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A Generative AI-Based Didactic Tool for Inventory Learning in Accounting Education: Evidence from XP Contable

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Abstract. Generative artificial intelligence (GenAI) offers new opportunities for accounting education, but empirical evidence on its use in structured, topic-specific interventions remains limited, particularly in inventory accounting. Accordingly, this study evaluated changes in inventory learning outcomes and student self-perceptions following the use of XP Contable—a GenAI-supported learning environment—among undergraduate students enrolled in the Financial Resources Accounting course. A pre-experimental one-group pretest-posttest design was used to obtain preliminary evidence of change in an intact classroom cohort. Twenty-one students constituted the final analytical sample. The structured classroom intervention comprised two two-hour sessions (four hours total), while platform access and practice extended over approximately three weeks. XP Contable integrated conceptual explanations, worked examples, AI-supported practice, assessment, immediate feedback, and repeated attempts. Data were analyzed using descriptive statistics, paired-samples *t*-tests, Wilcoxon signed-rank tests, effect sizes, platform learning analytics, and descriptive thematic analysis of open-ended responses. Mean knowledge scores increased from 7.81 to 8.76 out of 11, $t(20) = 2.42$, $p = .025$, with a consistent Wilcoxon result ($p = .026$) and a moderate within-participant effect (Cohen's $d_z = .53$). Platform analytics recorded 466 assessment attempts, with mean performance increasing from 3.51 out of 5 on first attempts to 4.99 on best attempts ($p < .001$). The proportion of students reporting medium or high inventory knowledge increased from 38.1% to 81.0%. The largest increases in correct responses were observed for items addressing inventory valuation methods, periodic and perpetual inventory systems, and the cost-of-goods-sold formula. However, students continued to experience difficulty applying FIFO under rising prices and connecting ending inventory with financial statements. The findings provide preliminary evidence that a structured GenAI-supported learning environment can complement inventory instruction through repeated practice and

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feedback. However, the one-group design, small single-course sample, and absence of a control group limit causal inference and generalizability.

Keywords: accounting education; generative artificial intelligence; inventory learning; digital didactic tools; experiential learning

1. Introduction

Digital transformation is reshaping accounting practice and, consequently, the competencies expected of accounting graduates. Accounting education increasingly integrates digital platforms, data-driven tools, simulations, and technology-based activities to bridge the gap between academic knowledge and professional practice (Tettamanzi et al., 2023; Al-Hattami, 2025; Nassar, 2026). Simulation-based accounting environments allow students to engage in tasks that approximate real-world scenarios and apply their accounting knowledge in interactive settings (Sidorova et al., 2024). These developments raise not only about the role of digital technologies in accounting education but also about the extent to which specific instructional designs can lead to measurable learning outcomes.

Experiential learning provides a suitable pedagogical framework for this purpose. In a systematic review of 50 studies on experiential learning in university accounting education, Gittings et al. (2020) identified technical knowledge and comprehension, authentic application of theory, and student attitude and satisfaction among the most frequently reported benefits of experiential learning activities. Similarly, Yusof et al. (2020) demonstrated that the experiential learning cycle can enhance student engagement in accounting education. The pedagogical value of technology therefore lies not simply in the consumption of digital content but in actively engaging learners in applying concepts, evaluating outcomes, receiving feedback, and adjusting their actions (Gittings et al., 2020; Yusof et al., 2020). This process is particularly relevant to practical accounting education, where students must apply accounting standards and methods and understand how they affect accounting outcomes.

Inventory accounting is a natural context for this type of instruction. Applied inventory cases require students to distinguish among measurement approaches and relate inventory decisions to accounting treatment and reporting implications (Long & Nothhelfer, 2020). Instruction in this area addresses the relationships among inventory systems, valuation methods, cost of goods sold, ending inventory, Kardex inventory records, and financial statements (Long & Nothhelfer, 2020; Prokofieva, 2020). Consequently, an instructional environment that combines conceptual explanations, worked examples, procedural practice, feedback, and repeated application may help students integrate conceptual knowledge with procedural implementation in inventory accounting (Gittings et al., 2020; Sidorova et al., 2024).

Generative artificial intelligence (GenAI) has recently expanded the range of digital resources available for accounting education, with empirical research examining its use across different instructional contexts and purposes. Ballantine et al. (2024) critically analyzed the opportunities and challenges of AI in accounting education. Zhou and Luo (2025) provided descriptive evidence on how accounting students use GenAI and perceive its contribution to their learning processes. Blondeel et al. (2025) explored GenAI as a help-seeking resource in an accounting data analytics course. Abeysekera (2024) and Tharapos et al. (2025) focused on ChatGPT's ability to complete accounting assessments, its use in accounting assessment design, and its influence on the attainment of learning outcomes across different cognitive levels. Wiseman and Foster (2025), in turn, incorporated GenAI into cost-accounting activities that required students to verify outputs, identify errors, and exercise accounting judgment.

Collectively, these studies demonstrate the growing body of research on GenAI in accounting education. The existing gap, therefore, does not lie in a widespread absence of research on AI within this discipline. Rather, the literature reviewed provides limited empirical evidence on structured GenAI-supported interventions specifically designed for undergraduate inventory accounting and evaluated in terms of learning outcomes, platform learning analytics, and students' perceptions of the learning experience (Abeysekera, 2024; Ballantine et al., 2024; Blondeel et al., 2025; Tharapos et al., 2025; Wiseman & Foster, 2025; Zhou & Luo, 2025). This distinction is important because findings concerning general AI adoption, accounting data analytics, cost accounting, or AI performance on assessments do not necessarily explain how a topic-specific GenAI environment functions in inventory instruction.

