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Using Generative Artificial Intelligence Tools to Explain and Enhance Experiential Learning for Authentic Assessment

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Abstract: The emergence of generative artificial intelligence (GenAI) requires innovative educational environments to leverage this technology effectively to address concerns like academic integrity, plagiarism, and others. Additionally, higher education needs effective pedagogies to achieve intended learning outcomes. This emphasizes the need to redesign active learning experiences in the GenAI era. Authentic assessment and experiential learning are two possible meaningful alternatives in this context. Accordingly, this article investigates how GenAI can enhance teaching and learning by constructively addressing study situations beyond conventional learning approaches and cultivating high-order skills and knowledge acquisition. This study employs thing ethnography to examine GenAI tools' integration with authentic assessment and experiential learning and explore implementation alternatives. The results reveal insights into creating human-centered and GenAI-enhanced learning experiences within a constructive alignment. Specific examples are also provided to guide their implementation. Our contributions extend beyond the traditional use of GenAI tools as mere *agents-to-write* or *agents-to-answer* questions to become *agents-to-support* experiential learning for authentic assessment. These findings underscore the transformative role of GenAI tools in enhancing teaching and learning efficacy and effectiveness. The limitations in treating GenAI tools as subjects in thing ethnography are acknowledged, with potential for future implementation evaluation.

Keywords: experiential learning; authentic assessment; constructive alignment; generative artificial intelligence; educational innovation; higher education

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1. Introduction

This research-to-practice work refers to using generative artificial intelligence (GenAI) in experiential learning activities for authentic assessment in higher education (HE). This work arises from the current concerns about using GenAI tools in educational activities; the potential risks for academic integrity, intellectual property, and plagiarism; and the adverse effects on students' learning, skill development, and knowledge acquisition.

GenAI is revolutionizing different aspects of daily life, as reported in news media headlines, including professional practice, education, and science, by generating various texts, images, audio, algorithms, or combinations of them [1]. However, GenAI has raised concerns about developing trust in these artifacts, controlling their creation and managing their adoption [2,3].

GenAI can be defined as "the field of science which studies the (fully) automated construction of intelligence" [4]. GenAI involves machine learning and pre-trained large language models based on a large corpus of text data, learning grammar, vocabulary, and various linguistic elements to later generate coherent and contextually relevant human-like

content in response to the complex prompts it receives. Among the specific application tools of GenAI, ChatGPT 3.5 (Chat Generative Pre-Trained Transformer) is the most famous because it was one of the first tools that were made free and easily accessible online [3]. Nonetheless, an improved paid version (Chat GPT 4) is now available.

ChatGPT, for instance, can be used in education to write assignments, articles, and presentation slides; elaborate and answer exams; or solve coursework problems. These possibilities raise concerns given its intellectual transformative power and limitations concerning its information sources, insufficient training, false responses, misleading information, and the potential generation of spam, hate speech, and other harmful associations that might be implicit in its contained data [3]. However, other academic concerns also point to the scientific reliability and ethical implications of knowledge homogenization, rethinking learning outcome assessments and (higher-order) thinking processes [5–7].

Moreover, the use of GenAI should take some considerations, for pedagogical reasons, to prioritize human agency and responsible use [7]. These considerations include contributing to humankind's needs and learning effectiveness; supporting intrinsic (learning) motivation; the technology that humans control; the learning purpose and the learner's profile; and promoting human interactive engagement, higher-order thinking, and human accountability usage and impact. Hence, appropriate GenAI interactions should consider a definition of proper knowledge domain applications, clear outcomes, suitable tools and comparative advantages, users' requirements, human pedagogical methods, and ethical risks.

Some recent research results show that ChatGPT can provide answers in exams that exceed the mean responses of students, which poses a significant challenge to traditional assessment methods in HE [8]. These findings highlight the need to redesign curricula and methods of assessment through, for instance, reintroducing invigilated, in-person assessments, augmenting experience with chatbots, and increasing the prevalence of practical projects that artificial intelligence struggles to replicate well.

Nevertheless, GenAI tools can also enhance student learning by aiding in preparing for and writing assignments and improving their quality and narratives [9]. Using this technology for personalized, self-directed, and adaptive learning and ubiquitous on-demand support is also a potential gain. For example, GenAI tools can provide information and customized learning plans, generate feedback, and offer complementary learning resources to students at any time [10,11].

Previous works on information technology point to its diverse applications to enhance learning effectiveness and efficacy, for instance, by using artificial neural networks to predict academic performance [12]; web-enabled self-regulated learning [13]; games, mixed reality, social media, and other tools for ICT-supported pedagogical practices [14]; and simulation games [15]. However, the use of AI opens new learning enhancement opportunities.

An alternative to using GenAI in education, beyond exams and assignment writing, is building supportive and engaging learning environments that complement traditional pedagogical methods. This proposition can provide a dynamic and interactive platform to foster knowledge acquisition and acknowledge the existing concerns on plagiarism and academic integrity [8,16]. However, this perspective requires effective teacher leadership to guide the adequate use of GenAI tools. Additionally, GenAI can ignite the creation of innovative *authentic assessments* and irreplicable learning experiences by asking students to demonstrate comprehension and apply knowledge to complex and fictitious cases [16]. Authentic assessment refers to examining student performance on worthy intellectual tasks [17].

This learning environment refers to *experiential learning* that goes beyond simple memorization and fosters a deeper understanding of academic subjects through reflective and practical activities [8]. Experiential learning emphasizes what students must do to construct their knowledge and achieve their intended learning outcomes [18]. Therefore, assessments that evaluate higher-level cognitive skills like analysis, creation, and evaluation

can help engage students in meaningful learning experiences while making it more difficult for GenAI tools to deal with them.

Accordingly, GenAI tools can support teachers (or academics) as agents-to-think-with through a constructionist view, fostering more interactive and engaging learning experiences and promoting more profound understanding, critical thinking, and hands-on activities in students' fields [19]. Hence, learning activities and assessment methods should promote higher-level learning, whether teaching in-person or online, that can make a significant impact on students' learning outcomes. With this in mind, there is a pending task for instructional designers and teachers to develop authentic assessment and experiential learning practices using GenAI tools to support students' learning effectively [20].

Accordingly, this work aims to explore alternatives, as actionable recommendations, to carry out experiential learning-based activities and authentic assessments that integrate GenAI tools in HE. By doing so, we intend to answer the following research questions (RQ):

1. (RQ1) What is the interplay between GenAI tools and experiential learning for authentic assessment?
2. (RQ2) What alternatives can be identified for including GenAI tools in learning activities while concurrently considering experiential learning and authentic assessment?

These questions entail (i) a clarification of the notions of authentic assessment and experiential learning using GenAI tools, (ii) establishing a relationship between GenAI tools and experiential learning for authentic assessment, and (iii) investigating alternatives for the use of GenAI tools in specific learning activities.

A working hypothesis is proposed to guide the research process comprising the central notions supporting this work:

Incorporating GenAI tools into learning activities while concurrently considering experiential learning and authentic assessment can help support students' learning effectively.

Following these ideas, this article unfolds in five additional sections. Section 2 reviews the primary conceptual constructs supporting this work: experiential learning, authentic assessment, and constructive alignment. Section 3 covers the methodology of this work by using a *thing ethnography* approach that integrates the conceptual constructs guiding this work to interview GenAI tools. Thing ethnography considers things, which are not objects, but subjects that possess a non-human worldview or perspective to unveil novel insights in the research [21–23]. Section 4 summarizes the results, and Section 5 discusses the results, findings, limitations, and future work. Finally, Section 6 refers to the conclusions of this work amid the research aim and the research questions.

