Enhancing Auditors' Ability to Identify Opportunities to Commit Fraud in Automated System Environments: The Use of Case Studies

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ABSTRACT: Research suggests that audit team members, especially staff, may lack the necessary training to be able to identify fraud risks and to develop appropriate responses to identified fraud risks (e.g., Knapp and Knapp 2001; Braun 2000; Zimbelman 1997). This lack of training may be particularly acute with respect to the perpetration of fraud in automated environments (Filipek 2007). We find evidence that supports our hypotheses that future staff auditors exposed to and practicing with example cases where fraud is perpetrated in automated environments, are better able to recognize indicators of fraud in automated environments and to develop appropriate audit responses to identified fraud opportunities (audit tests and recommendations) than future staff auditors who are not exposed to or practice with example cases.

Key Words: fraud identification; IT auditing; cognitive constructivism

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INTRODUCTION

The notorious fraud headlines surrounding Enron, WorldCom, and other high profile companies during the last decade has led the accounting profession with a daunting task of restoring its public image. The creation of the Public Company Accounting Oversight Board (PCAOB) under the Sarbanes-Oxley Act of 2002 (the Act) and the stringent testing of internal controls required under the Act, have helped rejuvenate the profession's image. In addition, the issuance of Statement of Auditing Standard (SAS) No. 99, *Consideration of Fraud in a Financial Statement Audit* (AICPA 2001), has increased auditors' professional skepticism and the risk assessment standards (SAS Nos. 104-111) have helped auditors more closely link the risk of material misstatement to specific audit procedures. While all of these measures are needed, the accounting profession must continue to diligently narrow what Rezaee (2004) terms the "perceived trust gap"–the erosion of the public's confidence in the core values of integrity, objectivity, independence, and competence, maintained by CPAs. Rezaee argues that a continuing focus on anti-fraud education and training can bridge this gap. He joins the call of Carmichael (2004) and Makkawi and Schick (2003) to improve auditor training to identify fraud risks and to develop appropriate responses to identified fraud risk. Specifically, Rezaee calls for educators to develop training programs aimed at combating fraud, integrate anti-fraud education into both college courses and training programs for professionals.

Research findings indicate that auditors have difficulty identifying fraud (Knapp and Knapp 2001; Braun 2000; Zimbelman 1997; Jamal et al. 1997). This problem may be amplified by auditors' lack of skills in identifying information technology (IT) risk (Filipek 2007; Fleming and Wortmann 2005). This skill gap may be attributable to the auditors' lack of knowledge in identifying key risk factors for fraud (Carpenter et al. 2002; Braun 2000; Hoffman and Patton 1997). One reason auditors may not have the knowledge to detect fraud is that auditors lack practice and feedback in fraud detection (Carpenter et al. 2002). Without sufficient exposure to examples of fraud identification risks, auditing responses, and internal control recommendations, particularly when automated systems are used, auditors are likely to overlook indications of fraud.

Carmichael (2004) suggests that accounting students, as future staff auditors, need to be trained on how financial statement fraud might be perpetrated. In addition, it has been suggested that the IT skills of auditors have received little attention from accounting academics and that changes in academic curricula should be made to better prepare students for their careers as auditors (Ernst & Young 2007).

In response to these suggestions and to help reduce these skill gaps, we expose students enrolled in senior- and graduate-level auditing and internal auditing classes to example cases where fraud is perpetrated in automated environments. We then compare the students' responses to questions concerning fraud identification risk, auditing responses, and internal control recommendations, to a control group of students not exposed to the example cases using both within- and between-group analyses. We find that the treatment group of student-participants both (1) *self-evaluated* the improvement in their IT-related fraud skills higher than the control group of student-participants, and (2) were *independently* evaluated as having a higher level of IT-related fraud skills than the control group. These findings suggest that exposure to example cases where fraud is perpetrated in automated environments enhances future staff auditors' abilities to identify fraud risks, propose appropriate auditing responses, and develop appropriate internal control recommendations.