XP Contable was developed to address this specific pedagogical and empirical gap. The platform organizes inventory learning into four progressive levels that combine conceptual explanations, worked accounting examples, AI-supported practice, assessment, immediate feedback, and repeated attempts. Its instructional design operationalizes experiential learning principles by guiding students from conceptualization and initial experience through active problem solving, feedback, reflection, and further experimentation (Gittings et al., 2020; Yusof et al., 2020). Unlike prior studies of GenAI in accounting education that have focused primarily on student perceptions, AI performance, assessment design, accounting analytics, or cost-accounting activities, the present study examines a structured intervention specifically designed for inventory accounting. It integrates four complementary sources of evidence: matched pretest-posttest performance, XP Contable learning analytics, post-intervention perception data, and open-ended student responses (Abeysekera, 2024; Blondeel et al., 2025; Tharapos et al., 2025; Wiseman & Foster, 2025; Zhou & Luo, 2025).

Accordingly, this study addresses the following research question: *To what extent do undergraduate accounting students' inventory learning outcomes and self-perceptions change after a structured GenAI-supported intervention using XP Contable?* The study aims to evaluate changes in these outcomes following the intervention and to characterize students' progression and experience within the platform. A pre-

experimental one-group pretest–posttest design was adopted because XP Contable was implemented in an intact course cohort and the primary objective was to obtain preliminary evidence of changes in an authentic instructional context rather than to establish comparative causal effects. This design allows the same participants to be assessed before and after the intervention but does not permit causal attribution to the intervention alone (Creswell, 2009). By integrating learning outcomes, platform learning analytics, perception measures, and open-ended student responses, the study contributes topic-specific empirical evidence on the evaluation of a structured GenAI-supported learning environment for undergraduate inventory accounting.

2. Literature Review

This literature review positions XP Contable at the intersection of experiential learning, technology-supported accounting education, inventory instruction, and GenAI. Experiential learning provides the primary theoretical foundation for the intervention because XP Contable combines conceptual explanation, guided practice, active problem solving, feedback, and repeated application. Research on digital technologies and GenAI, in turn, provides evidence on the opportunities and limitations associated with technology-supported accounting instruction (Gittings et al., 2020; Ballantine et al., 2024; Blondeel et al., 2025; Wiseman & Foster, 2025).

2.1 Experiential Learning as the Theoretical Framework

Experiential learning theory (ELT) introduced by Kolb (1984) conceptualizes learning as a cyclical process comprising four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This theory is particularly relevant to learning environments in which students apply concepts, analyze outcomes, and refine their reasoning (Hulaikah et al., 2020; Gittings et al., 2020). In their systematic review on experiential learning in university accounting education, Gittings et al. (2020) identified technical knowledge and comprehension, authentic application of theory, and student attitude and satisfaction among the most frequently reported benefits of this approach. The authors also emphasized the need for more robust empirical research methods.

Accounting-oriented applications can facilitate the implementation of structured experiential learning activities. Yusof et al. (2020) found that an experiential learning cycle enhanced student engagement in a Principles of Accounting course. González-Acosta et al. (2020) showed how business software can support experiential learning by immersing students in practical, technology-mediated scenarios. Butler et al. (2021) similarly designed an experiential strategy in which accounting students assessed professional competencies, reflected on competency gaps, and developed improvement plans, thereby linking experience, reflection, and subsequent action. More broadly, experiential-learning research highlights that learning from practice depends not merely on participation in activities but also on opportunities to reflect on those experiences (Sanders et al., 2020).

This theoretical perspective underpins the design of XP Contable. The platform introduces accounting concepts and worked examples, engages students in solving inventory-related problems, and provides feedback that enables them to identify errors and attempt activities again. These components reflect the processes of conceptualization, experience, reflection, and active experimentation and thus provide a theoretical basis for understanding how the intervention may support learning (Gittings et al., 2020; Yusof et al., 2020). Structured assessment and feedback may further support this process by making performance expectations and areas for improvement visible to students (Reddy, 2012).

2.2 Digital Technologies and Generative AI in Accounting Education

As accounting practice becomes increasingly digital, accounting education must equip students with the competencies required to work with digital platforms, analytics, cloud applications, and other technology-mediated processes (Knudsen, 2020; Asonitou, 2020; Schönfeldt & Birt, 2020). Maali and Al-Attar (2020) identified gaps between university accounting curricula and labor-market expectations, while Kroklicheva et al. (2020) and Aguiar and Gouveia (2020) emphasized the growing relevance of digital accounting environments and the need to examine their implications for accounting education.

Empirical studies in accounting education provide more specific evidence on the use of digital technologies. Fan and Song (2020) compared traditional clickers with mobile audience-response systems in three Financial Accounting courses and found that students using the mobile system achieved higher final-examination scores and reported a more positive classroom experience. Online tutorials have also been used to support learning of the accounting cycle, while active-learning and technology-supported strategies have been associated with greater student engagement and application of accounting concepts (Zhang et al., 2020; King, 2020; Pinto & Durán-Aponte, 2020). The transition to online accounting education during the COVID-19 pandemic further showed that maintaining student engagement in digital learning environments depends on adequate interaction, communication, and access to learning resources (Ali et al., 2021).

GenAI extends these forms of digital support by generating explanations, responding to questions, assisting with problem solving, and providing feedback. However, research in accounting education has also identified important limitations (Ballantine et al., 2024; Bashraheel & Ghinea, 2026). Abeysekera (2024), for example, tested ChatGPT on both introductory and advanced Financial Accounting multiple-choice assessments and identified incorrect responses resulting from inappropriate assumptions and task complexity. Tharapos et al. (2025), using 18 assessments from six undergraduate accounting courses, found that GenAI performed better on lower- and mid-order learning tasks than on higher-order tasks. These findings indicate that GenAI should complement students rather than replace students' accounting reasoning and verification processes.