2. Background

Given the existing literature on the use of GenAI tools in education and their contribution to the effective development of student learning outcomes, the concepts of experiential learning and authentic assessment need clarification and integration as the primary conceptual constructs supporting this work.

2.1. Experiential Learning

HE demands pedagogical approaches that consider real-world situations to gain relevant learning and build new capabilities in students for their future professional careers [24]. Moreover, these approaches should allow for long-lasting learning in diverse environments and from multiple perspectives [25].

Accordingly, experiential learning is considered a more effective alternative than any other educational approach for high-impact education as it enhances students' motivation to construct meaningful learning [26]. This type of learning might be seen in terms of experience-based, reflective, and problem-solving activities.

This type of learning requires moving from a knowledge-broadcasting kind of teaching, where students passively sit and listen, to a constructivist alternative in which students learn by thoughtfully executing tasks while being 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 [27]. Hence, experiential learning turns into a first-hand alternative to support active learning.

Experiential learning is widely acknowledged as part of a continuous meaning-making process in specific contexts, whereby students develop an interest in and recognize learning relevance through personal and environmental experiences [28]. Kolb's experiential learning cycle, which involves four stages, including concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE), is the backbone of experiential learning [18]. Each cycle stage depends on its predecessor and follows a continuous logical pattern step by step. CE refers to a new experience or situation that triggers a stimulus to actively engage in a task rather than merely reading or watching. RO is about 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 the reflection. It also includes interpreting and updating experiences from new knowledge. Finally, AE refers to what the learner applies to the outer world. It is also known as the testing stage to apply conclusions to new experiences. Thus, learning comprises intellectual activities that guide learners' actions, whereas practical activities and tasks provide feedback for conceptual knowledge in a specific context.

Approaching learning from this perspective helps to systematize reflective practice for hands-on, meaningful activities in situated real-world scenarios to develop students' learning outcomes [29,30].

2.2. Authentic Assessment

An assessment is authentic when student performance is directly examined on worthy intellectual tasks rather than indirect, proxy, or simplistic substitutes from which valid inferences are made [17]. Authentic assessments enable learners to address realistic tasks, ambiguity, or actual intellectual challenges to judge, clarify, and take purposeful action toward mastery in a learning situation [31]. Therefore, student understanding is seen as the ability to explore, criticize, or extend theories and assumptions, and knowledge is thus displayed as reflective know-how. All authentic assessments are performance assessments because they require students to construct extended responses effectively, perform a task, or produce a product [32].

Consequently, in this view, authentic assessment allows for more sophisticated and effective ways to use knowledge, for instance, in contextualized problem-solving and decision-making situations to develop complex and critical thinking [17,31].

Additionally, authentic assessments use authentic performance standards that are inherent to successful performance (of what students can do), including multifaceted scoring systems disaggregated for judging learning achievements rather than relying on scoring tests [17,31]. Accordingly, authentic assessments should, for instance, require students to mirror the priorities and challenges found in the activities of academic disciplines and professional practice or simulate real-world tests of ability, among others.

Authentic assessment comprises crucial principles in pedagogical design [33,34]. 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 [17,35]. Grounded in multiple criteria, it focuses on students' progress toward mastery, presenting realistic, contextualized, and complex intellectual challenges.

Unlike fragmented tasks, authentic assessment identifies strengths rather than serving as a punitive measure.

2.3. Constructive Alignment

There is a need to articulate the ideas of experiential learning and authentic assessment to provide a structure to interplay with GenAI tools and integrate these into learning experiences and activities. A step forward in this direction can be found in the concept of constructive alignment [36].

If students are to engage in experiential learning for authentic assessment, teachers' fundamental task is to develop suitable learning experiences that are likely to achieve the intended learning outcomes (ILOs) [36–38]. Constructive alignment is based on three central elements: (i) intended learning outcomes (ILOs), (ii) teaching and learning activities (TLAs), and (iii) assessment tasks (ATs). Alignment is achieved by ensuring ILOs reflect the desired learning outcomes, while TLAs facilitate achieving those outcomes, and ATs assess students' attainment of the ILOs. Teaching and learning activities become crucial in accomplishing the requisite ILO verbs, whereas the AT challenge is to show evidence of students' achievements authentically.

Constructive alignment suggests that meaningful learning occurs when students actively construct knowledge and meaning through coherent, authentic, and contextualized experiences. By aligning ILOs, TLAs, and ATs, educators can promote higher-order thinking, deep understanding, and acquiring relevant skills. Overall, this view can help integrate experiential learning and authentic assessment.

This proposition helps to identify the possible interplay of GenAI tools within a structure of constructive alignment in which learning technology enhances pedagogies and extends learning environments [39]. Hence, GenAI tools can be linked to navigate "what to learn", as defined by ILOs, support "how to learn" according to the experiential learning cycle in TLAs, and effectively construct responses, execute tasks, or create products as indicated by ATs in "how to assess learning".

3. Materials and Methods

To address the research questions, this study employs an ethnographic approach to explore the nuances of integrating GenAI into experiential learning for authentic assessment. By treating GenAI tools as active subjects in the research process, the investigation aims to uncover novel possibilities in a still ill-explored field. By leveraging their text processing and generation capabilities, GenAI tools' responses will help us identify innovative alternatives for incorporating GenAI in learning activities.

Ethnographic research considers a cultural lens to the study of people's lives within their multiple formal and informal communities with the aim of observing and analyzing how people interact with each other and with their environment [40]. Ethnography seeks to access the "native's point of view" through the meanings and reports of people. Accordingly, ethnography focuses on interpretation, understanding, and representation. This is a social constructionist research approach in which several descriptions, or versions, of "reality" are considered to provide an authentic description of the world. Therefore, an ethnographic research process involves data collection from different perspectives that represent participants in their own terms and description writing followed by analysis and interpretation [40,41].

In this way, this work considers GenAI tools not merely as objects, but as study subjects, because of their capacity to provide human-like responses and seamlessly engage in conversations with humans [23]. For instance, previous works in artificial intelligence (AI) show the possibility of interviewing ChatGPT for information elicitation or obtaining insights into diverse research topics [42–45].

Using a GenAI tool as a subject that co-performs daily practices with users and impacts their interactions in which it is embedded allows people to engage and converse with it. As humans, we shape objects, and objects shape and transform our practices

reciprocally [46]. Acknowledging this dynamic interaction between people and objects calls for approaches that give both entities recognizable roles in human practices and present new ways of defining and solving problems collectively with things, whose skills and functions are different from those of humans. This perspective challenges anthropocentric assumptions about the world and opens new ways of understanding objects, people, and use practices [21,47].

A plausible method for this purpose can be found in thing ethnography to aid in exploring GenAI's interaction and participation in human activities, social and cultural dimensions, and their impact on society (and education) from their perspective—to give voices to the voiceless. Accordingly, thing ethnography refers to collecting and interpreting things' perspectives from everyday data and trajectories that things provide access to and the theory-based analysis that humans undertake to identify patterns and gain novel insights into their socio-material interactions [21]. Thing ethnography involves stepping into things' shoes to explore the acting out of things' attributes, as in role-playing, to portray and empathize with the elusive "inner life of things" [48]. Cameras, microphones, and sensors are used for thing-centered data collection; however, other alternatives like interviews can be used for this purpose. Generally, ethnographic interviews are conducted within a specific social location and represent an experience with moments of interaction with declarative content [49]. In this sense, *interviews with things*, in thing ethnography, can help to access and illustrate the first-person things' subjectivities and agency by looking at the particular qualities and contexts of their experience [48]. Nevertheless, interviews with things focus on the richness of insights and inspiration generated in the process rather than on the reliability and representativeness of results.