The example cases are intended to be used to in auditing, internal auditing, accounting systems, or forensic accounting classes as an aid to enhance both students' knowledge of how fraud might be facilitated in automated environments and their abilities to suggest appropriate auditing responses to fraud indicators. The cases describe three different scenarios where fraud is facilitated by inadequate *general* IT controls. As with all instances of fraud, fraud in automated environments requires the presence of an opportunity (i.e., missing internal control), a pressure (i.e., individual feels he or she has no other choice), and an attitude (i.e., individual is able to justify their decision) to commit fraud. Each case incorporates these concepts. Instructional guidance and student learning objectives are presented in Appendix F (appendices are located in a separate file).

This paper proceeds as follows. The next section provides background on the auditor's responsibility to detect fraud and theoretical support for the study's methodologies. The third section describes tests of the study's case materials. The fourth section presents the study's results, and the final section presents a summary of the study's findings.

BACKGROUND AND THEORY

Auditors' Ability to Detect Fraud

SAS No. 99 requires that auditors conduct certain activities in order to discharge their responsibility to search for fraud in accordance with generally accepted auditing standards or auditing standards adopted by the PCAOB.[1] One of the requirements of SAS No. 99 is that all members of the engagement team participate in a discussion to identify "how and where they believe the entity's financial statements might be susceptible to material misstatement due to fraud" (SAS No. 99, paragraph 14). This requirement assumes there is value in having all members of the engagement team participate in the identification of potential fraud areas.[2] Engagement partners and managers may add value to the discussion based on their years of experience in identifying potential fraud and depth of client knowledge; audit staff may add value by contributing ideas that may not have been thought of by other engagement team members. However, during the conduct of the audit, engagement staff personnel are more-likely the first exposed to fraud, making it critical that they be able to recognize indicators of potential fraud. In effect, they are the auditing firm's "first line of defense" in detecting fraud.[3]

Auditors, however, may fail to detect fraud because they do not have the necessary knowledge to identify key risk factors for fraud (Carpenter et al. 2002; Braun

[1] SAS No. 99 was adopted by the AICPA in June 2002, and was adopted by the PCAOB as an *Interim Standard* (AU Section 300) in April 2003.
[2] Carpenter (2007) finds support with this assumption; specifically, she finds that brainstorming audit teams generate more quality fraud ideas than individual auditors generate before the brainstorming session.
[3] SAS No. 109, *Understanding the Entity and Its Environment and Assessing the Risks of Material Misstatement*, also requires discussions among engagement team personnel when considering the impact of errors on the financial statements. Our cases are specifically directed at the identification and response to fraud, not errors.

2000; Hoffman and Patton 1997). One reason auditors may not have the knowledge to detect fraud is that auditors lack practice and feedback in fraud detection. Because fraud occurs infrequently in audits (Loebbecke et al. 1989), auditors have limited practice and feedback opportunities available for learning how to detect fraud.

Carpenter et al. (2002) conduct an experiment to show that the ability of auditors to detect fraud comes in part from experience–not in years of experience but in terms of dealing with specific examples of fraudulent activity. They find that graduate accounting students who had practice and feedback in detecting fraud more accurately assessed firm environment risk factors (as opposed to account specific risk factors) than did practicing auditors who averaged over 3.5 years of audit experience. Their results suggest that a typical audit environment in which auditors infrequently encounter fraud does not adequately equip auditors to detect frauds.

Fraud Detection in an Automated Environment

Audit risk increases if staff auditors lack sufficient skills to identify fraud risks and propose appropriate audit responses. This skills gap may be particularly acute with respect to the perpetration of fraud in automated environments. A recent survey of 450 IT internal auditing professionals identifies IT auditing and risk management skills as the top two areas where internal auditors need to improve (Filipek 2007).[4] Unless accountants intend to be employed as IT specialists, it is likely that they lack formalized IT training which further inhibits their ability to identify ways that fraud might be perpetrated in automated environments. This lack of staff auditors' IT skills poses an

[4] Full survey available at www.protiviti.com/portal/site/pro-us/menuitem.d5c0f953cd1bd1ff9411310df5ffbfa0#2006; accessed August 1, 2008.

escalating problem as an increasing number of companies use and rely upon automated systems.

