



Assertion-Evidence-Connection and XBRL Media in Audit Planning: Experimental Evidence

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ABSTRACT

This study examines the effect of the Assertion-Evidence-Connection audit learning method and the use of XBRL-based financial reporting media on the effectiveness of audit planning, particularly on accuracy in assessing the risk of material misstatement. Using a 2 × 2 factorial experimental design, 57 sixth-semester accounting students were assigned to one of four treatment groups, and their audit planning accuracy was analyzed using two-way ANOVA. The results show that students taught with the Assertion-Evidence-Connection method achieved significantly higher accuracy in assessing the risk of material misstatement than those taught conventionally, whereas students who used XBRL-based financial reporting media were not significantly more accurate than students without access to XBRL data, and no significant interaction effect was found between the two factors; this indicates that the Assertion-Evidence-Connection method, rather than XBRL media, is the primary driver of audit planning accuracy in this sample. These findings extend contextual learning theory by showing that explicitly connecting assertions, objectives, and evidence within a single instructional sequence strengthens novice auditors' professional judgment, and they support the view that audit technology and auditor reasoning are complements rather than substitutes; practically, accounting educators and audit firms should prioritize assertion-based reasoning instruction as the primary lever for improving audit planning accuracy, rather than assuming that access to structured, machine-readable reporting formats such as XBRL will improve judgment on its own. This study offers novel experimental evidence on the combined, rather than isolated, effect of an integrated audit learning method and XBRL-based reporting media on audit planning effectiveness.

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1. INTRODUCTION

Economic globalization has increased the complexity of financial transactions and financial statement presentation, raising the risk that unintentional errors or intentional fraud will cause material misstatements (Jung et al., 2021; Moorthy et al., 2011). Because unqualified financial reports mislead users' decisions (Summers and Sweeney, 1998), the reliability of audited financial information has become a central concern within auditing, a core branch of the accounting discipline responsible for verifying that financial statements are free from material misstatements. Within this domain, how prospective auditors are taught to connect management's assertions with sufficient and appropriate audit evidence during the planning phase remains a fundamental yet underexamined question in accounting education research.

Audit quality depends heavily on auditor competence, which is shaped not only by professional experience but also by the learning process during accounting education (Agevall et al., 2018; Elsayed and Hassan, 2024; Gittings et al., 2020). International Standard on Auditing 200 requires auditors to evaluate the reasonableness of management's assertions before designing audit procedures; however, prior studies indicate that conventional audit instruction struggles to make these assertions concrete for students, leaving a persistent gap between assertions, audit objectives, and the evidence auditors must gather to reach sound conclusions (Burdon and Munro, 2017; Jalbert, 2008; Mugwira et al., 2026; Willits, 2010; Wright, 2016).

This gap is compounded by the current era of big data, in which auditors increasingly rely on electronic financial data and analytical procedures that compare a client's figures with industry benchmarks during the planning phase (Abdelwahed et al., 2025; Appelbaum et al., 2017; Brown-Liburd et al., 2015; Samaha and Hegazy, 2010). Extensible Business Reporting Language (XBRL) offers a standardized medium for such comparisons; however, its use in accounting curricula has largely been confined to information-systems courses rather than integrated into audit planning instruction, even though auditors need comparable industry data to identify anomalies efficiently and support the professional skepticism required for sound risk assessment (Ennar and Damak-Ayadi, 2024; Quadackers et al., 2014).

Despite extensive research on audit learning models and XBRL adoption as separate streams, few studies have examined how an assertion-based teaching method and XBRL-based reporting media jointly affect students' ability to plan an audit, and fewer still have tested this relationship experimentally rather than through perception surveys (Broberg et al., 2017; Hammersley et al., 2010). This represents a genuine gap and novelty in the literature, because prior audit-education research has typically isolated either the instructional method or the technological medium without assessing their combined and interactive effect on a core, high-stakes audit judgment: assessing the risk of material misstatement during planning.

