: 10.1177/10451595231184928.
- Meron, Y. and Tekmen Araci, Y. (2023), “Artificial intelligence in design education: evaluating ChatGPT as a virtual colleague for post-graduate course development”, *Design Science*, Vol. 9, p. e30, doi: 10.1017/dsj.2023.28.
- Merrett, C.G., Adams, J., Johnson, A.W. and Swenson, J.E.S. (2023), “Collaborating with Aviation Museums to Enhance Authentic Assessments for Aerospace Structures”, *ASEE Annual Conference and Exposition, Conference Proceedings*.

- Michel-Villarreal, R. (2023), "Interview with ChatGPT 3.5 on the Integration of GenAI tools into Experiential Learning for Authentic Assessment, an Example of Lean Healthcare in Operations Management Education", Mendeley Data, 13 November, doi: 10.17632/WWBTFWWFWN.1.
- Michel-Villarreal, R., Vilalta-Perdomo, E., Salinas-Navarro, D.E., Thierry-Aguilera, R. and Gerardou, F.S. (2023), "Challenges and Opportunities of Generative AI for Higher Education as Explained by ChatGPT", *Education Sciences*, Vol. 13 No. 9, p. 856, doi: 10.3390/educsci13090856.
- Mollick, E. (2023), "How to use AI to do practical stuff: A new guide. One useful thing", *Oneusefulthing*, 30 March, available at: <https://www.oneusefulthing.org/p/how-to-use-ai-to-do-practical-stuff> (accessed 10 February 2023).
- Montesinos, L., Salinas-Navarro, D.E. and Santos-Diaz, A. (2023), "Transdisciplinary experiential learning in biomedical engineering education for healthcare systems improvement", *BMC Medical Education*, Vol. 23 No. 1, p. 207, doi: 10.1186/s12909-023-04171-x.
- Morris, N.P. (2012), "Teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology. By Diana Laurillard", *British Journal of Educational Studies*, Vol. 60, pp. 448–450.
- Morris, T.H. (2020), "Experiential learning – a systematic review and revision of Kolb's model", *Interactive Learning Environments*, Vol. 28 No. 8, pp. 1064–1077, doi: 10.1080/10494820.2019.1570279.
- Picault, J. (2021), "Don't just read the news, write the news! — A course about writing economics for the media", *The Journal of Economic Education*, Vol. 52 No. 2, pp. 114–127, doi: 10.1080/00220485.2021.1887030.

- Reyes, A. and Zarama, R. (1998), "The process of embodying distinctions - a re-construction of the process of learning", *Cybern. Hum. Knowing*, Vol. 5, pp. 19–33.
- Rudolph, J., Tan, S. and Tan, S. (2023), "ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?", *Journal of Applied Learning & Teaching*, Vol. 6 No. 1, doi: 10.37074/jalt.2023.6.1.9.
- Salinas-Navarro, D. (2023), "Interview with ChatGPT 3.5 on the Integration of GenAI tools into Experiential Learning for Authentic Assessment", Mendeley Data, 11 June, doi: 10.17632/68tym5fx9t.2.
- Salinas-Navarro, D.E., Mejia-Argueta, C., Da Silva-Ovando, A.C. and Garay-Rondero, C.L. (2020), "Going beyond traditional approaches on industrial engineering education", *2020 IEEE Frontiers in Education Conference (FIE)*, presented at the 2020 IEEE Frontiers in Education Conference (FIE), IEEE, Uppsala, Sweden, pp. 1–8, doi: 10.1109/FIE44824.2020.9273891.
- Sane, A., Albuquerque, M., Gupta, M. and Valadi, J. (2023), "ChatGPT Didn't Take Me Very Far, Did It?", *Proceedings of the ACM Conference on Global Computing Education Vol 2*, presented at the CompEd 2023: ACM Global Computing Education Conference 2023, ACM, Hyderabad India, pp. 204–204, doi: 10.1145/3617650.3624947.
- Santos, R.P. dos. (2023), "Enhancing Chemistry Learning with ChatGPT and Bing Chat as Agents to Think With: A Comparative Case Study", arXiv, doi: 10.48550/ARXIV.2305.11890.
- Saunders, M.N.K., Lewis, P. and Thornhill, A. (2007), *Research Methods for Business Students*, 4th ed., Financial Times/Prentice Hall, Harlow, England ; New York.