IT controls can generally be divided into two types: *general* and *application* controls. General controls include access restriction, segregation of duties, and physical safeguards. For example, the use of passwords to restrict individuals' access to programs to those specifically required in the execution of their assigned duties is a general control. Application controls include processing checks and controls over the modification of IT programs. For example, using batch totals to help ensure that data has been correctly input is an application control. Both types of controls are important; however, it is generally agreed that weak general controls reduce, or even eliminate, the positive effects of strong application controls (Hitzig and Jacoby 1995). For example, if all employees have access to financial reporting programs, strong financial reporting processing checks likely will not reduce the risk that financial data may not be processed in accordance with management's criteria.

In this paper, we focus on fraud perpetrated by violating *general* IT controls for two reasons. First, general controls are at least as important, if not more important, than application controls. According to Ernst & Young (2007), the pervasiveness of IT general controls requires that generalist auditors deepen their IT knowledge. Second, due to their complexity, the appropriateness of application controls is more-likely to be delegated to IT auditor-specialists, not audit staff.

Information Processing

To be successful in auditing careers, auditing graduates must be able to apply their technical knowledge to a variety of unstructured tasks. Staff accountants are expected to identify and solve unstructured problems under uncertainty and exercise judgment in decision-making (Ahadiat 1999). The ability of auditors to effectively analyze unstructured tasks requires higher-ordered thinking skills (Springer and Borthick 2004); therefore students need exposure to auditing issues beyond learning the mechanics of how an audit works and the substance of auditing standards. Classroom assignments that require students to develop and practice appropriate skills in a systematic manner aid in the development of these higher level thinking skills (Mayer 2003). We believe that providing students with a series of cases within a particular domain (e.g., the identification and investigation of fraud in automated environments) is one way to acquire this essential skill set.

A variety of information processing theories have been proposed to explain how individuals learn as a result of building a knowledge base within a particular context. Cognitive constructivism, which refers to constructs learners make as a result of past and current knowledge, is one such theory. The theory suggests that learning is creating meaning from an individual's experiences and the interactions the individual has with the environment. The cognitive constructs are highly contextual; as a result, optimal learning occurs in simulated environments relevant to the learner's experiences (Bruner 1986).

Elaboration theory is another information processing theory. According to elaboration theory, optimal learning is achieved in a sequential manner by building, or elaborating, on the core ideas and principles of the subject matter (Reigeluth and Stein 1983). The process begins with an overview of the most fundamental ideas of the subject and the presentation of the simplest task. Subsequent lessons on the subject should be organized in an increasing order of complexity so the basic ideas become ingrained in the learner. During each lesson, a review of previous information learned with appropriate feedback should be included, enabling the learner to develop a meaningful context into which subsequent ideas and skills can be assimilated (Reigeluth 1992).

Cognitive constructivism and elaboration theory utilize problem-based leaning to develop higher order cognitive skills in individuals. Problem-based learning models are derived from the apprenticeship, or learning-by-doing, model. In problem-based models, individuals learn the task-specific skills from the beginning and continue to build their cognitive abilities as the contexts become increasingly more complex (He 2002).

Cullen et al. (2004) explore the use of case studies in accounting education. Their study provides evidence that more complex accounting issues can be effectively conveyed to students in a problem-based learning context. Problem-based learning is particularly relevant for auditing students. Students leaving college are often expected to retrieve knowledge of technical information and apply it to a variety of ill-structured situations. To facilitate higher order learning, students should be given active opportunities to construct knowledge in a set of realistic experiences. To retain the information taught, students must be able to see the meaning, purpose, and application of material they are learning, which includes feedback on their performance. If the material is not learned well initially, students may not be able to retain or retrieve the information later in more complex scenarios. Thus, auditing material should be learned sequentially through a series of practical and repetitive assignments (Lieb 1991). In addition, as Bonner and Walker (1994) note, the acquisition of knowledge will not occur by simply proving individuals with instruction–it must be supplemented with feedback.