Therefore, this study aims to examine the effect of the Assertion-Evidence-Connection audit learning method and the use of XBRL-based financial reporting media, both individually and interactively, on the effectiveness of audit planning. By doing so, this research contributes to the applied accounting literature by providing experimentally derived guidance for accounting educators and professional training designers on combining pedagogical methods and reporting technology to strengthen auditors' professional judgment before they enter practice. Accordingly, this study proposes that H1) the Assertion-Evidence-Connection method affects the effectiveness of audit planning; H2) the use of XBRL-based financial reporting media affects the effectiveness of audit planning; and H3) the interaction between the Assertion-Evidence-

Connection method and the use of XBRL-based financial reporting media affects the effectiveness of audit planning. Because prior audit-education research has not established that reasoning-based instruction and reporting technology contribute equally to planning judgment, a null result for either factor would itself be informative, indicating that one lever may matter more than the other for training novice auditors.

2. METHODS

This study employs a controlled laboratory experiment with a 2×2 factorial design, an approach consistent with prior accounting research that establishes causal relationships between audit-related interventions and auditors' judgment outcomes through between-subjects manipulation (Ennar and Damak-Ayadi, 2024; Gajewski et al., 2025; Mugwira et al., 2026). An experimental design is used, rather than a survey or field study, because it allows the Assertion-Evidence-Connection method and the use of XBRL-based financial reporting media to be independently manipulated and randomly assigned, thereby isolating their causal effect on audit planning accuracy from confounding factors present in natural classroom or field settings. The independent variables are the Assertion-Evidence-Connection method (X1) and the use of XBRL media (X2), each manipulated at two levels (used or not used), while the dependent variable is the accuracy of audit planning (Y), operationalized as participants' accuracy in assessing the risk of material misstatement **Figure 1**.

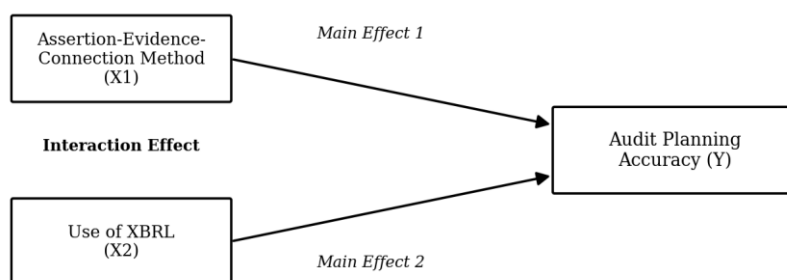


Figure 1. Conceptual Framework.

Figure 1 makes the conceptual framework explicit. The assertion-evidence-connection method (X1) and the use of XBRL media (X2) are each modeled as an independent variable with a direct path to audit planning accuracy (Y), corresponding to Hypotheses 1 and 2, while the dashed path connecting X1 and X2 represents the hypothesized interaction between the two factors in shaping Y, corresponding to Hypothesis 3. Audit planning accuracy (Y) is operationalized, as noted above, as participants' accuracy in assessing the risk of material misstatement, so that the framework links the two manipulated instructional factors directly to the accuracy measure analyzed in the Results and Discussion section.

The 2 × 2 factorial design placed participants into four cells, as summarized in **Table 1**: Cell 1 (neither method used), Cell 2 (XBRL only), Cell 3 (Assertion-Evidence-Connection only), and Cell 4 (both used).

Table 1. Research design

Assertion-Evidence- Connection Method	XBRL		Total
	Not Used	Used	
Not Used	Cell 1	Cell 2	1,2
Used	Cell 3	Cell 4	3,4
Total	1,3	2,4	

In this study, the Assertion-Evidence-Connection method was operationalized as a structured learning treatment that explicitly taught participants what management assertions are and how each assertion connects to a specific audit objective and the procedures used to gather and test the relevant evidence. Participants assigned to this treatment were first introduced to the definition of an assertion as an implied or expressed representation by management that is embodied in the financial statements and were then guided through the three categories of assertions recognized in auditing standards. The first category, transaction-level assertions, concerns classes of transactions and events during the period and comprises occurrence, completeness, accuracy, cut-off, and classification assertions. The second category, account-level assertions, concerns account balances at the period end and comprises existence, rights and obligations, completeness, valuation, and allocation. The third category, presentation and disclosure-level assertions, concerns how transactions, balances, and other matters are presented and disclosed in the financial statements and comprises occurrence and rights and obligations, completeness, classification and understandability, and accuracy and valuation assertions. For each assertion within these three categories, the treatment material connects three elements in sequence: (a) the definition of the assertion itself, (b) the corresponding audit objective, that is, the specific conclusion the auditor must reach to determine that the assertion has been fairly stated, and (c) the audit procedures appropriate for gathering and testing the evidence needed to reach that conclusion, such as inspection, observation, external confirmation, recalculation, reperformance, inquiry, and analytical procedures. By working through each assertion in this defined sequence, from assertion to audit objective to evidence-gathering procedure, participants in the Assertion-Evidence-Connection condition practiced the same reasoning chain that links management's assertions directly to the audit evidence required to assess the risk of material misstatement. By contrast, participants in the control condition worked through the same case materials without this explicit assertion-objective-evidence sequencing.