Previous thing ethnography interventions have used different objects and sensors to obtain the perspective of things; however, given chatbots' unique text generation capacities, this work interviews GenAI tools as subjects using written conversations [23].

Currently, some of the largest, most common, and widely used online GenAI conversational chatbots available for text generation are Open AI's ChatGPT 3.5, Google Bard, Microsoft New Bing (version 96.0.1054.43 recently rebranded as Microsoft Copilot), and Anthropic's Claude 1.0. These chatbots are highly regarded because of their usage simplicity, free access, availability, and performance, despite their current limitations such as hallucinations, limited or no access to internet databases, and poor or no use of references [50,51]. Therefore, these four chatbots were selected as interview subjects within this work's ethnography methodology to obtain their perspectives and help answer the research questions. The interview subjects and their URL links are listed in Table 1 below.

Table 1. Interview subjects.

GenAI Tools	Developer	URL
ChatGPT 3.5	OpenAI	https://chat.openai.com (accessed on 16 September 2023)
Claude 1.0	Anthropic	https://genai.works/app/claude (accessed on 16 September 2023)
New Bing/Copilot	Microsoft	https://www.bing.com/new (accessed on 16 September 2023); https://copilot.microsoft.com/
Bard	Google	https://bard.google.com (accessed on 16 September 2023)

The process of interviewing GenAI tools was threefold [48,52]: (i) data collection, (ii) data organization, and (iii) data analysis and interpretation. In the data collection stage, GenAI tools were interviewed on a one-to-one basis using a set of questions and themes to gather data from the perspective of the thing. This study adopted an exploratory semi-structured interview to allow the interviewees to unveil the richness of their views [53] with a degree of structure and flexibility [54]. An interview guide was prepared beforehand regarding experiential learning, authentic assessment, and constructive alignment, in line with the research questions, to direct the interviewees' responses, giving transparency and reliability to the interviewing process (see Appendix A). Nevertheless, probes were included as part of a non-standardized semi-structured interviewing process to provide flexibility

to the interaction with the GenAI tools and allow for further exploration of significant responses deemed for the research topic [55]. Probing is adopted to seek clarification for unclear words or phrases, complete stories the interviewer thought were unfinished, and encourage engagement with the interviewee [56].

The second stage involved becoming familiar with the collected data set and preparing and organizing it for their analysis and reporting. This stage in this work consisted of a thematic analysis driven by the supported theoretical approach and the research questions (see Section 1), which deductively informed about the necessary codes and themes for collating and grouping data [57]. Hence, GenAI tools' text answers were reviewed to understand and empathize with the thing's perspective, and they were prepared/collated in formats to categorize data systematically and to identify and report similarities, coincidences, or patterns that helped to provide a compelling argument concerning the supporting evidence.

Finally, in the last stage, the researchers interpreted data by taking an immersive exploration into the inner perspective of things and making sense of it through pedagogical theories. The researchers linked, at this stage, the analysis of the first-person view of things to the research questions to provide answers and create insights that can shed light on the relationships between objects and human practices and present new ways of defining and solving problems collaboratively with things [46]. This view refers to expanding the alternatives for understanding the possible use of GenAI tools to enhance experiential learning for authentic assessment and their integration into learning experiences in HE.

As for ethnographic studies [58–61], this work addresses the research criteria of validity by proposing a thing ethnography methodology that acknowledges the animistic nature of GenAI tools. This approach considers the access to their perspectives and reaches consistent interpretations when comparing interview results with the existing body of literature. Moreover, reliability is addressed by providing a step-by-step methodology that consistently allows for the subsequent collection, usage, and reporting of data from different chatbots. It also considers data accuracy in comparing deviations in prompts (of different GenAI tools) of the various research studies [62]. Regarding transferability, as generalizability, this research study's findings might not apply to other contexts, situations, times, and populations, as GenAI tools' views can differ from other subjects in their opinions (for example, they might not answer the same) as well as in their contextual conditions or circumstances, leading to different results and interpretations [63]. This limitation requires further data collection and validation, as in Popper's idea of falsification [59,64].

4. Results

The extracts of the interviews with ChatGPT 3.5, Google Bard, Microsoft New Bing, and Anthropic's Claude regarding the conceptual understanding of the GenAI tools and the research questions are presented here. The interview extracts were summarized in tables, and emerging themes were identified accordingly.

Questions involving the fundamental concepts guiding this work were prompted to the four selected GenAI tools to test their "understanding" of the topics. Despite these questions and answers not being a central part of this work, they illustrate the capability of the tools to build sensible and well-informed responses.

4.1. Conceptual Clarification: GenAI Responses Regarding Experiential Learning, Authentic Assessment, and Constructive Alignment

GenAI responses to the questions regarding (i) experiential learning, (ii) authentic assessment, (iii) constructive alignment, and (iv) Kolb's cycle contribution to authentic assessment are as follows.

The answers of the four GenAI tools to the question concerning Kolb's experiential learning (What is Kolb's experiential learning about?) provide a standard and complementary definition and descriptions of the stages of the learning cycle as the main themes. Further descriptions of experiential learning regarding definitions and the learning cycle stages were provided by the GenAI tools in the interviews.

Similar and complementary answers were obtained for the following question regarding the assessment of learning outcomes in real-world scenarios by effectively applying knowledge and skills: what is Wiggins' idea of authentic assessment about in learning and teaching activities? The main emerging themes in this case were the authentic assessment concept, principles, examples, and benefits. A summary of the responses to the question, including further details on authentic assessment principles, was provided during the interviews.

The four GenAI tools provided consistent and complementary descriptions regarding the following question: what is Biggs and Tang's notion of constructive alignment concerning the pedagogical design of learning and teaching activities? They all pointed to the effective alignment of ILOs, TLAs, and ATs. The identified emerging themes consisted of the constructive alignment concept, a description of the key components, and benefits.

Finally, the four GenAI tools also consistently answered the following question: how can the use of Kolb's experiential learning cycle contribute to authentic assessment? Answers were obtained regarding the four stages of the experiential learning cycle and their contribution to authentic assessment, including descriptions, activities, contributions, and examples as the main emerging themes.

Overall, the four GenAI tools provided answers that match the existing scholarly literature on the referred topics, considering definitions, characteristics, components or elements, benefits, and examples. Hence, all GenAI tools interviewed offered appropriate and reliable descriptions.

4.2. The Interplay of GenAI Tools and Experiential Learning for Authentic Assessment

Regarding the following question, the emerging themes referred to AI-enriched ILO formulation and definition through the integration of GenAI tools: how can GenAI tools be used for the formulation of intended learning outcomes within the framework of Biggs and Tang's constructive alignment? As this question is more open to interpretation, the interviewees' (i.e., GenAIs) answers covered different issues. The most completed response was elaborated by ChatGPT 3.5, which indicated that "[b]y leveraging GenAI tools in the formulation of intended learning outcomes, educators can streamline the process, promote alignment with teaching and assessment strategies, and ensure that the learning outcomes are clear, measurable, and conducive to meaningful learning experiences". A summary of the themes and suggestions is presented in Table 2 concerning the integration alternatives for ILO formulation.