Research Hypotheses

As noted above, auditors generally lack the knowledge to identify key risk factors for fraud due to their lack of experience with fraudulent activities. Research based on cognitive constructivism and elaboration theory, most notably the problem-based learning model of "learning by doing," suggests that deep learning occurs when individuals are engaged in active learning, including practice of an application with appropriate feedback. Linking these concepts together, we posit that auditors receiving more experience with fraud through practice, including receiving appropriate feedback, will be better able to detect the potential for the occurrence of fraud. Specifically, we hypothesize that future staff auditors exposed to and practicing with example cases where fraud is perpetrated in automated environments, will be better able to:

H1: recognize indicators of fraud in automated environments,

H2: identify how financial statements might be impacted as a result of identified fraud,

H3: suggest appropriate audit tests to identify fraud opportunities, and

H4: develop more appropriate recommendations to reduce the likelihood of fraud, than will future staff auditors who are not exposed to or practice with example cases**.**

TESTING THE CASE MATERIALS

To test our hypotheses, we use the case materials included in Appendix A (appendices are located in a separate file) and two groups of students enrolled in senior- or graduate-level auditing or internal auditing classes at two universities (i.e., four groups of student-participants, two groups with case exposure and two groups without). Since many of these students will begin positions with accounting firms within twelve months following the course, they are appropriate surrogates for future staff auditors. Table 1 presents a summary of student participants in each group.

[Insert Table 1]

The case materials include three representative cases where fraud is facilitated by inadequate general IT controls. The case materials were reviewed by two currently-practicing audit partners in public accounting who found the cases to contain realistic examples of fraud in automated environments.

As depicted in Figure 1, three sessions were required to execute the experiment and test the case materials.

[Insert Figure 1]

During the first session (the second class period of the semester), students were recruited to participate in the experiment. Students agreeing to participate completed a demographic questionnaire and pre-test of their self-reported skills, both of which are included in Appendix B. Demographic data ensure the appropriateness of the participants as accounting majors expected to enter into accounting and auditing careers within twelve months, and enable testing of the influence of potentially relevant covariates like gender, grade point average, and work experience. The pre-test asks students to self-evaluate on a scale from zero to nine their ability to (1) identify red flags that suggest the opportunity for fraud perpetrated in automated environments, (2) suggest how the financial statements might be impacted by fraud opportunities, (3) identify potential audit tests designed to detect fraud, and (4) make appropriate recommendations for improvements in internal control. The administration of the pre-test at the beginning of the semester, as opposed to just prior to the treatment, helps to reduce the likelihood that demand effects influence the students' responses. All responses are coded to enable matching with post-test and independent evaluations prepared during subsequent experimental sessions.

In the second session (mid-semester of the course), the instructor presented a discussion of the auditors' responsibilities for detecting fraud and SAS No. 99. To reduce the likelihood that the experiment's results are affected by instructional differences, the same instructor led the class discussion on fraud. Appendix C contains the slideshow that was used in the discussions to the four groups of student-participants used in the study.

Two groups of students (one at each university) acted as the treatment groups for the experiment. The treatment groups were exposed to an instructor-led example case (Case 1) where automated systems are used to facilitate a fraud. The treatment groups then practiced fraud identification and audit responses using a second case (Case 2 at University A; Case 3 at University B). The sequence of the cases was varied to eliminate any ordering effects. The other two groups of students acted as control groups (one from each university). The control groups were not exposed to the example case (Case 1) and did not practice fraud identification and audit responses with a second case.

After all of the participants completed their session on the auditors' responsibilities for detecting fraud and SAS No. 99, as described above, they then self-reported their abilities to detect and respond to fraud risks using the post-test. The post-test, with on a scale from zero to nine, was identical to the pre-test. The post-test is included in Appendix D. The post-test enables us to report both within-participant measures of changes in the participants' self-reported skills, and between-participant measure differences of the treatment and control groups.

During the final session (the penultimate class period prior to final exams), both treatment and control groups were asked to complete a third case (Case 3 at University A; Case 2 at University B). Students were given 20 minutes to complete the case and were reminded of the importance of the experiment in terms of validating the quality of teaching materials. The participants' subjective responses to the cases were assessed and rated on a ten-point scale (zero to nine) independently by two evaluators, one of whom was blind as to which participants were members of the treatment and control groups. Both evaluators teach auditing and/or fraud investigation classes, and both are familiar with internal controls in automated environments. The form used by the evaluators is included in Appendix E. The average score of the independent evaluations of each of the four case questions is used in the study's analyses of between-participant responses in the treatment and control groups. The evaluators' degree of concordance, measured using

Kendall's W,[5] was highly significant ($p < .01$) for each of the four criteria except for the evaluation of participants' ability to suggest how the financial statements might be impacted by the fraud opportunities ($p = .160$). We later consider the impact of this difference in the independent evaluations on the study's results.