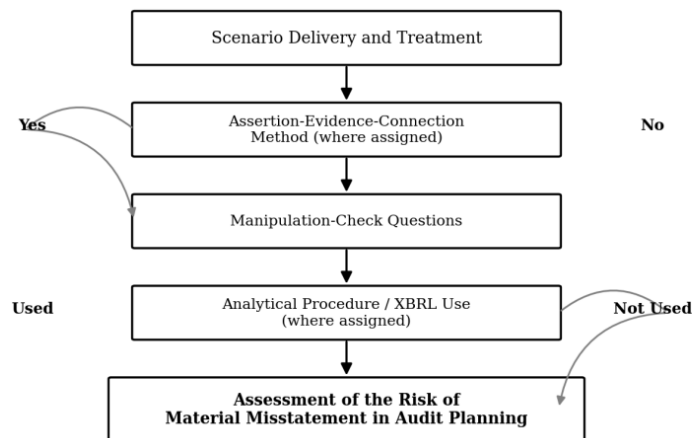


Figure 2. Experiment Flow.

Participants proceeded through a structured simulation in which they received a case scenario and their assigned treatment, applied the Assertion-Evidence-Connection method where assigned, answered manipulation-check questions to confirm they had correctly followed the treatment instructions, performed analytical procedures using XBRL-based industry comparison data where assigned, and finally assessed the risk of material misstatement in audit planning, as shown in **Figure 2**. The dependent variable, audit planning accuracy, was measured through participants' scored responses on the risk-assessment task, using a 1-9 scale in which higher scores indicate an assessment closer to the risk level established by the case materials. This scoring approach follows prior experimental audit research that operationalizes planning judgment quality through case-based accuracy scores rather than self-reported perceptions (Henrizi et al., 2021; Popova, 2012). To support replication, the case scenario, Assertion-Evidence-Connection treatment and control materials, XBRL-based industry comparison data, manipulation-check items, and accuracy-scoring rubric are provided as [AUTHOR TO ATTACH — Appendix/Appendices]. All 57 respondents who completed the simulation are included in the analysis below. Of the 80 sixth-semester students initially recruited and randomly assigned across the four cells, 57 fully completed the online sequence of manipulation-check and risk-assessment items. The remaining participants, who did not complete the full sequence, were excluded listwise and are not part of the analyzed sample.

Manipulation checks confirmed that the participants engaged with their assigned treatments as intended. A basic case-comprehension item common to all four conditions, asking participants to identify the audited company's reported revenue figure, was answered correctly by all 57 participants (100%), indicating that all participants had attended to the core case materials. Among the 28 participants who received the Assertion-Evidence-Connection treatment (Groups B and D), all 28 (100%) correctly answered the manipulation-check item requiring them to apply the assertion-objective-evidence sequence to compute the case's rationally expected revenue, confirming that this treatment was understood and followed as instructed. Among the 29 participants who received the XBRL treatment (Groups C and D), 25 (86.2%) correctly answered the manipulation check item requiring them to compare the audited company's reported revenue with the XBRL-based industry-average revenue (93.3%, 14 of 15, in the XBRL-only condition versus 78.6%, 11 of 14, in the combined Assertion-Evidence-Connection and XBRL condition). This lower, though still majority, pass rate could help explain why the main and

interaction effects of XBRL did not reach significance. All participants were retained in the main analysis reported below to preserve the full randomized sample, and this manipulation-check pattern is noted as an interpretive caveat on the XBRL and interaction results in the discussion.