Recent empirical studies also shed light on how students use and perceive GenAI. Zhou and Luo (2025) surveyed accounting students and found that approximately 80% reported using AI at least weekly, primarily to obtain help with difficult concepts. Students also reported benefits such as reduced learning time, improved knowledge acquisition, greater enjoyment, and better academic performance. Nevertheless, these findings reflect students' perceptions rather than experimentally established causal effects. Blondeel et al. (2025), in a study of 312 students enrolled in an accounting data analytics course, found that greater ChatGPT expertise was associated with better course performance. In addition, students valued ChatGPT for its accessibility but preferred human assistance when accuracy was particularly important.

Applied pedagogical studies provide further insights into the use of GenAI in accounting instruction. Wiseman and Foster (2025) integrated GenAI into an undergraduate cost-accounting assignment in which students compared AI-generated analyses with manual recalculations, identified errors, and exercised professional judgment. Their findings support instructional approaches that require students to verify and reflect on GenAI outputs rather than accept them uncritically (Wiseman & Foster, 2025). Nevertheless, concerns regarding academic integrity, overreliance, accuracy, and ethical use remain central to GenAI adoption in higher education and accounting education (Ballantine et al., 2024; Kizilcec et al., 2024; Al-Hajaya, 2026).

2.3 Inventory Learning and Applied Digital Instruction

Inventory accounting requires students to integrate conceptual understanding, valuation principles, computational procedures, and their implications for financial statements. It is therefore well suited to instructional approaches that combine theoretical explanation with practical problem solving (Long & Nothhelfer, 2020; Prokofieva, 2020). Long and Nothhelfer (2020), for instance, developed an accounting case in which students analyzed the initial and subsequent measurement of inventory under different accounting standards, demonstrating that inventory instruction can be situated in real-world scenarios rather than limited to abstract definitions.

Visualization and authentic accounting activities offer additional approaches to supporting learning. Prokofieva (2020) examined the incorporation of financial data visualization into financial accounting education to improve students' understanding of accounting information. Rivero-Menéndez et al. (2018) and Alshurafat et al. (2020) highlighted pedagogical approaches and learning techniques that engage students in accounting scenarios resembling real-world decision-making contexts. Similarly, Bunea et al. (2025) emphasized the importance of authentic professional experiences in developing accounting competencies.

These findings provide a more specific pedagogical rationale for XP Contable than a general assumption that digital technologies improve learning. XP Contable combines practical inventory challenges with illustrative examples, iterative practice, progress assessments, and immediate AI-assisted feedback. These

features align with research emphasizing experiential learning, technology-enhanced engagement, and assessment-oriented approaches in accounting education (Gittings et al., 2020; Fan & Song, 2020; Wiseman & Foster, 2025). The rationale is not that GenAI inherently improves learning, but that it can be embedded within a systematic instructional approach in which students apply accounting principles, receive feedback, identify errors, and correct their responses (Abeysekera, 2024; Wiseman & Foster, 2025).

2.4 Research Gap and Positioning of XP Contable

Three specific gaps motivate the present study. First, research on technology-supported accounting education continues to highlight the need for stronger empirical evidence linking instructional innovations to measurable learning outcomes rather than relying primarily on perceptions or descriptive accounts of technology use (Knudsen, 2020; Gittings et al., 2020; Jordan & Samuels, 2020).

Second, recent studies of GenAI in accounting education have addressed varied contexts. Zhou and Luo (2025) examined students' patterns and perceptions of AI use. Blondeel et al. (2025) investigated GenAI in accounting data analytics. Abeysekera (2024) and Tharapos et al. (2025) evaluated ChatGPT performance on accounting assessments. Similarly, Wiseman and Foster (2025) analyzed an AI-supported cost-accounting assignment. Systematic and conceptual research has further explored the opportunities, risks, competency requirements, and strategies associated with integrating GenAI into accounting education (Ballantine et al., 2024; Anica-Popa et al., 2024; Harjanto et al., 2025; Bashraheel & Ghinea, 2026). However, none of the studies reviewed here evaluate a GenAI-supported instructional intervention specifically designed for undergraduate inventory accounting using matched pretest-posttest evidence. The empirical contribution of the present study therefore lies in addressing this topic-specific gap rather than a general absence of GenAI research in accounting education.

Third, existing frameworks emphasize AI-related competencies, assessment redesign, ethical use, and professional skill development, yet they do not provide an intervention model specifically designed for the sequential learning of inventory concepts, valuation methods, Kardex-related tasks, cost of goods sold, and their implications for financial statements (Anica-Popa et al., 2024; Promma et al., 2025; Tharapos et al., 2025). XP Contable bridges this gap by operationalizing experiential learning principles within a topic-specific GenAI-supported environment that integrates theory, worked examples, active practice, immediate feedback, repeated attempts, and progress assessment (Gittings et al., 2020; Wiseman & Foster, 2025).

Accordingly, the present study evaluates changes in students' learning outcomes and self-perceptions following interaction with this structured inventory learning environment. The pre-experimental one-group pretest-posttest design provides preliminary evidence of changes in an authentic classroom context, consistent with calls for applied evaluation of instructional innovations, while acknowledging the design's limitations for causal inference (Jordan & Samuels, 2020; Creswell, 2009).