Some practical, relevant instances provided by Gen AI tools are listed below to offer practical guidance in their use:

- ChatGPT 3.5: Incorporating higher-order thinking.
    - "Scenario: An educator aims to foster higher-order thinking skills in their course".
    - GenAI assistance: The educator uses the GenAI tool to generate ILOs that align with Bloom's Taxonomy levels, ensuring that students engage in critical thinking and analysis. For example: "Evaluate the ethical implications of X" or "Analyze and synthesize competing theories in the field of Y".
- Microsoft New Bing: "[. . .] Content Generation: Let's say one of the learning outcomes for a computer science course is "Students should be able to understand and explain the concept of binary search trees". A GenAI tool could generate a detailed explanation of binary search trees, including their structure, operations, and use cases. This content could then be used as part of the course materials [. . .]".
- Anthropic Claude: "Translate outcomes into student-friendly language—Make learning outcomes clearer for students using simplification, analogies, and examples".

Table 2. The use of GenAI tools in the formulation of ILOs for constructive alignment *.

AI-Enriched ILO Formulation	GenAI Tools	Integration Alternatives
Content generation	ChatGPT 3.5 and Microsoft New Bing	Offer diverse sets of content outcomes for consideration related to a specific topic or subject area
Summarize standards, competencies, and goals from curriculum documentation	Anthropic Claude 1.0	Digest diverse reference materials and identify key learning aims
Alignment suggestions	ChatGPT 3.5	Analyze ILOs and provide alignment suggestions
Customization for diverse learners	ChatGPT 3.5	Create customized ILOs, using input parameters, tailored to specific courses or learner groups
Multidisciplinarity	ChatGPT 3.5	Integrate and bridge different subject areas and competencies from various domains
Language refinement	ChatGPT 3.5 and Anthropic Claude 1.0	Refine the language of ILOs to make them more precise, measurable, student-friendly, and aligned with assessment criteria
Diversity	ChatGPT 3.5	Provide a broad range of ILOs, ensuring that the learning outcomes cover various cognitive levels and different aspects of learning
Examples and templates	ChatGPT 3.5	Provide examples and templates for ILOs, making it easier to create clear and effective learning outcomes
Assessment-driven ILOs	ChatGPT 3.5	Help educators create ILOs that are closely aligned with the chosen assessment tools and criteria
Feedback and iteration	ChatGPT 3.5	Provide feedback on ILOs, suggesting improvements and offering insights into alignment issues
Alignment with real-world applications	ChatGPT 3.5	Emphasize the application of knowledge in authentic contexts to increase learning relevance
Adaptation to learners' needs	ChatGPT 3.5	Dynamically adjust ILOs based on individual learner profiles, meeting their specific needs and abilities

* Obtained from extracts of diverse answers provided by GenAI tools during their interviews.

Two tools (i.e., ChatGPT 3.5 and Microsoft New Bing) provided sophisticated answers consisting of a hypothetical learning space and well-intended TLAs.

Moreover, emerging themes found in the responses to the question regarding integration (how can GenAI tools be integrated into teaching and learning activities while taking into account Kolb's experiential learning cycle and Biggs and Tang's constructive alignment?) refer to suggested AI-enhanced TLAs through integrating GenAI into diverse, active pedagogical approaches and experiential learning in line with ILOs. Again, ChatGPT 3.5 provided the most comprehensive answer, claiming that "GenAI tools can [. . .] assist educators in designing personalized, aligned, and engaging learning experiences that cater to individual learning styles while promoting reflective practice, real-world application, and continuous improvement in line with the principles of these two educational frameworks". A summary of the themes and examples can be found in Table 3 regarding the integration of GenAI tools into TLAs.

Some relevant examples of how GenAI tools can be applied at various stages of the teaching and learning process are described as follows:

- ChatGPT 3.5: Dynamic problem-solving challenges.
    - "Kolb's Influence: To encourage active experimentation and provide students with dynamic problem-solving challenges that evolve as they make decisions. GenAI can help create adaptive problem scenarios.
    - Constructive Alignment: Make sure that the problem-solving challenges align with the ILOs and assessment methods. AI can adjust the challenges based on the desired learning outcomes and provide feedback on students' problem-solving strategies".

- Google Bard: "A science teacher might use a GenAI tool to generate a realistic simulation of a scientific experiment. This would allow students to have a concrete experience of the experiment and then reflect on their results. The teacher could then use the GenAI tool to generate concept maps or other visualizations to help students understand the abstract concepts involved in the experiment".
- Anthropic Claude: Business—Marketing.
  a. "Student teams develop a social media marketing campaign for a product launch (collaborative project).
  b. An AI reviews their initial draft and provides feedback on how well their ideas align with marketing best practices and campaign objectives (constructive alignment).
  c. Students post campaign ideas to a simulated social platform and analyze user reactions (active experimentation).
  d. An AI bot plays the role of target users responding to their posts and ideas".

Table 3. The integration of GenAI tools into TLA considering experiential learning and constructive alignment *.

AI-Enhanced TLAs	GenAI Tools	GenAI Tools Integration
Realistic case studies	ChatGPT 3.5 and Microsoft New Bing	Help create challenging scenarios as concrete experiences for reflective and hands-on learning
Simulations or virtual labs for active experimentation	ChatGPT 3.5, Microsoft New Bing, and Anthropic Claude 1.0	• Design and customize simulations to match desired learning outcomes • Apply students' knowledge and skills in a controlled, interactive environment GenAI plays a role in simulations, responding dynamically based on student actions
Personalized learning pathways	ChatGPT 3.5, Google Bard, Microsoft New Bing, and Anthropic Claude 1.0	Recommend individualized content and activities that align with each student's progress through the experiential learning cycle
Storytelling and narrative learning	ChatGPT 3.5 and Anthropic Claude 1.0	Create narrative-driven learning activities or scenarios that immerse students in the subject matter as concrete experiences
Dynamic problem-solving challenges that evolve	ChatGPT 3.5	• Create adaptive problem scenarios as students make decisions to encourage active experimentation. Adjust challenges to desired learning outcomes and provide feedback on students' problem-solving strategies
Interactive group discussions on complex topics	ChatGPT 3.5 and Google Bard	• Facilitate these discussions by providing discussion prompts and relevant resources. • Assist in generating discussion questions that encourage critical thinking and reflection
Multimedia-rich learning resources	ChatGPT 3.5	Suggest diverse multimedia resources that complement the learning objectives at different stages of Kolb's cycle
Interactive gamification learning activities	ChatGPT 3.5	Design interactive gamified learning activities that offer students concrete experiences and challenges to solve within a game-based environment
Collaborative projects	ChatGPT 3.5, Google Bard, and Anthropic Claude 1.0	• Assist teams by providing research resources, suggesting project milestones, and facilitating collaboration • Help teams reflect on their progress and apply course concepts to practical project tasks