Audit planning accuracy was operationalized through a single item in which participants selected a value from 1 (very low risk) to 9 (very high risk) to represent their assessed risk of material misstatement in the revenue account; participants' raw selected value served directly as their accuracy score, so no separate multi-criterion scoring rubric or independent scorer was involved in generating the scores analyzed in **Table 2 and Table 5**. The item's validity rests on the case having been deliberately constructed so that a high value on the scale is the substantively correct judgment: participants were given cues consistent with an elevated risk of material misstatement in the revenue account, including a pandemic-related industry-wide decline in comparable hotel revenue that was not reflected in the audited client's own reported figures, an unqualified prior-year audit opinion that could create unwarranted comfort, and a short audit-time constraint, all of which are risk indicators grounded in auditing standards and prior experimental-audit research rather than an arbitrary numeric target. Because the measure is a single self-reported numeric judgment rather than a rubric scored by independent raters, conventional inter-rater reliability indices such as Cohen's kappa or an intraclass correlation coefficient do not apply here; the appropriateness of this single-item measure instead follows the same case-based, numeric risk-assessment approach used in prior experimental audit-judgment research (e.g. Henrizi et al., 2021; Wright, 2016), rather than a multi-item rubric requiring independent scoring.

The population of this study was the students of the Indonesian University of Education, and sixth-semester students were selected as the sample because they already possessed foundational knowledge of the audit process, which is necessary to meaningfully engage with the simulation and to test the audit learning model, while not yet having received extensive professional audit training that could confound the effect of the experimental treatments (Gittings et al., 2020). Participation was voluntary, and participants were informed of the general nature of the task before providing consent, consistent with standard ethical practice for behavioral accounting experiments involving student participants. Data normality was tested using the Kolmogorov-Smirnov technique, and the homogeneity of variance was tested using Levene's test as a precondition for Analysis of Variance (ANOVA); hypotheses were then tested using two-way ANOVA with the assistance of SPSS version 25, allowing the main effect of each independent variable and their interaction effect to be estimated simultaneously.

The experiment was administered as an online simulation using Google Forms, in a single data-collection window under the supervision of a research assistant (experimenter) who guided participants through the procedure. At the outset of the session, all participants assumed the role of an auditor assigned to plan the audit of a hotel client and were given identical background information about that client, including its objectives and business strategy, accounting procedures, and fraud, business, and control risk information, together with the client's income and comprehensive income statements for the current and prior year. Participants were then randomly divided into four groups corresponding to the four cells of the 2×2 design in Table 1, each of which worked through the identical client background, the same manipulation-check item, and the same final risk-assessment task, differing only in which of the two treatments, if any, they received in between, as illustrated in Figure 2: the control group (Cell 1, $n = 14$)

proceeded directly from the manipulation-check item to the risk-assessment task; the Assertion-Evidence-Connection-only group (Cell 3, $n = 14$) additionally received the Assertion-Evidence-Connection learning treatment before the risk-assessment task; the XBRL-only group (Cell 2, $n = 15$) was additionally given access to XBRL-based industry-comparison data to perform an analytical procedure before the risk-assessment task; and the combined group (Cell 4, $n = 14$) received both the Assertion-Evidence-Connection treatment and the XBRL-based analytical procedure before the risk-assessment task. Because the four groups differed only in this treatment combination and not in the client background, manipulation-check item, or risk-assessment task, the balanced cell sizes ($n = 14$ -15) reported in **Table 2** reflect this random division into the four treatment cells rather than any systematic difference in how participants were recruited into the study.

As with laboratory experiments generally, this design prioritizes internal validity: random assignment to the four cells in Table 1 rules out systematic differences in prior ability or motivation as alternative explanations for differences in audit planning accuracy across treatment groups, which allows the observed effects to be attributed to the Assertion-Evidence-Connection method and XBRL media themselves rather than to pre-existing participant characteristics. The trade-off, common to behavioral accounting experiments using student participants as proxies for novice auditors, is that external validity to full professional settings must be established through replication with practicing auditors in future research (Popova, 2012; Sihombing et al., 2023) ; nonetheless, sixth-semester accounting students are a defensible proxy for entry-level auditors because they are the population accounting programs are directly responsible for preparing, so the findings may usefully inform curriculum design even before such replication occurs, though as evidence from a single course at a single institution they should be treated as preliminary rather than conclusive.