RESULTS

A descriptive summary of the participants' demographics is presented in Table 2. A total of 97 students participated in at least one of the three sessions of the study's experiment.[6] Of these, 14 students were eliminated from the study's analyses as they did not participate in both of parts one and two (self evaluations) of the study. Another five students are lost because they did not participate in part 3 of the study (independent evaluation). Data losses are primarily due to absence on at least one of the three days that the experiment was administered. Only one student declined to participate in the study.

[Insert Table 2]

As depicted in Panels A and B of Table 2, 41 percent of the participants are male. On average, they report approximately one to three years of accounting experience, and less than one year of IT-related experience.

Also as shown in Table 2, there are significant differences in student demographics comparing the treatment and control groups, and comparing universities, increasing the likelihood that results may be attributed to covariate characteristics rather than the effects of the study's treatment. In particular, the variables grade point average,

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[5] Kendall's W is a non-parametric measure of concordance used, among other things, as a measure of inter-rater agreement. It ranges in value from 0 (no agreement) to 1 (complete agreement).

[6] All of the participants were offered a total of three extra credit points for participating in the study (one point for completion of each part of the experiment). It was our intention that this would increase the likelihood that students would attend to the experimental materials.

accounting-related experience, and IT-related experience vary significantly among the treatment and control groups, and gender varies significantly between the universities. We consider the impact of significant covariates on the study's results in our multivariate analysis.

Three sets of univariate analyses are presented in Table 3. The first univariate analysis (Panel A) compares students' self-reported perceptions of the study's four areas of interest (ability to identify red flags, ability to identify financial statement impacts, ability to identify audit tests, and ability to identify recommendations). A comparison is also made for the participants' total scores (sum of scores for the four areas of interest). Total scores are compared before instruction (first session, pre-test) and after instruction (second session, post-test) for both the treatment and control groups. Given that the scale of evaluation ranged from zero to nine, a score greater than 5.5 would suggest that participants are more confident than not in their fraud identification skills. The mean pre-test scores for each of the four areas of interest were less than 5.5 and ranged from 3.53 to 4.65. The mean post-test scores for each of the four areas of interest were greater than 5.5 and ranged from 5.14 to 6.35. All participants in the treatment group reported a significant increase in their perceived skills in each of the study's four areas of interest and in total ($p < .001$). The control group reported similar perceived increases in their skills in three areas (red flags, audit tests and recommendations, ($p < .001$)), and a moderate increase in the fourth area (financial statement impacts ($p < .10$)).

[Insert Table 3]

Participants' total scores were similar on the pre-test for both the treatment and control groups (16.33 and 16.07, respectively); total scores on the post-test appear to have greater variation (24.15 and 20.88, respectively, for the treatment and control groups). The significance of these observed differences is tested in Panel B of Table 3.

The second univariate analysis (Table 3, Panel B) compares the change in student-participants' self-reported skills in each of the study's four areas of interest (post-test scores minus pre-test scores) and in total, between the treatment and control groups. We find that for two of the study's four areas of interest and in total, students in the treatment group reported significantly greater increases in their perceived skills than participants in the control group. Specifically, treatment group participants reported greater increases in their ability to identify how financial statements might be impacted by fraud ($p = .005$), and in their ability to suggest recommendations to improve internal controls in automated environments ($p = .027$).

The third univariate analysis (Panel C of Table 3) compares the independently-evaluated skills of the participants between the treatment and control groups in each of the study's four areas of interest. The evaluators' average scores of the four areas of interest for the treatment group range from 3.36 to 7.34, and for the control group range from 2.54 to 5.32. For both the treatment and control groups, the average scores were lowest for assessments of participants' ability to determine audit tests, and were highest for participants' ability to identify the impact of fraud on financial statements. These findings are not unexpected given students' familiarity with accounting and financial statements, and their lack of familiarity with auditing procedures. On average, the evaluators reported a total score for the treatment participants of 20.46, compared to the participants' self evaluation post-test total scores of 24.15. This compares to the evaluators' average total score for the control participants of 15.90, and the participants' self evaluation post-test total scores of 20.88. This finding suggests that the participants tended to overestimate their fraud evaluation skills.