Table 3. *Cont.*

AI-Enhanced TLAs	GenAI Tools	GenAI Tools Integration
Adaptive prompts, questions, or quizzes	ChatGPT 3.5, Microsoft New Bing, and Anthropic Claude 1.0	• Adjust the difficulty level of questions based on the student's progress through the learning cycle and alignment with course objectives • Promote active experimentation to test knowledge, promote reflection, and receive feedback
Virtual field trips and tours	ChatGPT 3.5	Virtual immersive experiences related to course materials, enhanced with additional information, interactive elements, and reflection prompts
Peer review and feedback	ChatGPT 3.5	Facilitate the peer-review process by providing guidelines and facilitating reflection, experimentation, and the exchange of feedback among students
Interactive simulations to experiment with abstract concepts	ChatGPT 3.5	Provide hints and explanations within the simulations to help students understand and apply these concepts
Adaptive reading lists	ChatGPT 3.5	Recommend readings based on students' progress and preferences
Multimodal learning pathways	ChatGPT 3.5	Suggest multimedia resources to enhance engagement based on students' preferences and alignment with learning objectives
Real-time feedback	Google Bard	Provide real-time feedback for student work improvement
Supporting blended learning	Google Bard	Provide access to online resources that supplement face-to-face instruction
Facilitating lifelong learning	Google Bard	• Provide access to resources and opportunities to learn new things • Create a personalized learning dashboard that tracks progress and recommends new learning opportunities
Conceptual model development	Anthropic Claude 1.0	• Assist in creating models to represent key course concepts • Review models and give feedback on accuracy, completeness, and areas needing improvement

* Obtained from extracts of diverse answers provided by GenAI tools during their interviews.

In this case, Anthropic Claude provided one of the most elaborated trains of ideas by providing a TLA, with the point of intervention where a GenAI could contribute to supporting the T&L process.

The emerging themes established by the responses to the question regarding the employment of GenAI tools (how can GenAI tools be employed to facilitate Wiggins' authentic assessment methods while considering Biggs and Tang's constructive alignment?) refer to suggested AI-enabled assessment methods involving higher-order skills; active, hands-on tasks; enriched rubrics; and real-world-like scenarios. ChatGPT 3.5 indicated that "[b]y integrating GenAI tools into the authentic assessment process, educators can create assessments that align with the ILOs and teaching strategies and leverage AI's capabilities for automation, personalization, and feedback generation. This approach ensures that assessment methods effectively measure students' ability to apply their learning in real-world contexts [. . .]". A summary of the integration of GenAI tools for assessment methods is presented in Table 4.

Table 4. The use of GenAI tools to facilitate authentic assessment considering constructive alignment *.

AI-Enabled Assessment Methods	GenAI Tools	GenAI Tools Integration
Generating real-world problem-solving scenarios	ChatGPT 3.5, Microsoft New Bing, and Anthropic Claude 1.0	• Create authentic, complex problem-solving scenarios that align with the ILOs • Generate scenarios that require students to apply their knowledge, problem-solving, and critical thinking skills • Provide students with access to case studies, data, and simulations
Automated peer review with AI-assisted feedback	ChatGPT 3.5 and Google Bard	• Implement AI-supported peer review systems that streamline the peer assessment process • Assist in providing feedback templates and suggestions for constructive comments
Adaptive scenario-based assessments	ChatGPT 3.5	Develop adaptive scenario-based assessments where AI adjusts the scenarios and questions based on students' responses
AI-enhanced portfolio assessment	ChatGPT 3.5, Google Bard, and Anthropic Claude 1.0	• Help students organize their work, provide feedback, and track their progress • Examines student portfolios for evidence of skill development and growth over time, mapping artefacts to intended learning outcomes
Simulations and interactive virtual labs with AI feedback	ChatGPT 3.5 and Google Bard	• Create virtual labs where students can conduct experiments • Provide real-time feedback on their actions, ensuring alignment with the ILOs and helping students refine their practical skills
Natural language processing (NLP) for essay evaluation	ChatGPT 3.5	• Implement NLP-powered tools to evaluate essays • Analyze the alignment of the essay content with the ILOs and provide feedback on the clarity and coherence of students' arguments
AI-generated project challenges	ChatGPT 3.5 and Google Bard	• Generate project challenges that align with the ILOs • Suggest project topics, requirements, and criteria, ensuring that they align with the intended learning outcomes • Help students collaborate on projects, gather data, and create presentations
Adaptive quizzes with immediate feedback for formative self-assessment	ChatGPT 3.5 and Anthropic Claude 1.0	• Create adaptive quizzes with AI that adjust question difficulty based on students' alignment with the ILOs • Provide immediate feedback for each question, aligning with the assessment criteria
Scenario-based role-play assessments	ChatGPT 3.5	• Generate role-play scenarios that align with the ILOs • Guide how students' performance aligns with the assessment criteria and the constructive alignment framework
Creating assessment rubrics	Microsoft New Bing and Anthropic Claude 1.0	Create rubrics for learning outcome achievements
Competency-based assessment	Anthropic Claude 1.0	Review student work products, like reports, designs, presentations, etc., and provide feedback on how well they demonstrate mastery of core competencies for the field or profession
Automated scoring	Anthropic Claude 1.0	Assist by automating routine scoring while teachers focus on higher-order evaluation and feedback

* Obtained from extracts of diverse answers provided by GenAI tools during their interviews.

Some practical examples offered by GenAI tools concerning the proposals in Table 4 are listed below:

- Chat GPT 3.5: Adaptive scenario-based assessments.
  - "Biggs and Tang's Constructive Alignment: Create assessments that adapt to students' progress and align with the ILOs.
  - GenAI Facilitation: Develop adaptive scenario-based assessments where AI adjusts the scenarios and questions based on students' responses. AI ensures that each student's assessment experience is tailored to their alignment with the ILOs".
- Google Bard: "A business teacher might use a GenAI tool to generate a realistic simulation of a job interview. This could be used to assess students' communication and interview skills".
- Microsoft New Bing: "Creating Rubrics: For a course on public speaking with a learning outcome of "Students should be able to deliver a persuasive speech", a GenAI tool could create a rubric that assesses various aspects of public speaking, such as clarity of speech, strength of argument, and audience engagement".
- Anthropic Claude: History class.
  a. "Students participate in a roleplay simulation acting as historic figures (performance-based).
  b. An AI assesses their ability to accurately portray the figures based on provided profiles (competency-based).
  c. Students self-reflect on their decisions and strategies in character (formative self-assessment). The AI reviews reflections and provides feedback".

In this case, all of the GenAI tools provided refined responses that were helpful to answer this challenging question.

4.3. The Use of GenAI Tools in Learning Activities for Authentic Assessment

Responses to the question regarding alternatives to integrate GenAI tools (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?) involve themes concerning integrating GenAI tools into each experiential learning stage with specific AI-enhanced activities that promote concrete experiences, reflection, conceptualization, and practical learning. According to ChatGPT 3.5, integrating GenAI tools can enhance experiential learning while adhering to the principles of authentic assessment, namely, alignment with real-world contexts, reflection and critical thinking, practical application, and personalization and feedback. A summary is presented in Table 5 concerning the integration of GenAI tools into AI-enhanced learning activities at each stage of the experiential learning cycle.

Two integrated examples, provided by GenAI tools, are presented below to guide their implementation:

- ChatGPT 3.5:
  - Concrete experience (CE): "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".
  - Reflective observation (RO): "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".

- 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".
- Active experimentation (AE): "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".

- Anthropic Claude: Business course—negotiation skills:
  a. Students roleplay a business negotiation against an AI bot playing the negotiation partner (concrete experience).
  b. The AI assesses the negotiation strategy and adapts its responses to drive reflection (reflective observation).
  c. Students write a report applying negotiation theory to analyze the experience (abstract conceptualization).
  d. The AI reviews the report based on the rubric criteria tied to the learning outcomes (authentic assessment).