3. RESULTS AND DISCUSSION

The table below lists the number of participants in this study, consisting of 57 people, of whom 28 received treatment involving the Assertion-Evidence-Connection method. As many as 29 people received analysis treatment with XBRL media, and 28 did not.

Table 2. Factorial descriptive

Presence or Absence of Assertion	Application of XBRL	Mean	Std. Deviation	N
Present	Used	6.5714	2.37663	14
	Not Used	6.0714	1.97929	14
	Total	6.3214	2.16117	28
Absent	Used	5.1333	1.80739	15
	Not Used	4.5714	1.65084	14
	Total	4.8621	1.72635	29
Total	Used	5.8276	2.18875	29
	Not Used	5.3214	1.94467	28
	Total	5.5789	2.06974	57

Homogeneity testing was carried out using Levene's test, which showed a significance value of .643, greater than .05, indicating that the variance of the score variable was homogeneous and that the assumption of homogeneity for the two-way ANOVA test was fulfilled. **Table 3** shows homogeneity test and **Table 4** shows normality test.

Table 3. Homogeneity test

F	df1	df2	Sig.
.561	3	53	.643

Table 4. Normality test

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Residuals for Audit Planning Accuracy Score	.139	57	.202	.938	57	.006

The Kolmogorov-Smirnov test did not indicate a significant departure from normality ($p = .202$), whereas the Shapiro-Wilk test, which is more sensitive with this sample size, indicated a significant departure ($p = .006$). Because the four cells were of comparable size ($n = 14-15$) and two-way ANOVA is known to be robust to moderate non-normality under such balanced conditions, the analysis proceeds with ANOVA, while noting this assumption as a caveat on the precision, rather than the direction, of the significance tests reported below.

Table 5. Test of between subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	34.376 ^a	3	11.459	2.955	.041
Intercept	1777.583	1	1777.583	458.409	.000
Assertion	30.726	1	30.726	7.924	.007
XBRL	4.014	1	4.014	1.035	.314
Assertion * XBRL	.014	1	.014	.004	.953
Error	205.519	53	3.878		
Total	2014.000	57			
Corrected Total	239.895	56			

Notes: a. R Squared = .143 (Adjusted R Squared = .095)

The test results show that the Assertion-Evidence-Connection method has a significance value of .007 ($< \alpha = 5\%$), so the first hypothesis is accepted. However, XBRL-based financial reporting media shows a significance value of .314 ($> \alpha = 5\%$), so the second hypothesis is not supported. Testing the interaction between the two factors shows a significance value of .953 ($> \alpha = 5\%$), so the third hypothesis is also not supported. Taken together, only the Assertion-Evidence-Connection method had a statistically significant main effect on the accuracy of audit planning; neither the use of XBRL media alone nor its interaction with the learning method reached significance in this sample. Effect sizes, calculated as partial eta squared from the Type III sums of squares in **Table 5**, indicate that the Assertion-Evidence-Connection method has a medium-

to-large effect (partial $\eta^2 = .130$), whereas the effect of XBRL media is small (partial $\eta^2 = .019$) and the interaction effect is negligible (partial $\eta^2 < .001$). The medium-to-large effect size for the Assertion-Evidence-Connection method reinforces the substantive, and not merely statistical, importance of this main effect, even though the model's overall R-squared of .143 indicates that a considerable share of variance in audit planning accuracy remains unexplained by the two factors examined here.

The finding that the Assertion-Evidence-Connection method significantly improves the accuracy of audit planning supports the theoretical premise of International Standard on Auditing 200 that sound audit conclusions depend on auditors' ability to link management's assertions with corroborating evidence. It also aligns with contextual learning theory, which holds that instruction anchored in realistic, sequential case reasoning produces deeper professional judgment than abstract, disconnected instruction (Hamruni, 2015). This result is consistent with Wright (2016), who found that connecting business risk information with assertions and evidence improves the accuracy of risk-of-material-misstatement assessments, and it extends Jalbert (2008) and Willits (2010), who identified the abstractness of assertions as a persistent obstacle in audit education, by showing that an explicitly sequenced Assertion-Evidence-Connection method can help overcome that obstacle. The result is further corroborated by Elsayed and Hassan (2024), who found that experiential, simulation-based audit instruction similarly enhances accounting students' professional judgment and performance compared with passive, lecture-based teaching.