- Smith, A., Hachen, S., Schleifer, R., Bhugra, D., Buadze, A. and Liebreuz, M. (2023), “Old dog, new tricks? Exploring the potential functionalities of ChatGPT in supporting educational methods in social psychiatry”, *International Journal of Social Psychiatry*, p. 00207640231178451, doi: 10.1177/00207640231178451.
- Stokel-Walker, C. and Van Noorden, R. (2023), “What ChatGPT and generative AI mean for science”, *Nature*, Vol. 614 No. 7947, pp. 214–216, doi: 10.1038/d41586-023-00340-6.
- Tülübaşı, T., Demirkol, M., Özdemir, T.Y., Polat, H., Karakose, T. and Yirci, R. (2023), “An Interview with ChatGPT on Emergency Remote Teaching: A Comparative Analysis Based on Human–AI Collaboration”, *Educational Process International Journal*, Vol. 12 No. 2, doi: 10.22521/edupij.2023.122.6.
- Turney, C.S.M., Robinson, D., Lee, M. and Soutar, A. (2009), “Using technology to direct learning in higher education: The way forward?”, *Active Learning in Higher Education*, Vol. 10 No. 1, pp. 71–83, doi: 10.1177/1469787408100196.
- UNESCO. (2023), *Guidance for Generative AI in Education and Research*, United Nations Educational, Scientific and Cultural Organization, Paris, France.
- Vahl, M. (1997), “Doing Research in the Social Domain”, in Stowell, F.A., Ison, R.L., Armson, R., Holloway, J., Jackson, S. and McRobb, S. (Eds.), *Systems for Sustainability*, Springer US, Boston, MA, pp. 147–152, doi: 10.1007/978-1-4899-0265-8_26.
- Villarroel, V., Bloxham, S., Bruna, D., Bruna, C. and Herrera-Seda, C. (2018), “Authentic assessment: creating a blueprint for course design”, *Assessment & Evaluation in Higher Education*, Vol. 43 No. 5, pp. 840–854, doi: 10.1080/02602938.2017.1412396.

- Villarroel, V., Boud, D., Bloxham, S., Bruna, D. and Bruna, C. (2019), “Using principles of authentic assessment to redesign written examinations and tests”, *Innovations in Education and Teaching International*, pp. 1–12, doi: 10.1080/14703297.2018.1564882.
- Vince, R. (2022), “Reflections on ‘Behind and Beyond Kolb’s Learning Cycle’”, *Journal of Management Education*, Vol. 46 No. 6, pp. 983–989, doi: 10.1177/10525629221114040.
- Volante, L., DeLuca, C. and Klinger, D.A. (2023), “Leveraging AI to enhance learning”, *Phi Delta Kappan*, Vol. 105 No. 1, pp. 40–45, doi: 10.1177/00317217231197475.
- Wiggins, G. (1990), “The Case for Authentic Assessment”, *Practical Assessment, Research, and Evaluation*, University of Massachusetts Amherst, Vol. 2 No. 2, doi: 10.7275/FFB1-MM19.
- Wiggins, G. (2011), “A True Test: Toward More Authentic and Equitable Assessment”, *Phi Delta Kappan*, Vol. 92 No. 7, pp. 81–93, doi: 10.1177/003172171109200721.
- de Zeeuw, G. (1996), “Three Phases of Science: A Methodological Exploration”, *Working Paper 7. Centre for Systems and Information Sciences, University of Humber*, Vol. 7.

Table I. The Integration of GenAI Tools into Experiential Learning Activities for Authentic Assessment.

Experiential learning cycle stage	GenAI Integration	Authentic Assessment
<ul style="list-style-type: none"> Concrete experience (CE) 	AI-enhanced scenarios and simulations to recreate real-world issues or problems.	<ul style="list-style-type: none"> Realism: Alignment with real-world contexts and practical applications Cognitive challenge: Reflection, critical thinking, conceptualization, decision making, and problem solving. Evaluative judgement: Peer review, collaborative reflection, learning personalization and feedback.
<ul style="list-style-type: none"> Reflective observation (RO) 	AI-powered reflection, discussions and journaling to facilitate critical thinking and connect concepts to concrete experiences and previous knowledge.	
<ul style="list-style-type: none"> Abstract conceptualization (AC) 	AI-driven/generated/personalized conceptual analysis, mapping, exercises, and quizzes to clarify understanding and apply, align and connect concepts.	
<ul style="list-style-type: none"> Active experimentation (AE) 	AI-enhanced projects, simulations and experiments to provide feedback and guidance.	

Table II. Comparison of a ChatGPT 3.5 Lean Healthcare Virtual Scenario and a Real-World Learning Experience (own elaboration).

Experiential Learning Stage	ChatGPT 3.5 Lean Healthcare Virtual Scenario	Lean Healthcare, Biomedical Engineering Module
Concrete experience	Students enter a virtual healthcare environment to collaboratively encounter simulated scenarios addressing operational aspects in real time.	Students observed diverse real-world healthcare processes, shadowed relevant stakeholders, and documented their findings concerning quality, time, cost, and safety aspects of operations according to lean principles.
Reflective observation	Students reflect on their experiences in the simulation, analyze actual case studies, and undertake further GenAI prompts to guide their introspection.	Students identified problems or issues in the current situation, analysed root causes, and defined the desired situation by using lean problem-solving principles and tools.
Abstract conceptualization	Students use GenAI tools to access learning resources and further engage in discussions about theoretical aspects.	Students created and proposed lean countermeasures and relevant performance metrics to reach the desired situation.
Active experimentation	Students return to the virtual healthcare simulation,	Students prepared and discussed a deployment plan to guide the

	armed with their enhanced understanding of lean concepts, to continuously improve processes.	adoption of the proposed countermeasures.
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