As Panel C of Table 3 indicates, we find significant differences in the evaluators' assessment of the participants' responses to the cases (rating between zero and nine) between the treatment and control groups in all four areas of interest ($p < .05$). Thus, we find support for all four of our hypotheses that future auditors exposed to and practicing with example cases of fraud in automated environments are better able to recognize indicators of fraud in automated environments (H1), identify how financial statements might be impacted as a result of identified fraud (H2), suggest appropriate audit tests to identify fraud opportunities (H3), and develop more appropriate recommendations to reduce the likelihood of fraud (H4).

Recall that analysis of several of the demographic data suggested the existence of significant differences between participants in the treatment and control groups. To account for the influence of these potential covariates on the study's results, we perform an ANCOVA which is presented in Table 4.[7]

[Table 4]

[7] ANCOVA allows the inclusion of other independent variables to improve the precision of the experimental instrument. These covariates may eliminate other possible sources of variance in the dependent variable related to factors not controllable by the researcher (Lattin et al. 2003).

The results of our ANCOVA indicate that after considering the impact of the covariates, University, Grade Point Average, Accounting Experience, and IT Experience, the experimental treatment used in the study (exposure to and practicing with the study's cases) is a significant predictor ($p <.05$) of the participants' ability to identify indicators of fraud (red flags) in automated environments (H1), identify how financial statements might be impacted by fraud (H2), determine what audit tests should be performed to detect fraud (H3), and recommend improvements over internal controls (H4).

The results also show that the university from which the participants were drawn is a significant predictor of the participants' identification of how financial statements might be impacted by fraud. Students at University B tending to be evaluated as better at suggesting how the financial statements might be affected by fraud ($p = .004$). Recall that participants from University A completed Case 3 for the post-test, while students from University B completed Case 2 for the post-test. While attempts were made to keep the complexity level of the cases similar, the enhanced performance of the students at University B may be attributable, at least in part, to the context of the case.

In addition to differences attributed to University affiliation, both accounting and IT-related work experience appear to contribute to students' ability to make recommendations to improve internal controls ($p = .007$ and .021, respectively).

Tests of concordance suggested that differences in the independent evaluators' scores of participants' abilities on one of the study's measures, the ability to suggest how the financial statements might be effected by fraud, may impact the study's findings. We test for this possibility by replacing the average evaluators' measure used in the

ANCOVA results presented in Table 4 with the individual evaluators' scores. We find (results untabulated) that the use of the study's cases is still a significant indicator of participants' ability to suggest how the financial statements might be effected by fraud using one of the evaluator's score of this measure ($p < .004$), but not using the other evaluator's score ($p = .298$). This finding suggests that the study's results may be impacted by individual instructors' perceptions of this particular measure and students' abilities. The study's cases remain a significant indicator of participant scores for the other three measures using the individual evaluator scores.

SUMMARY

We propose and find evidence to support each of the study's four hypotheses. When students enrolled in auditing classes (as representative future auditors) are exposed to, and practice with, example cases where fraud is perpetrated in automated environments, the students' abilities to recognize indicators of fraud and to develop appropriate audit responses (audit tests and recommendations) is significantly greater than the abilities of students who are not exposed to, or practice with, the example cases**.** Our findings are supported both by self-evaluations of students' perceptions of their fraud skills, and independent evaluations of students' fraud skills.

Importantly, the study's independent evaluations of students' skills are made several weeks after they are initially exposed to instruction on fraud and the study's cases. These findings are supportive of the internal validity of the study's case materials and suggest that the cases may be used in a classroom or other settings to enhance individuals' automated systems and fraud learning experiences.

Our findings have important implications for educators and practitioners. Educators may need to consider more active learning instruction as opposed to simply transmitting information, to help students understand information more thoroughly and to develop higher order thinking skills. For practitioners, the cost of not identifying fraud risk factors is potentially very large. Practitioners and educators need to work closely together to develop practice case material for students and staff accountants. Practitioners may want to share their actual fraud experiences (or instances where fraud was prevented and how) with educators. Academicians can integrate those experiences into case settings for use by students in class or auditors in training sessions.