The nonsignificant effect of XBRL-based financial reporting media on audit planning accuracy diverges from the expectation set out by Samaha and Hegazy (2010, 2011) and Abdelwahed et al. (2025), who argue that standardized, machine-readable reporting formats and big-data-analytics tools generally enhance audit quality. However, this null result is not necessarily inconsistent with that literature once the mechanism is considered more closely: those studies largely examined technology adoption among practicing auditors who already possess the professional judgment needed to interpret standardized data, whereas the participants here were students encountering XBRL-based industry comparisons for the first time, with no explicit instruction on how to translate that comparison into a risk judgment (Brown-Liburd et al., 2015; Holt and Loraas, 2021; Sihombing et al., 2023). This interpretation aligns closely with Barr-Pulliam et al. (2024), who argue that audit technology and auditor reasoning function as complements rather than substitutes: access to richer or more comparable data only improves judgment when paired with the interpretive skill to act on it, and simply providing standardized information, without a reasoning framework, can leave judgment quality unchanged. It also qualifies (Ennar and Damak-Ayadi, 2024), who found that clearer risk-relevant information supports more skeptical, accurate judgments among practicing auditors; the present results suggest that this benefit may depend on the perceiver already possessing sufficient professional skepticism to exploit that information, a capacity novice students may not yet have developed (Peytcheva, 2013; Xu et al., 2023). Broberg et al. (2017) similarly found that easier access to client information increases auditors' confidence in their evidence, but confidence and accuracy are conceptually distinct, and the present findings indicate that easier access to comparable data did not, on its own, translate into more accurate risk assessment among novice participants. This interpretation is reinforced by the manipulation-check results reported in the Method section: whereas participants who received the Assertion-Evidence-Connection treatment passed its

manipulation check without exception, only 86.2% of participants who received the XBRL treatment correctly answered the XBRL manipulation-check item, and this pass rate was lower still, at 78.6%, in the combined Assertion-Evidence-Connection and XBRL condition; the comparatively weaker manipulation of the XBRL treatment may therefore have contributed to, though it does not fully explain, the non-significant XBRL main effect reported above.

The absence of a significant interaction is consistent with the pattern of main effects reported above: because XBRL media alone did not significantly improve accuracy, there is little basis to expect that it would substantially amplify the effect of the Assertion-Evidence-Connection method either. This result diverges from the interactive relationship implied by Hammersley et al. (2010), who suggested that documentation specificity and priming jointly shape auditors' judgment; however, it is plausible in this study's context because only the Assertion-Evidence-Connection method meaningfully engaged participants' reasoning process, while XBRL media, without that reasoning scaffold, did not add discernible value on its own or in combination. This non-significant interaction has clear practical implications: accounting programs should not assume that simply layering standardized reporting technology on top of existing instruction will enhance audit planning accuracy; the reasoning-based instructional method appears to be the active ingredient, and technology access without it does not reliably translate into better judgment.

Taken together, these findings can be synthesized into a single explanatory thread, illustrated in **Figure 3**: the Assertion-Evidence-Connection method strengthens the cognitive process by which students connect assertions to evidence, and this reasoning process significantly improves audit planning accuracy, particularly the assessment of the risk of material misstatement; XBRL media, by contrast, strengthens the data infrastructure available to auditors but, without a reasoning framework to interpret it, does not by itself produce a significant improvement in judgment accuracy, nor does it significantly amplify the benefit of the reasoning-based method.

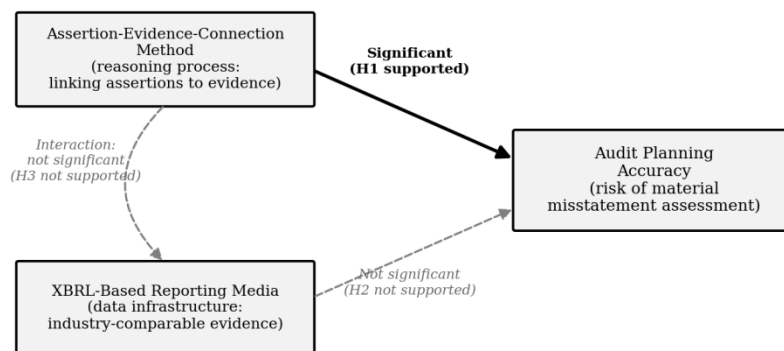


Figure 3. Synthesis of Findings.