The previous two examples from ChatGPT 3.5 and Anthropic Claude show the ability of GenAI tools to provide functional answers to complex questions concerning T&L challenges.

Table 5. The use of GenAI tools to facilitate authentic assessment considering constructive alignment *.

Experiential Learning Stage	GenAI Tools	AI-Enhanced Learning Activities	GenAI Tools Integration
Concrete experience	ChatGPT 3.5 Microsoft New Bing, Google Bard, and Anthropic Claude 1.0	AI-generated scenario-based simulations	• Create realistic simulations that immerse students in authentic scenarios related to the course content • AI dynamically adjusts parameters and situations in an immersive virtual environment in response to student actions
	ChatGPT 3.5 and Google Bard	AI-enhanced virtual field trips	Create enhanced virtual field trips or tours by providing interactive elements and real-time information
	ChatGPT 3.5	AI-enhanced virtual reality (VR) experiences	Create immersive VR experiences that allow students to historically explore significant places, scientific simulations, or cultural events
	ChatGPT 3.5 and Bard	AI-generated scenario challenges	Generate complex, real-world scenarios or problems that simulate challenges faced in specific professions or industries for problem solving
	Google Bard	Gamified learning	Create gamified learning experiences that make learning fun and engaging
	Anthropic Claude 1.0	AI adaptive tutoring and chat box	Provide personalized guidance and questioning in simulations and AI roleplaying

Table 5. *Cont.*

Experiential Learning Stage	GenAI Tools	AI-Enhanced Learning Activities	GenAI Tools Integration
Reflective observation	ChatGPT 3.5	AI-powered discussion forums	• Engage students in reflective discussions on their concrete experiences • Assist in moderating discussions, summarizing key points, and providing prompts for deeper reflection
	ChatGPT 3.5, Microsoft New Bing, and Anthropic Claude	AI-generated reflection prompts	Generate personalized reflection prompts based on students' experiences to think critically about their experiences and promote self-reflection
	ChatGPT 3.5, Google Bard, and Anthropic Claude	AI-powered reflective journaling	Help students reflect on their experiences, guiding them to deeper reflection
	ChatGPT 3.5 and Google Bard	Automated peer reflection facilitation	Facilitate peer reflection by grouping students and generating reflection questions or discussion topics based on their shared concrete experiences
	Google Bard and Anthropic Claude	Self-assessment	Create self-assessment tools that listen, ask follow-up questions, and help students track their progress and identify areas where they need to improve
Abstract conceptualization	ChatGPT 3.5 and Microsoft New Bing	AI-generated conceptual exercises	Create abstract conceptualization exercises that challenge students to connect their concrete experiences to theoretical concepts by providing hints and explanations
	ChatGPT 3.5	AI-personalized conceptual quizzes	Generate personalized quiz questions to align students' prior concrete experiences with the abstract concepts they have encountered, providing an assessment of their understanding
	ChatGPT 3.5 and Google Bard	AI-driven concept mapping	Employ AI-driven concept mapping tools that assist students in organizing and synthesizing their abstract conceptualizations to clarify their understanding
	ChatGPT 3.5	AI-generated conceptual analysis tasks	Provide data or scenarios for analysis to apply abstract concepts to real-world problems
	Google Bard	AI mnemonic devices	GenAI tools can be used to create mnemonic devices that help students remember important information
	Google Bard	AI modeling	GenAI tools can be used to create models that help students understand abstract concepts
Active experimentation	ChatGPT 3.5 and Google Bard	AI-enhanced project-based learning	Provide real-world project suggestions, learning resources, and automated feedback
	ChatGPT 3.5 and Google Bard	AI-adaptive decision-making simulations	• Create decision-making simulations to actively experiment with various strategies • Adjust scenarios based on students' decisions, providing a dynamic and aligned learning experience

Table 5. *Cont.*

Experiential Learning Stage	GenAI Tools	AI-Enhanced Learning Activities	GenAI Tools Integration
Active experimentation	ChatGPT 3.5	AI-simulated experiment design	• Create AI-driven experiment design platforms to execute virtual experiments in a controlled environment. • Provide real-time feedback on experiment design and outcomes
	ChatGPT 3.5	AI-enhanced project collaboration	Suggest project milestones, identify potential project risks, and help students actively experiment with project management strategies
	Google Bard	Internships	Connect students with internship opportunities to gain real-world experience in their field
	Microsoft New Bing	AI decision-making scenarios	Create new scenarios for decision making where students can apply their knowledge and validate their learning

* Obtained from extracts of diverse answers provided by GenAI tools during their interviews.

5. Discussion

To answer the research questions, a discussion in this section delves into an exploration of experiential learning, authentic assessment, and constructive alignment; the interplay of GenAI tools with experiential learning for authentic assessment; and alternatives for integrating these tools in teaching and learning practice. Additionally, limitations and future work are examined to delimit the contributions of this work.

5.1. Conceptual Clarification of Experiential Learning, Authentic Assessment, and Constructive Alignment as Explained by GenAI Tools

The interpretations provided by the four GenAI tools to increasingly complex questions show a common understanding of Kolb's experiential learning. Their level of abstraction recognizes the cyclical nature of the learning process; however, the four tools present different depths in the theoretical construct and detail in the implementation. In summary, the four tools can offer practical experiences complemented by reflection, abstract conceptualization, and active experimentation.

The explanations of authentic assessment provided by the GenAI tools demonstrate a shared understanding of its principles and purpose, but also with different levels of detail and exemplification. These explanations emphasize the importance of assessing students' abilities in real-world contexts, promoting meaningful learning and preparing students for future challenges. Moreover, they highlight the need for its practical implementation in educational settings for curriculum design, assessment design, and the role of teachers in facilitating authentic assessment.

Regarding constructive alignment, the different interpretations of GenAI tools also reveal a shared understanding of its principles and significance in pedagogical design. Constructive alignment is a valuable framework for creating coherent, aligned, student-centered learning experiences to construct knowledge through students' active engagement. Again, different and complementary levels of detail and examples were provided.

Lastly, concerning integrating experiential learning into authentic assessment, the shared interpretations of the GenAI tools refer to comprehensive learning, student engagement, and learning relevance by incorporating real-world experiences and activities aligned with the learning cycle. Additionally, there is an emphasis on reflective practice and the acquisition of real-world skills, which prepares students for their future careers and lifelong learning. The iterative nature of both the cycle and authentic assessment supports

continuous feedback and improvement, ensuring that students can continually refine their understanding and skills.

Summing up, GenAI tools can help understand pedagogical theories by providing clear definitions, explanations, and practical applications from diverse perspectives. Educators, researchers, and learners can leverage these insights to create more meaningful and effective student-centered learning experiences. However, each GenAI tool offers unique perspectives, depth of understanding, and strengths. While ChatGPT 3.5 mainly provides comprehensive explanations, including definitions, principles/elements, and practical guidance, Google Bard emphasizes practical aspects and real-world applications, New Bing focuses on clarifying theories and concepts, and Anthropic Claude highlights goals and principles.

5.2. Findings on the Interplay of GenAI Tools and Experiential Learning for Authentic Assessment

The relationship between GenAI tools, authentic assessment, and experiential learning has been explored according to the structure of constructive alignment as an alternative to guide and articulate their integration effectively. Accordingly, this discussion is threefold, covering the constructive alignment structure of ILOs, TLAs, and ATs in the following subsections.