3. Methodology

3.1 Research Approach and Design

This study adopted a predominantly quantitative evaluative approach, supplemented by qualitative evidence from open-ended survey responses. A pre-experimental one-group pretest–posttest design was used to examine changes in students' inventory knowledge and self-perceptions following their use of XP Contable. Qualitative responses served only to contextualize students' experiences.

This design was selected because XP Contable was implemented within an existing university course and an intact classroom cohort. Each participant's pretest score was paired with the corresponding posttest score, allowing direct within-participant comparison. A concurrent control group was not included because the intervention was embedded in the regular activities of the available cohort. Thus, the objective was to obtain preliminary evidence of change in an authentic classroom setting rather than to establish comparative efficacy (Creswell, 2009; Wan Mohd Nori et al., 2016). Given that testing effects, concurrent learning, maturation, novelty, and other uncontrolled factors may have influenced the results, the findings are interpreted as changes following exposure to XP Contable rather than as definitive evidence of causal effects.

3.2 Participants and Recruitment

The study was conducted with undergraduate accounting students enrolled in the Financial Resources Accounting course at Politécnico Colombiano Jaime Isaza Cadavid, Colombia. The course syllabus covers inventory systems, asset valuation, cost of goods sold, Kardex procedures, and financial statements. Participants were recruited using a non-probability, total-cohort invitation approach. All 27 students in the cohort were invited to participate, and participation was voluntary. The resulting sample was therefore a voluntary-response sample drawn from the complete cohort. After excluding incomplete, ineligible, and out-of-group records, 21 students had valid matched pretest–posttest, perception-survey, and XP Contable records and constituted the final analytical sample. This voluntary recruitment process may have introduced self-selection bias and limits the generalizability of the findings.

3.3 Data Collection Instruments

Data were collected from three complementary sources: a pretest–posttest instrument assessing inventory knowledge and self-perceptions, a post-intervention perception survey, and XP Contable learning analytics.

The pretest–posttest instrument contained 15 items: two contextual questions, 11 multiple-choice knowledge items, and two self-perception items (Appendix 1). The 11 knowledge items yielded a total score ranging from 0 to 11 and were designed as a brief criterion-referenced classroom measure aligned with the intervention rather than as a comprehensive standardized test. They covered five areas: foundational inventory concepts; periodic vs. perpetual inventory systems; cost of goods sold; inventory valuation, including the first-in, first-out (FIFO) method; and relationships between inventory and financial statements. Six items

primarily assessed conceptual recognition or understanding, while five required procedural or interpretive application, including comparisons between inventory systems, cost-of-goods-sold relationships, FIFO under rising prices, financial statement classification, and numerical calculations. Because the instrument did not include extended-response or advanced integrative tasks, conclusions are limited to the foundational and intermediate competencies assessed.

The two self-perception items assessed students' perceived inventory knowledge and their perceived ability to calculate cost of goods sold or prepare a Kardex. These items were analyzed separately from the multiple-choice knowledge items. The instrument was aligned with the course content and reviewed by subject-matter and instructional experts, whose verbal recommendations were incorporated into the final version. As no written expert rating forms or quantitative content validity indices were retained, the review is reported as expert-based content validation. Internal consistency reliability, assessed using the Kuder-Richardson Formula 20 (KR-20), was .426 for the pretest and .398 for the posttest, indicating limited internal consistency and representing a measurement limitation. The use of identical items in the pretest and posttest improved comparability but may have introduced a testing effect.

The post-intervention perception survey contained thirty response fields, including 21 Likert-type items organized into four dimensions: general perception (eight items), perceived learning (six), autonomous learning (four), and relevance and scope (three). Items were rated on a five-point scale ranging from 1 (*Strongly disagree*) to 5 (*Strongly agree*). The survey also included structured categorical and multiple-response questions and two open-ended questions addressing the learning experience and suggested improvements. The instrument was reviewed by experts.

For the 21 participants, Cronbach's alpha was .941 for the overall scale and .879, .888, .627, and .800 for the four dimensions, respectively. The coefficient for the autonomous learning dimension was interpreted cautiously given the limited number of items and the small sample size. XP Contable learning analytics, restricted to the same 21 participants included in the final sample, comprised data on level progression, assessment attempts, initial and subsequent performance, and completion. These data provided behavioral evidence that complemented the knowledge and perception measures.

3.4 Intervention and Procedure

XP Contable is a GenAI-supported educational tool that provides conceptual explanations, worked examples, active practice, assessment, and immediate feedback. The structured classroom intervention consisted of two two-hour sessions, for a total of four hours. Platform records covered the period from March 18 to April 8, 2026, suggesting an implementation and practice period of approximately three weeks.

XP Contable was organized into four progressive levels. At each level, students reviewed theoretical concepts, analyzed worked examples, practiced with GenAI support, received feedback to identify and correct errors, and completed an assessment required for progression to the next level. Additional attempts were allowed, creating opportunities for repeated practice and improvement. The content covered inventory systems, inventory valuation methods, purchase and sales returns, Kardex methods, cost of goods sold, and their relationship to the income statement. The sequence incorporated experiential learning principles through conceptualization, experience, active experimentation, feedback, reflection, and revision (Gittings et al., 2020; Yusof et al., 2020). GenAI was used to support practice and provide feedback rather than to replace the instructor.

Data collection proceeded as follows: a pretest administered in the classroom under standardized conditions; two structured XP Contable sessions, with continued platform access throughout the implementation period; a post-intervention perception survey; and a posttest administered under conditions similar to those of the pretest. The final paired dataset comprised 21 participants.