Future research aimed at enhancing students' knowledge in a learning-by-doing task could compare individual case practice with team-based case practice. Would learning synergies be found if a group completed the practice cases, or might the use of a group dilute the learning experience of the group members?

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TABLE 1

Summary of Treatment and Control Groups of Student-participants

	Treatment	**Control**	**Totals**
University A	Case 1 - Present Case 2 - Practice Case 3 - Evaluate (n = 15)	Case 3 – Evaluate (n = 20)	(n = 35)
University B	Case 1 - Present Case 3 - Practice Case 2 - Evaluate (n = 25)	Case 2 – Evaluate (n = 23)	(n = 48)
Totals	(n = 40)	(n = 43)	(n = 83)

TABLE 2

Descriptive Statistics of Student-participants

Panel A: Comparison of Treatment and Control Groups

	Mean			
	All Participants (n = 83)	**Treatment Group (n = 40)**	**Control Group (n = 43)**	**t-test of differences [a]**
Gender	.41	.38	.44	.542
Grade point average	2.82	2.53	3.09	<.001
Accounting-related experience	1.31	1.68	.98	.022
IT-related experience	.76	1.28	.28	<.001

Panel B: Comparison of University A and University B Student-participants

	Mean			
	All Participants (n = 83)	**University A (n = 35)**	**University B (n = 48)**	**t-test of differences [a]**
Gender	.41	.26	.52	.016
Grade point average	2.82	2.77	2.85	.479
Accounting-related experience	1.31	1.60	1.10	.111
IT-related experience	.76	1.00	.58	.111

[a] Two-tailed p-values are reported.

Gender is a dichotomous variable equal to one if the participant is a male, otherwise equal to zero.
Grade point average is a continuous variable ranging from one (1.0 to 1.9) to four (4.0 to 4.9).
Accounting-related experience is a continuous variable ranging from zero (no years experience) to four (more than six years).
IT-related experience is a continuous variable ranging from zero (no years experience) to four (more than six years).

TABLE 3

Descriptive Statistics (Mean Scores) and Univariate Test Results

Panel A: Within Participant Self-reported Analyses [a]

	Treatment (n = 40)			**Control (n = 43)**		
	Pre-test	**Post-test**	**t-test of differences**[b]	**Pre-test**	**Post-test**	**t-test of differences**[b]
Ability to identify Red Flags that suggest the possibility of fraud occurring in automated system environments	3.94	5.98	<.001	3.56	5.16	<.001
Ability to identify how financial statements might be impacted by fraud	4.36	5.98	<.001	4.65	5.14	.098
Ability to determine what audit tests might be performed to detect fraud	3.66	5.85	<.001	3.53	5.14	<.001
Ability to suggest recommendations to improve internal controls over automated systems	4.36	6.35	<.001	4.33	5.44	<.001
Total score	16.33	24.15	<.001	16.07	20.88	<.001

[a] Student-participants were asked to self-report their perception of their abilities on each of the four fraud identification-related skills using a Likert scale ranging from 0 (poor) to 9 (excellent).
[b] Two-tailed p-values are reported.

(continued)

TABLE 3
(continued)

Descriptive Statistics (Mean Scores) and Univariate Test Results

Panel B: Between Groups Self-reported Analyses [a]

	Mean change between Pre-test and Post-test		t-test of differences [b]
	Treatment (n = 40)	Control (n = 43)	
Ability to identify Red Flags that suggest the possibility of fraud occurring in automated system environments	2.04	1.60	.268
Ability to identify how financial statements might be impacted by fraud	1.61	.49	.005
Ability to determine what audit tests might be performed to detect fraud	2.19	1.60	.123
Ability to suggest recommendations to improve internal controls over automated systems	1.99	1.12	.027
Total score	7.83	4.81	.017

[a] Student-participants were asked to self-report their perception of their abilities on each of the four fraud identification-related skills using a Likert scale ranging from 0 (poor) to 9 (excellent).
[b] Two-tailed p-values are reported.