5.2.1. The Use of GenAI Tools in the Formulation of ILOs for Constructive Alignment

Referring to the interview results in Table 2, integrating GenAI tools into the formulation and definition of ILOs offers support in content generation, customization, alignment, and language refinement, promoting personalized and learner-centric education. This view provides the possibility of improving the quality and pertinence of ILOs. Moreover, these tools facilitate ILO formulation by enriching their multidisciplinarity, diversity, and the application of knowledge in real-world contexts, all of which are essential aspects of constructive alignment. ILO feedback and iterative improvements are also encouraged, fostering ongoing quality enhancement in education.

The differences in the proposed integration of GenAI tools for ILO formulation mainly revolve around the tools' unique functions and strengths. For instance, ChatGPT 3.5 excels in most proposals, especially in context generation, customization, and adaptability; New Bing focuses on context generation; while Anthropic Claude emphasizes the analysis of existing content. Google Bard does not provide a particular distinctive answer on this topic. On the other hand, similarities include content generation, alignment support, language refinement, and adaptation to learners' needs. However, they all provide various possibilities for integrating GenAI tools for ILO formulation (see Table 2).

5.2.2. The Integration of GenAI Tools into TLA Considering Experiential Learning and Constructive Alignment

Integrating GenAI tools into TLA offers alternatives to designing AI-enhanced activities and resources that align with the different phases of the experiential learning cycle and ensure alignment with learning outcomes (see Table 3). Additionally, they facilitate personalization, engagement, and real-time feedback, promoting a dynamic and learner-centric approach to education. In summary, the differences among these GenAI tools primarily relate to the scope of their functions and areas of specialization. ChatGPT 3.5 offers a wide range of capabilities, including simulations, gamification, real-time feedback, and more, while other tools may have more specific functions. In terms of exemplification, ChatGPT 3.5 and Anthropic Claude provide the most precise and explicit practical examples to guide the tools' implementation. However, similarities include personalization and adaptation, narrative learning, collaborative projects, feedback and assessment, the recommendation of multimedia resources, support for blended learning, and the facilitation of lifelong learning. These tools offer diverse capabilities to enhance TLAs within an experiential learning framework for constructive alignment.

5.2.3. The Use of GenAI Tools to Facilitate Authentic Assessment Considering Constructive Alignment

Integrating GenAI tools contributes diverse options to creating authentic, relevant, and effective assessments, emphasizing alignment with intended learning outcomes, real-world applications, ongoing improvement, and student-centered learning. The responses of GenAI tools to integrating authentic assessment methods within the constructive alignment framework exhibit differences and similarities. ChatGPT 3.5 and Anthropic Claude focus on creating realistic problem-solving scenarios that align with ILOs. ChatGPT 3.5 and Google Bard contribute to AI-assisted peer review, streamlining the feedback process. Furthermore, ChatGPT 3.5 and Google Bard emphasize creating adaptive assessments based on students' responses. On the other hand, Microsoft New Bing and Anthropic Claude concentrate on competency-based assessment, automating routine scoring, and developing assessment rubrics. Anthropic Claude specifically engages in reviewing student work products for core competencies.

Regarding AI-enhanced portfolio assessment and simulations with AI feedback, ChatGPT 3.5 and Google Bard share common ground, focusing on monitoring students' progress over time. While all of these GenAI tools work towards authentic assessment, each one has a unique role. ChatGPT 3.5 is more versatile, contributing to various assessment methods. Google Bard, on the contrary, is more concentrated, mainly proposing real-time feedback and gamification activities. Microsoft New Bing and Anthropic Claude are more focused on competency-based assessments and rubric development. Nevertheless, referring to the tools' exemplification, ChatGPT 3.5 and Anthropic Claude provide sound, practical examples to guide their integration.

These differences in emphasis reflect the varying strengths and capabilities of the GenAI tools, but their collective contribution seeks to align assessment practices more closely with constructive alignment principles.

Accordingly, concerning RQ1, a relationship can be established between GenAI tools and experiential learning for authentic assessment following the structure of constructive alignment as follows:

- GenAI tools can enrich ILO formulation, enhance their quality and pertinence, and validate their definition, clarity, and content. GenAI tools provide a wide range of possibilities for integrating GenAI tools into ILO formulation (see Table 2 for integration alternatives).
- GenAI tools can help TLAs to develop AI-enhanced activities and resources that align with experiential learning and other pedagogies to ensure alignment with learning outcomes, opening the gate for authentic assessments (see Table 3 for activity examples).
- GenAI tools provide diverse options for creating AI-enabled/assisted assessments that underscore alignment with ILOs, real-world or contrived applications, ongoing improvement, and student-centered learning (see Table 4 for authentic assessment options).
- Overall, GenAI tools can articulate with (and integrate into) experiential learning for authentic assessment through an AI-supported coherent structure of ILOs, TLAs, and ATs. In this case, GenAI tools can act as agents-to-define what to learn, how to learn, and how to assess learning, supporting and facilitating the instructional/pedagogical design of learning experiences. Additionally, these tools also offer action-oriented possibilities to become agents-to-teach-and-learn-with and agents-to-assess-learning-with. Therefore, GenAI tools can become transformative resources to support teaching and learning roles in teaching practice, learning activities, and within learning environments. This view calls for the design of pedagogical interventions in which GenAI tools are purposively integrated to achieve specific teaching and learning aims and goals.

5.3. Findings on the Use of GenAI Tools in Specific Learning Activities for Authentic Assessment

The interview results provide insights into how GenAI tools can transform learning activities across different stages of the experiential learning process, from concrete experience

to abstract conceptualization and active experimentation (see Table 5). These tools have the potential to foster deeper learning through reflective and critical thinking and practical skill development. Hence, GenAI tools can be effectively integrated into AI-enabled experiential learning to create more dynamic and enriching educational experiences while considering authentic assessment.

In examining the proposals by ChatGPT 3.5, Google Bard, Microsoft New Bing, and Anthropic Claude, it becomes evident that these AI-driven tools exhibit distinct specializations and areas of focus. ChatGPT 3.5 stands out as a versatile instrument, spanning multiple stages of experiential learning and offering a broad spectrum of functionalities, such as generating simulations and facilitating discussions. In contrast, Google Bard specializes in constructing intricate scenarios and gamified experiences, emphasizing problem solving and engagement, primarily during the early phases of the experiential learning cycle. New Bing takes a unique role by mainly concentrating on generating scenarios for decision making, which plays a vital role in the active experimentation stage, aligning with practical applications within educational contexts. Claude primarily focuses on personalized guidance, roleplaying, and facilitating discussions within simulations, catering to the human interaction aspect of learning, particularly in the earlier stages. Again, in terms of exemplification, ChatGPT 3.5 and Anthropic Claude provide the most transparent and explicit practical examples to guide the tools' incorporation. Despite these differences, there are striking similarities among these tools,, most notably concerning their commitment to personalization, interactive learning elements, feedback and reflection mechanisms, dynamic adaptation, real-world application, support for collaborative learning, and integrating assessment and evaluation features. These can collectively enhance experiential learning for authentic assessment across diverse educational settings.