For the broader field of accounting, this synthesis reinforces the view that audit quality depends primarily on the auditor's reasoning process, with reporting technology serving as a potentially useful but not sufficient complement (Abdelwahed et al., 2025; Appelbaum et al., 2017; Brown-Liburd et al., 2015; Li et al., 2026; Samaha and Hegazy, 2010). For accounting education specifically, the results suggest that curricula should prioritize explicit, assertion-based reasoning instruction as the primary lever for improving audit planning accuracy; exposure to standardized electronic reporting formats, such as XBRL, remains worth including, given the big-data-driven audit environments described by Abdelwahed et al. (2025) and Ennar and Damak-

Ayadi (2024), but this study's results caution that technology exposure alone, without accompanying reasoning instruction, should not be expected to significantly improve novice auditors' judgment.

These findings also speak to the broader debate among audit standard-setters about how technology should be positioned relative to auditor judgment. Barr-Pulliam et al. (2024), in their review of the literature underlying the IAASB's proposed revision of ISA 500 (Exposure Draft 500), argue that digital tools and auditor reasoning function as complements rather than substitutes: technology expands the evidence auditors can efficiently examine, but its value still depends on auditors' capacity to interpret that evidence against management's assertions. The present results provide direct empirical support for this complementarity view, and arguably sharpen it: rather than each factor making an independent contribution, only the reasoning-based method proved sufficient on its own, while technology access without that reasoning capacity showed no significant benefit. This suggests that as audit regulators continue to revise evidence-related standards for a data-rich environment, accounting curricula should not treat technology adoption as a substitute for judgment-building instruction, but should ensure that reasoning-based training is in place before, or at least alongside, any expansion of standardized reporting tools (Gajewski et al., 2025; Saiewitz et al., 2026; Xu et al., 2023).

Finally, these results help address the macro-level accounting problem raised at the outset of this study: the risk that growing transactional complexity and reliance on electronic financial data will outpace auditors' ability to detect material misstatements. By demonstrating that an explicit, teachable reasoning method measurably improves novice auditors' risk-assessment accuracy, while mere access to standardized reporting technology does not, this study offers accounting educators and professional bodies concrete evidence that the reliability gap identified in the introduction is best narrowed through deliberate instruction in professional reasoning, rather than through technology provision alone.

Because the Assertion-Evidence-Connection method is procedurally simple to describe and does not depend on specialized software, it can plausibly be extended beyond the university classroom into professional training settings, such as the structured onboarding programs that audit firms already use for newly hired staff, without requiring prior investment in reporting technologies. Extending this line of research to practicing auditors and a broader range of misstatement scenarios and industries would allow the field to establish how far the reasoning-based accuracy gains observed here persist once auditors gain professional experience and whether XBRL or similar technologies begin to show a measurable benefit once users have first developed the underlying reasoning skill that this study finds to be decisive.

4. CONCLUSION

Conclusion This study shows that the assertion-evidence-connection audit learning method significantly improves the accuracy of audit planning, particularly students' ability to assess the risk of material misstatement, whereas the use of XBRL-based financial reporting media does not significantly improve accuracy on its own, and the two factors do not interact. These findings address the accounting problem raised in the introduction, namely that conventional audit instruction struggles to make management's assertions concrete: by explicitly sequencing assertions, objectives, and evidence, accounting educators can equip prospective auditors with the reasoning process needed to plan higher-quality audits, while the results caution that

simply providing standardized reporting media, such as XBRL, without accompanying reasoning instruction, is not by itself sufficient to close that gap.

For the accounting discipline more broadly, this study offers an empirically tested instructional design, centered on assertion-based reasoning, that accounting programs and professional training providers can adopt to strengthen prospective auditors' professional judgment before they enter practice, thereby contributing to the reliability of the financial statements on which users depend for decision-making. As big data and standardized electronic reporting become increasingly central to the audit profession, the findings of this study suggest that such technology should be introduced as a complement to, rather than a substitute for, explicit reasoning instruction, offering a concrete, evidence-based solution for preparing auditors capable of delivering higher-quality audit planning.

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