(continued)

TABLE 3
(continued)

Descriptive Statistics (Mean Scores) and Univariate Test Results

Panel C: Between Groups Independent Evaluator Analyses

	Evaluator Scores		**t-test of differences** [b]
	Treatment (n = 37)	**Control (n = 41)**	
Ability to identify Red Flags that suggest the possibility of fraud occurring in automated system environments	5.47	4.44	.008
Ability to identify how financial statements might be impacted by fraud	7.34	5.32	<.001
Ability to determine what audit tests might be performed to detect fraud	3.36	2.54	.004
Ability to suggest recommendations to improve internal controls over automated systems	4.28	3.61	.024
Total score	20.46	15.90	<.001

[a] Student-participants were asked to self-report their perception of their abilities on each of the four fraud identification-related skills using a Likert scale ranging from 0 (poor) to 9 (excellent).
[b] Two-tailed p-values are reported.

TABLE 4

Results of Analysis of Covariance
Dependent Variables: RED FLAG, FS ERROR, AUDIT TEST, RECOMD

		Sum of Squares	df	Mean Square	F	Sig.[a]
RED FLAG	Treatment	12.53	1	12.53	4.57	.036*
	University	6.01	1	6.01	2.19	.140
	GPA	2.83	1	2.83	1.03	.314
	Acct Exp	.61	1	.61	.22	.638
	IT Exp	2.19	1	2.19	.80	.374
	Error	189.30	69	2.74		
	Total	224.85	74			
FS ERROR	Treatment	35.25	1	35.25	6.66	.012*
	University	45.80	1	45.80	8.65	.004*
	GPA	3.43	1	3.43	.65	.424
	Acct Exp	3.23	1	3.23	.61	.437
	IT Exp	6.36	1	6.36	1.20	.277
	Error	365.16	69	5.29		
	Total	492.05	74			
AUDIT TEST	Treatment	13.18	1	13.18	8.17	.006*
	University	.92	1	.92	.57	.452
	GPA	.64	1	.64	.40	.531
	Acct Exp	1.42	1	1.42	.88	.351
	IT Exp	2.55	1	2.55	1.58	.213
	Error	111.40	69	1.61		
	Total	129.48	74			
RECOMD	Treatment	9.41	1	9.41	6.25	.015*
	University	.12	1	.12	.08	.780
	GPA	.39	1	.39	.26	.613
	Acct Exp	11.47	1	11.47	7.62	.007*
	IS Exp	8.46	1	8.46	5.62	.021*
	Error	103.79	69	1.50		
	Total	129.50	74			

* Significant at traditional levels.
[a] Two-tailed p-values are reported.

TABLE 4
(continued)

RED FLAG is the average independent evaluation of participants' abilities to identify red flags that suggest the opportunity for fraud perpetrated using automated systems.
FS ERROR is the average independent evaluation of participants' abilities to suggest how the financial statements might be impacted by fraud.
AUDIT TEST is the average independent evaluation of participants' abilities to identify potential audit tests designed to detect the fraud.
RECOMD is the average independent evaluation of participants' abilities to make appropriate recommendations for improvements in internal control.

University is a dichotomous variable equal to one if the participant is at University B, otherwise equal to zero.
GPA is a continuous variable ranging from one (1.0 to 1.9) to four (4.0 to 4.9).
Acct Exp is a continuous variable ranging from zero (no years experience) to four (more than six years).
IT Exp is a continuous variable ranging from zero (no years experience) to four (more than six years).

FIGURE 1

Experimental Sessions

Session 1 (second day of classes)	**Session 2 (mid-semester)**	**Session 3 (penultimate class period)**
Completion of demographic questionnaire and pre-test (self-report)	Instruction[1] and post-test (self-report)	Independent evaluation (completion of case[2])

[1]Instructions for the control group included only an instructor-lead discussion of the auditors' responsibility for detecting fraud and SAS No. 99. Instructions for the treatment includes (i) an instructor-lead discussion of the auditors' responsibility for detecting fraud and SAS No. 99, including a case example (Case 1) where automated systems are used to facilitate a fraud, and subsequently (ii) a practice case for fraud identification and audit responses (Case 2 at University A; Case 3 at University B).

[2]Both the control and treatment groups completed a case (Case 3 at University A; Case 2 at University B)