3.5 Data Analysis

Statistical analyses were conducted using R (4.6.1 Version). Knowledge scores were summarized using means, medians, standard deviations (SD), ranges, and percentages of correct responses. Pretest and posttest scores were compared using a paired-samples *t*-test. Given the small sample size, a Wilcoxon signed-rank test was also conducted on the same 21 paired observations ($n = 21$) as a robustness check. Lastly, Cohen's d_z and its 95% confidence interval were calculated.

Item-level percentages of correct responses were compared for diagnostic purposes to identify concepts showing improvement, limited change, persistent difficulty, or decline. Self-perception items were analyzed separately using frequencies, percentages, and paired ordinal procedures. Post-intervention perception data were summarized using descriptive statistics and Cronbach's alpha. Open-ended responses underwent descriptive inductive thematic coding to identify learning contributions, strengths, limitations, and opportunities for improvement. XP Contable learning analytics were also analyzed descriptively in terms of level progression, assessment attempts, performance changes, and completion.

3.6 Internal Validity and Ethics

The absence of a control group, the use of identical pretest and posttest items, concurrent learning, maturation, novelty, and increased attention were considered potential threats to internal validity. The approximately three-week implementation period was limited but did not eliminate maturation and history effects. Comparable pretest and posttest administration conditions, paired analyses, and the combination of multiple sources of evidence strengthened the interpretation of the findings without establishing causality. The limited KR-20 coefficients, voluntary participation, small sample size, and single-course setting further constrained measurement precision and generalizability.

Participants were informed of the study's academic and research purposes, the intended use of the data, and the voluntary nature of their participation. Data was anonymized, participation did not affect course grades, and only eligible records from voluntary participants in the target group were retained for analysis.

4. Results and Findings

This section presents the findings from the three complementary sources of evidence used in the study. First, XP Contable learning analytics describe students' progression and repeated assessment activity within the platform. Second, matched pretest-posttest data show changes in the inventory competencies measured by the knowledge test and in students' self-perceptions. Finally, the post-intervention survey captures students' perceptions of XP Contable and the recurring themes identified in their open-ended responses. All analyses reported in this section are based on the final analytical sample of 21 participants.

4.1 Learning Analytics from XP Contable

After data cleaning, the XP Contable Learning Analytics included records from the 21 eligible participants. During the implementation period, these students generated 466 assessment attempts across the four instructional levels. All 21 students attempted Levels 1-3, whereas 19 students (90.5%) progressed to Level 4. Overall, 19 participants (90.5%) passed all four levels, one passed three levels, and one passed two levels.

Table 1: XP Contable learning analytics by instructional level

Instructional level	Students who attempted	Total attempts	Mean attempts	Median attempts	Mean first-attempt score /5	Mean best score /5	Students who passed
Level 1	21	118	5.62	4	3.62	5.00	21
Level 2	21	212	10.10	5	3.19	5.00	21
Level 3	21	89	4.24	3	3.33	4.95	20
Level 4	19	47	2.47	2	3.95	5.00	19

Note. Authors' own work based on the cleaned XP Contable dataset (n = 21)

Repeated assessment activity differed substantially across instructional levels. Level 2 recorded the highest number of attempts (212), with a mean of 10.10 attempts per student, compared with 5.62 in Level 1, 4.24 in Level 3, and 2.47 in Level 4. Thus, Level 2 accounted for the greatest amount of repeated practice.

Performance increased with successive attempts. Based on the 82 student-by-level observations generated across the four instructional levels, the mean first-attempt score was 3.51 out of 5, whereas the mean best score was 4.99, corresponding to an average increase of 1.48 points. The Wilcoxon signed-rank comparison of first and best scores showed a statistically significant difference ($p < .001$). Across instructional levels, mean first-attempt scores ranged from 3.19 to 3.95, while mean best scores ranged from 4.95 to 5.00.

These findings indicate that students repeatedly interacted with the platform's assessment and feedback features and generally achieved higher scores on subsequent attempts. The first-to-best score comparison is therefore interpreted as evidence of within-platform performance progression and repeated practice rather than as an independent measure of learning or evidence of a causal effect.

4.2 Pretest–Posttest Learning Outcomes

The matched analysis included 21 students who completed both the pretest and posttest. As described in the Methodology, the 11 scored knowledge items constituted a targeted classroom measure of the inventory competencies addressed during the intervention.

Mean performance increased from 7.81 out of 11 (SD = 1.75) at pretest to 8.76 (SD = 1.51) at posttest, representing a mean increase of 0.95 points. Overall accuracy increased from 71.0% to 79.7%, a difference of 8.7 percentage points.

Table 2: Overall pretest–posttest performance

Measure	Pretest	Posttest	Difference
Participants	21	21	—
Mean score /11	7.81	8.76	+0.95
Median score /11	7.00	8.00	+1.00
Standard deviation	1.75	1.51	—
Minimum–maximum	6–11	6–11	—
Percentage of correct responses	71.0%	79.7%	+8.7 pp
Paired-samples <i>t</i> -test	—	—	$p = .025$
Wilcoxon signed-rank test	—	—	$p = .026$
Cohen's d_z	—	—	0.53

Note. Authors' own work based on the 21 matched pretest–posttest cases. pp = percentage points

The paired-samples *t*-test indicated a statistically significant difference between pretest and posttest scores, $t(20) = 2.42$, $p = .025$. The 95% confidence interval for the mean difference ranged from 0.13 to 1.77 points. The Wilcoxon signed-rank test yielded a consistent result ($p = .026$), and Cohen's $d_z = .53$ indicated a moderate within-participant effect. Thus, performance on the inventory competencies measured by the test was significantly higher at posttest than at pretest.

4.3 Item-Level Changes in Inventory Learning

Item-level analysis showed that changes were heterogeneous across the 11 knowledge items assessed.