Concerning RQ2, alternatives were proposed for including GenAI tools in learning activities considering experiential learning and authentic assessment:

- GenAI tools can support AI-enhanced activities across each stage of the experiential learning cycle. GenAI tools are also linked to integrating diverse, active pedagogical approaches and strategies such as adaptive learning, project-based learning, learning challenges, internships, field trips, collaborative learning, journaling, and gamification. They also cover individual, group, independent, or supervised activities for learning outcome development. Additionally, AI-enhanced activities also point to decision making, problem solving, modeling, and simulations, which allow for the development of high-level cognitive skills in real-world or contrived scenarios. Therefore, GenAI tools offer integrative pedagogical approaches and strategies within experiential learning activities for the authentic assessment of ILOs.
- GenAI tools might be regarded as *agents-to-learn-with*. They actively interact with learners as AI-enabled participants in their undertakings to accomplish their ILOs, provide support and feedback, and genuinely assess their accomplishments. This view demands the design of pedagogical interventions to directly support learners and their interactions with GenAI tools to improve their learning experiences and achievements.

5.4. Limitations

This work encompasses methodological and GenAI-related limitations, but also ethical concerns. In methodological terms, thing ethnography gives a voice to objects because of their supposed animistic nature. As GenAI tools can reply to prompts in human-like language, limitations and biases may exist regarding their consideration as subjects and capacity to articulate valid responses in thing interviewing. GenAI responses require accuracy and relevance verification by cross-referencing these with authoritative sources. In addition, they may only sometimes capture the full range of opinions and approaches within a given field. Another limitation is the potential variability in responses from the same GenAI tools over time. This constraint shares similarities with human responses in social research, necessitating careful crafting of the research process to attain stability in reports and responses by following a falsification process [64]. The results show that the GenAI responses

concerning the fundamental notions were consistent with those in the existing body of literature, but differences in detail, scope, and exemplification existed. Nevertheless, these results positively contribute to this work's research validity and transferability. However, responses regarding the research questions require further investigation through empirical work and practical cases in real-world educational scenarios.

Something that none of the GenAI tools provided was a feedback strategy to evaluate the effectiveness of the recommendations after their implementation. This lack of feedback makes it difficult to confirm the level of success or failure of any of the GenAI proposals. This absence results from how the interviews were conducted and the need for more explicit questions on this issue. Therefore, further research on GenAI tools' ability to act as reflective subjects/observers needs to be conducted.

Referring to GenAI tools, it is essential to use them as supplementary resources and apply their insights in a responsible, human-centered, and context-specific manner, considering that human thinking and expertise are still inimitable. Accordingly, GenAI tools must be a source of information and feedback to continuously test and validate the insights gained from their use, obtain real-world reactions from students and colleagues, and stay updated on the latest developments in AI.

In ethical terms, this work highlights the potential limitations and concerns regarding GenAI accessibility and inclusivity for all possible users, restrained human interactions and intellectual development, hidden bias, the potential manipulation of generated content, data privacy and security, transparency usage, and the purposes AI serves. These ideas call for a solid reflective teaching practice to anticipate the possible risks. There is also an ethical link to the responsible use of GenAI tools regarding information quality and usage, which must always adhere to human interpretation, judgment, and decision making. GenAI tools must not be used to make pedagogical human decisions, but should be used as supportive resources.

5.5. Future Work

Future work points to (i) the validation and testing of the proposed GenAI integration options for experiential learning activities and authentic assessment, (ii) application to specific educational real-world contexts, and (iii) creating clear guidelines for addressing limitations and ethical concerns.

A research agenda can be created to evaluate the proposed GenAI tools' integration options and their impacts on learning effectiveness and authentic assessment. This proposition can also include assessing their use to enrich ILOs, TLAs, and ATs. However, this view could extend to other active pedagogical approaches, such as challenge-based learning, gamification, or project-based learning. Concerning experiential learning, the proposed AI-enhanced activities at each stage of the learning cycle can be further explored to detail tasks in specific learning environments, scenarios, and learning disciplines. There is also the need to assess the direct contribution these tools can make to students' learning, including knowledge growth and skill development and the enrichment/enhancement of their learning experiences.

Future work is also required to exemplify the use of these tools in real-world contexts to create application cases for research, discussion, and dissemination purposes. Integrating GenAI tools into teaching and learning activities is promising but must be clarified. Therefore, practical implementations are required to delve into the grassroots of the use and possible implications. Also, new potential applications or limitations could emerge and be recognized from their use.

Finally, ethical concerns exist regarding the use of this technology beyond academic integrity, intellectual property, and plagiarism; it is necessary to explore new ways of addressing these issues regarding GenAI tools' reliability, responsible use, accessibility and inclusion, privacy and security, and transparency. This view calls for instrumenting preventive guidelines and actionable plans for appropriate and ethical usage.

6. Conclusions

In conclusion, this research has shed light on the interplay between GenAI tools and experiential learning for authentic assessment. By integrating GenAI tools into the constructive alignment framework for the instructional design of intended learning outcomes (ILOs), teaching and learning activities, and assessment tasks, we provided valuable guidance and practical examples to answer the research questions. Our work has not only identified alternatives for incorporating GenAI tools into learning activities while considering experiential learning and authentic assessment, but it has also opened exciting possibilities for enriching the human–GenAI interaction.

Our contributions extend beyond using GenAI tools as mere *agents-to-write* or *agents-to-answer* questions to become *agents-to-support* learning experiences. We highlighted their potential to act as *agents-to-think-about* ILOs and real-world complex learning scenarios, *agents-to-teach-and-learn-with* to facilitate active learning experiences, *agents-to-assess-learning-with* authentic assessment tasks, and *agents-to-learn-with* experiential learning activities for authentic assessment. These findings underscore the transformative role of GenAI tools in enhancing teaching and learning efficacy and effectiveness.

However, it is crucial to emphasize that the responsible use of GenAI tools is paramount. We must recognize the need to understand how to use GenAI effectively, ensuring that precise questions are asked to prevent GenAI hallucinations and the generation of fake content. Moreover, ethical implications and risks associated with GenAI tools should be carefully considered, and human agency and learning needs should always take precedence.

While our research provides a foundation for understanding the potential of GenAI tools in education, we acknowledge that further practical work and implementation in real-world educational settings are necessary to validate their contributions to learning. This ongoing exploration of GenAI's role in education is critical for accomplishing learning objectives and outcomes, making the appropriate use of these tools while integrating pedagogical approaches tailored to learners' needs. In this evolving landscape, the responsible use of GenAI is central to supporting human interactions and the broader purpose of education.

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Appendix A Interview Questions

A literature-enriched interview guide was elaborated to conduct the interaction with GenAI tools during the methodology's data collection stage as follows:

1. Conceptual clarification.
    - What is Kolb's experiential learning about?
    - What is Biggs and Tang's notion of constructive alignment concerning the pedagogical design of learning and teaching activities?

- 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?

2. The interplay of GenAI tools and experiential learning for authentic assessment (RQ1).
   - How can GenAI tools be used for the formulation of intended learning outcomes within the framework of Biggs and Tang's constructive alignment? Provide examples.
   - How can GenAI tools be integrated into teaching and learning activities while taking into account Kolb's experiential learning cycle and Biggs and Tang's constructive alignment? Provide examples.
   - How can GenAI tools be employed to facilitate Wiggins' authentic assessment methods while considering Biggs and Tang's constructive alignment? Provide examples.
3. The use of GenAI tools in specific learning activities for authentic assessment (RQ2).
   - 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? Provide additional alternatives and examples.

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