Table 3: Item-level correct responses

Knowledge item	Pretest	Posttest	Difference
Inventory definition	100.0%	100.0%	0.0 pp
Inventory item identification	100.0%	100.0%	0.0 pp
Beginning inventory	61.9%	57.1%	-4.8 pp
Periodic vs. perpetual inventory systems	71.4%	90.5%	+19.1 pp
COGS formula in periodic systems	66.7%	85.7%	+19.0 pp
Inventory valuation methods	52.4%	90.5%	+38.1 pp
Meaning of FIFO	90.5%	100.0%	+9.5 pp
FIFO under rising prices	23.8%	42.9%	+19.1 pp
Meaning of cost of goods sold	66.7%	76.2%	+9.5 pp
Ending inventory in financial statements	76.2%	57.1%	-19.1 pp
Numerical COGS calculation	71.4%	76.2%	+4.8 pp

Note. Authors' own work based on the 21 matched pretest–posttest cases. pp = percentage points; COGS = cost of goods sold

The largest increase was observed in the recognition of inventory valuation methods, with correct responses rising from 52.4% to 90.5% (+38.1 pp). Notable improvements were also observed in distinguishing between periodic and perpetual inventory systems (+19.1 pp), applying FIFO under rising prices (+19.1 pp), and identifying the cost-of-goods-sold formula in a periodic system (+19.0 pp). Correct responses to the item assessing the meaning of FIFO increased from 90.5% to 100.0%. Regarding inventory definition and inventory item identification, correct responses remained at 100.0% at both assessment points.

In contrast, performance declined for the beginning inventory item (-4.8 pp) and, more substantially, for the item addressing ending inventory in financial statements (-19.1 pp). Although performance on the FIFO-under-rising-prices item increased from 23.8% to 42.9%, fewer than half of the students answered it correctly at posttest. Overall, item-level changes were uneven, with FIFO rising prices and the relationship between ending inventory and financial statements remaining the most evident areas of difficulty.

4.4 Changes in Self-Perceived Inventory Knowledge and Procedural Ability

Students' self-perceptions also changed between pretest and posttest. The proportion reporting low or very low inventory knowledge decreased from 61.9% to 19.0%, whereas the proportion reporting medium or high knowledge increased from 38.1% to 81.0%. The Wilcoxon signed-rank test indicated a statistically significant change ($p = .031$).

Self-perceived procedural ability showed a similar pattern. The proportion of students reporting that they were able to calculate cost of goods sold or prepare a Kardex increased from 19.0% to 38.1%, while the proportion reporting that they were unable to perform these tasks decreased from 33.3% to 0.0%. The

corresponding Wilcoxon paired comparison test also indicated a statistically significant change ($p = .008$).

Table 4: Self-perceived inventory knowledge and procedural ability

Response category	Pretest	Posttest	Change
Low or very low inventory knowledge	61.9%	19.0%	-42.9 pp
Medium or high inventory knowledge	38.1%	81.0%	+42.9 pp
Able to calculate COGS/prepare Kardex	19.0%	38.1%	+19.0 pp
Unable to calculate COGS/prepare Kardex	33.3%	0.0%	-33.3 pp

Note. Authors' own work based on the 21 matched pretest-posttest cases. pp = percentage points; COGS = cost of goods sold

These percentages show a clear shift away from the lowest self-assessment categories. After the intervention, more than four-fifths of participants rated their inventory knowledge as medium or high, and none selected the response indicating that they were unable to perform the procedural tasks assessed.

4.5 Post-Intervention Perceptions of XP Contable

The 21-item post-intervention perception scale provided additional evidence regarding students' experiences with XP Contable. Mean ratings were above 4.0 on the five-point scale across all four dimensions.

Table 5: Post-intervention perceptions of XP Contable by dimension

Dimension	Items	Mean /5
General perception	8	4.31
Perceived learning	6	4.22
Autonomous learning	4	4.48
Relevance and scope	3	4.38

Note. Scale ranged from 1 = Strongly disagree to 5 = Strongly agree; n = 21

Autonomous learning received the highest mean rating ($M = 4.48$), followed by Relevance and scope ($M = 4.38$), General perception ($M = 4.31$), and Perceived learning ($M = 4.22$). Several individual items also received consistently positive responses. All 21 students agreed or strongly agreed that the interactive methods helped reinforce learning, that the level-based structure improved the learning experience, that they could progress at their own pace, and that the tool encouraged them to revisit and retry activities after making mistakes. In addition, 19 students (90.5%) agreed or strongly agreed that the examples worked helped them understand the topics.

The structured multiple-response questions provided further insights into how students incorporated the tool into their learning experience. Eight students identified XP Contable as their main source of support alongside the instructor, while another eight identified it as supplementary support. Seven students indicated that the platform was sufficient for them to learn most of the course

content independently. Because participants could select more than one response, these categories were not mutually exclusive.

Among the beneficial features, the examples worked were the most frequently selected, identified by 17 students (81.0%). Assessments and AI-supported interactive practice were each selected by eight students (38.1%), theory by seven students (33.3%), and immediate feedback by six students (28.6%).

Students also identified areas for improvement. The most frequently selected component was Kardex (8 students; 38.1%), followed by AI feedback and visualization of assessment errors (5 students each; 23.8%). Audio clarity and greater flexibility in open-ended responses were each selected by four students (19.0%).

Table 6: Most frequently selected features and improvement priorities

Category	Response	<i>n</i>	%
Feature	Worked examples	17	81.0
	Assessments	8	38.1
	AI-supported interactive practice	8	38.1
	Theory	7	33.3
	Immediate feedback	6	28.6
Improvement priority	Kardex	8	38.1
	AI feedback	5	23.8
	Visualization of assessment errors	5	23.8
	Audio clarity	4	19.0
	Flexibility of open-ended responses	4	19.0

Note. Multiple responses were permitted; therefore, percentages do not sum to 100%

4.6 Open-Ended Student Perceptions

The two open-ended survey questions provided additional detail on students' experiences with XP Contable and complemented the quantitative findings. Four recurring themes were identified.

First, students generally described XP Contable as a useful and practical educational tool for learning or reinforcing inventory-related topics. Many respondents specifically highlighted the combination of theoretical explanations, worked examples, and practical exercises.

Second, students valued the structure of practice, feedback, and repeated attempts. They indicated that examples helped prepare them for assessments and that opportunities to correct errors and retry activities supported continued practice. These responses were consistent with the positive ratings for worked

examples, autonomous learning, and encouragement to retry activities after making mistakes.

Third, the main operational concern involved technical stability and the preservation of students' progress. Several students reported that the platform occasionally shut down or reset during an activity, requiring them to reenter information or repeat tasks. They therefore suggested that the system automatically save responses, completed activities, and previous results.

Fourth, participants requested more explicit instructions about procedures, particularly for weighted average calculations, Kardex features, and incorrect responses. Suggested improvements included step-by-step explanations of calculations, more detailed feedback on incorrect responses, calculation options in the Kardex tables, and additional examples before assessments.

Taken together, the quantitative perception data and qualitative feedback indicate that students generally liked XP Contable, particularly its use of examples, interactive activities, self-paced progression, and repeated-attempt structure. At the same time, the qualitative data identified specific areas for technical and instructional improvement, including platform stability, Kardex features, feedback specificity, and more detailed procedural guidance.

5. Discussion

The findings indicate that XP Contable has pedagogical potential as a structured GenAI-supported environment for inventory learning in undergraduate accounting education. Three complementary patterns emerged: First, students repeatedly interacted with the platform and achieved higher scores on subsequent attempts. Second, matched pretest-posttest results showed a statistically significant increase in performance on the inventory competencies assessed. Third, students reported higher perceived inventory knowledge and procedural ability after the intervention. These findings are consistent with accounting education research showing that digital technologies are more educationally meaningful when integrated into structured activities involving practice, feedback, interaction, and application (Fan & Song, 2020; Gittings et al., 2020; Sidorova et al., 2024).

5.1 Learning Outcomes and Experiential Learning

The increase in the mean knowledge score from 7.81 to 8.76 and the moderate within-participant effect (Cohen's $d_z = .53$) indicate that students performed better on the inventory competencies assessed following the use of XP Contable. This finding is consistent with previous research on technology-supported accounting education. Fan and Song (2020) found that the use of mobile response technology in Financial Accounting courses led to improved performance, while Sidorova et al. (2024) discussed the pedagogical benefits of simulation-based accounting environments. Although these technologies differ from XP Contable, they similarly integrate digital resources into dynamic learning methodologies.

The findings are also in line with experiential learning theory. XP Contable integrates theoretical explanations, real-world examples, problem-solving activities, feedback, and multiple attempts, allowing students to move between theory, practical application, reflection, and further practice. Gittings et al. (2020) identified technical knowledge and comprehension, authentic application of theory, and student attitude and satisfaction as the key benefits of experiential learning activities in accounting education. Yusof et al. (2020), in turn, showed that experiential learning cycles can enhance student engagement in accounting education.

The platform learning analytics provides complementary evidence of these interpretations. Mean performance increased from 3.51 out of 5 on first attempts to 4.99 after repeated attempts. This pattern suggests that the pedagogical value of XP Contable lies not in GenAI alone but in its integration into a structured cycle of practice and feedback. A related approach was adopted by Wiseman and Foster (2025), who used GenAI to perform cost-accounting tasks that required students to verify outputs, identify errors, and exercise accounting judgment.

5.2 Differential Learning Across Inventory Competencies

Item-level results showed that improvement was not uniform across the inventory competencies assessed. The largest increase occurred in Inventory valuation methods (+38.1 pp), followed by Periodic vs. perpetual inventory systems (+19.1 pp), FIFO under rising prices (+19.1 pp), and Cost-of-goods-sold formula in periodic systems (+19.0 pp). These increases were concentrated primarily in items involving the recognition and application of inventory procedures. In a similar vein, Long and Nothhelfer (2020) demonstrated the value of applied inventory cases for connecting measurement principles with accounting treatment. Moreover, Gittings et al. (2020) found that experiential learning activities facilitate the transition from conceptual understanding to practical application.

Nevertheless, students continued to experience difficulty with some of the competencies assessed. Although the percentage of correct responses in the FIFO under rising prices item increased, it reached only 42.9% at posttest. Likewise, performance on the item addressing ending inventory in financial statements declined from 76.2% to 57.1%. These results indicate that improvement did not extend uniformly to all conceptual and financial reporting relationships assessed. This heterogeneity can be considered alongside the findings of Abeysekera (2024) and Tharapos et al. (2025), who found that GenAI performance varies across accounting tasks and levels of complexity. Although these studies examined AI rather than student performance, they highlight the varying cognitive demands of accounting tasks.

The findings of the present study therefore suggest that GenAI-supported inventory instruction may require additional scaffolding when students must connect calculations and inventory procedures with broader financial statement implications. Visual and step-by-step representations may be particularly useful for strengthening these connections (Prokofieva, 2020).

5.3 Contribution and Pedagogical Implications

The principal contribution of this study is its topic-specific evaluation of a structured GenAI-supported environment for inventory accounting instruction. Previous studies have examined accounting students' perceptions of GenAI (Zhou & Luo, 2025), the use of GenAI in accounting data analytics (Blondeel et al., 2025), AI performance on accounting assessments (Abeysekera, 2024; Tharapos et al., 2025), and GenAI-supported cost-accounting activities (Wiseman & Foster, 2025). The present study complements these lines of research by focusing specifically on inventory concepts, valuation procedures, Kardex-related tasks, cost of goods sold, and financial statement relationships.

The design of XP Contable also reflects its theoretical grounding. Its sequence of conceptual explanations, worked examples, active problem solving, feedback, reflection, and repeated attempts operationalizes experiential learning principles (Gittings et al., 2020; Yusof et al., 2020). Nevertheless, the heterogeneous item-level outcomes suggest that technology-supported practice does not benefit all accounting competencies equally.

From a pedagogical perspective, XP Contable may be particularly useful as a complementary environment for repeated practice, formative feedback, and reinforcement of inventory procedures. Future development should improve step-by-step explanations, Kardex support, and the connection between inventory calculations and financial reporting. Overall, the findings do not indicate that GenAI inherently enhances accounting learning. Rather, they provide preliminary evidence of improved performance on specific inventory items and most positive student self-perceptions following the use of a structured, topic-specific GenAI-supported environment (Gittings et al., 2020; Wiseman & Foster, 2025).

6. Conclusion

This study evaluated XP Contable as a structured GenAI-supported environment for inventory accounting instruction among undergraduate students. The evidence from 21 participants revealed a statistically significant increase in knowledge scores following the intervention, with a moderate within-participant effect. Platform learning analytics showed repeated practice and progression across successive attempts. For their part, students reported higher perceived inventory knowledge and greater perceived ability to perform procedural tasks after using the tool.

The largest improvements were observed in recognizing inventory valuation methods, distinguishing between periodic and perpetual inventory systems, and identifying the cost-of-goods-sold formula. However, changes varied across the knowledge items assessed. Students continued to experience difficulty applying FIFO under rising prices, despite improvement in this item. They also experienced difficulty connecting ending inventory with financial statements. These findings suggest that technology-supported practice may help improve some inventory competencies, but that more complex accounting relationships may require additional instructional support.

Accordingly, XP Contable supports accounting education by bringing together conceptual explanations, worked examples, discipline-specific practice, assessment, immediate feedback, and opportunities for repeated practice within a single instructional framework. The results support the integration of GenAI as a complementary educational tool within a structured experiential learning environment rather than as a replacement for traditional instruction. Overall, this study provides preliminary, topic-specific evidence of measurable improvements in specific inventory competencies, more positive student self-perceptions, and sustained engagement in practice following the intervention. The results also identify specific areas for instructional and technical enhancement, particularly the integration of inventory calculations with financial statements, Kardex functionality, and more detailed step-by-step feedback.

7. Recommendations, Limitations, and Future Research

XP Contable should be used as a complementary educational tool rather than as a substitute for traditional accounting instruction. Accounting instructors could incorporate it into structured learning sequences that combine conceptual explanations, worked examples, repeated practice, assessment, and formative feedback. Higher education institutions and curriculum developers should promote the pedagogically sound integration of GenAI through faculty development, appropriate technological infrastructure, and attention to accuracy and ethical use. The next upgrade of XP Contable should prioritize platform stability, automatic saving of student progress, improved Kardex features, more detailed explanations of incorrect responses, and step-by-step representations linking inventory valuation, cost of goods sold, ending inventory, and financial statements.

Several limitations should be considered when interpreting the findings. The one-group pretest-posttest design lacked a concurrent control group, which prevented causal attribution of the observed changes to XP Contable alone. The study included only 21 voluntary participants from a single course at one institution, potentially introducing self-selection bias and limiting generalizability. The 11-item knowledge test was a targeted classroom measure and showed limited internal consistency reliability ($KR-20 = .426$ at pretest and $.398$ at posttest). The use of identical items at pretest and posttest may also have introduced a testing effect, while the approximately three-week implementation period did not permit assessment of longer-term knowledge retention. Finally, the self-report measures may have been subject to response bias.

Future research should include larger, multicenter samples and, where feasible, control groups and quasi-experimental or randomized designs. Longitudinal studies are needed to examine knowledge retention, while more comprehensive assessment instruments could evaluate higher-order accounting competencies. Further studies should also investigate how the accuracy and explanatory quality of AI-generated feedback relate to learning outcomes. Finally, XP Contable should be validated across different accounting courses, student populations, and educational contexts.

Conflict of Interest

The authors declare no conflicts of interest.

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Appendix 1 Research Instrument: Prior Knowledge Questionnaire on Inventory Accounting

Instructions: The following questionnaire was administered to students before the implementation of XP Contable to assess their prior knowledge of inventory accounting.

1. What semester of the Public Accounting program are you currently enrolled in?
2. Have you previously studied inventory accounting in any course?
3. In accounting, inventory is defined as:
4. Which of the following items would normally be included in the inventory of a merchandising company?
5. Beginning inventory refers to:
6. What is the main difference between the periodic and perpetual inventory systems?
7. Under the periodic inventory system, cost of goods sold is primarily calculated at the end of the accounting period using:
8. Which of the following is an inventory valuation method?
9. The FIFO method means:
10. When prices are rising, FIFO generally results in:
11. Cost of goods sold represents:
12. Ending inventory is reported in:
13. A company has:

Beginning inventory = 1,000

Purchases = 4,000

Ending inventory = 800

The cost of goods sold is:

14. How would you rate your level of knowledge of inventory accounting?
15. Do you feel able to calculate cost of goods sold or prepare a Kardex inventory record?