A SOX 404 Simulation for Auditing and Accounting Systems Courses

John A. Schatzel

This paper reports on a preliminary investigation of a new interactive SOX 404 internal control evaluation simulation that was created to provide an alternative way of acquiring experiential learning that students could find to be realistic, interesting, and useful. The online multimedia simulation was developed as a supplement to traditional textbook-oriented courses and includes representative tasks for planning, evaluating entity-level control, evaluating activity-level control, and reporting. The study contributes to our understanding of instructional technology and the need for additional realistic experiential learning experiences called for by the profession (Albrecht, W. S & Sack, R J, 2000). A total of fifty-seven students tested the simulation; ten in a graduate auditing course, fourteen in an undergraduate auditing course, and thirty-three in two accounting systems courses. One week after the simulation exercises were concluded, the students completed a questionnaire to assess their perceptions of the simulation for realism, interest, and utility in learning. The results of the study indicate that the students found the simulation to be both interesting and realistic and that it helped them improve their understanding and appreciation of internal control evaluation, interviewing skills, and higher-order thinking. The results also suggest that interactive simulation may be used in additional to or as an alternative to field study or internships.

**Keywords:** audit simulation; internal control evaluation; interactive games technology

**Acknowledgement:** The author would like to acknowledge the helpful review comments received from Karen Teitel and Arnie Wright and thank the Teaching and Curriculum Section of the Northeast Region of the American Accounting Association for their Best Manuscript Award on an earlier version of this paper.
INTRODUCTION

Learning the new requirements of Section 404 of the Sarbanes-Oxley Act of 2002 can be a challenging task. These requirements include an understanding and evaluation of a company’s internal control over financial reporting using an accepted rubric such as the COSO Integrated Framework of Internal Control (COSO, 2004). Although traditional methods of learning through textbooks are a good start to acquiring understanding, evaluating how well a system is actually working requires application of such knowledge and other higher-order learning objectives that are often not emphasized in auditing and accounting systems textbooks. (Stokes, 2008)

Traditionally, gaining practical experience with subject matter has been achieved through internships and on-the-job training. Although experiential learning through internships has become a highly recommended part of a quality business education, such experiences are not always available or may be difficult for a course instructor to control and evaluate. Consequently, students may not be assigned to internal control evaluation and even when they are it is often only to the activity-level portion of the COSO framework. Getting students exposed to the entity-level side is challenging and may not be practical because evaluating a public company’s governance structure is a risky task that generally requires higher-level experience. To provide such opportunities, Davidson and Baldwin (2005) suggest that faculty may need to create other exercises that stress and assess critical thinking beyond the textbook.

With current technology, it could be feasible to use interactive simulations to create rich and highly controlled active learning environments that students might find to be realistic and useful. Simulations are controlled detailed models intended to reflect a situation found in the real world (Adams, 1973). Using a multimedia simulation, students may be able to experience the various tasks involved in SOX 404 internal control evaluation in a realistic and uniform manner. This technology can also allow students to be evaluated in an objective manner by seeding the simulation with known control deficiencies (significant and/or material)
and comparing their results to a model solution. Aldrich (2004) states that interactive simulations can bridge the gap between the classroom and the real skills learned in apprenticeships and on the job. He also suggests that simulations are the first fundamental change to education since the textbook. This research, therefore, contributes to our understanding of the extent to which these assumptions apply to accounting education.

The SOX 404 Simulation

The overall purpose of the SOX 404 simulation was to create a realistic learning environment that students would find to be useful and could be used to teach internal control evaluation in a manner that might be more interesting than textbooks and emphasize the higher-order learning objectives suggested in prior scholarly research (Davidson & Baldwin, 2005; Stokes 2008).

To enhance realism, the simulation contained tasks that were based on a SOX 404 evaluation of internal control including planning, entity-level and activity-level control evaluation, and reporting (PCAOB, 2004 and 2007). To make it interesting, the simulation tasks were introduced within the context of a narrative using interactive games technology. A growing body of literature supports this approach, which combines the elements of enjoyment and pleasure with opportunities to succeed and the benefits of evaluative outcomes and feedback (Cermignano, Hargadon, & McMullen, 1998; Cook & Hazelwood, 2002; Haywood, McMullen, & Wygal, 2004; Iuppa & Borst 2007; Prensky, 2001). To address the importance of developing “soft skills” and the higher-order learning objectives of Bloom’s Taxonomy (1956), the simulation requires extensive interviewing (Wells, 2001), analyzing and synthesizing multiple evidence sources, and evaluating how effectively internal control within a simulated company is working.

The SOX 404 Content

Because there were no examples of a SOX 404 simulation to follow, it was necessary for the present author to develop a prototype. The first
The step in creating the prototype was the development of a representative work program, which followed the five phases of a SOX 404 evaluation implied in PCAOB No. 2 (planning, assessing management’s process, evaluating internal control design, testing the controls for operating effectiveness, and reporting.) Although there were no requirements to perform the tasks in any particular order, after an initial test, it was decided to reorganize the tasks so that evaluating entity-level control would be performed before evaluating activity-level control. It was thought that focusing on the entity-level control first would be easier and more logical for students and that it would also work better for instructors in assigning the material. This top-down approach later became the standard in PCAOB No. 5 (2007). Assessing management’s process was also eliminated consistent with the changes made in PCAOB No. 5.

Once the overall structure of the program was established, the specific internal control procedures were included. Figure 1 shows an example of a portion of the work program where students enter their findings as each task is completed.

**Figure 1.** Planning Section of Work Program with Open Conclusions Panel.

<table>
<thead>
<tr>
<th>PLANNING</th>
<th>Based on our review of the financial statements, we are setting planning materiality for material weaknesses at (based on income before taxes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify key individuals who can help provide us with the documents and answers we need</td>
<td>$12,000</td>
</tr>
<tr>
<td>2. Obtain information about the company’s business that may affect our audit procedures</td>
<td>$12,000</td>
</tr>
<tr>
<td>3. Gather current information about internal control that will assist the audit team in planning our work</td>
<td>$12,000</td>
</tr>
<tr>
<td>4. Make a preliminary assessment of materiality for planning the design of audit procedures and evaluating control deficiencies</td>
<td>$12,000</td>
</tr>
</tbody>
</table>
Connecting the Content to the Client
To connect the SOX 404 content to the client, a preliminary meeting is setup between the work supervisor and the student to describe the client and explain the general tasks being assigned. Figure 2 illustrates one of the introductory screens of the simulation.

Planning
The planning tasks include acquiring additional information about the company, reviewing the company’s financial statements, and making a preliminary assessment of materiality for determining material weaknesses.
Understanding and Testing Entity-Level Control

In this part of the simulation, students must conduct a series of interviews to gather documentation (including committee charters, codes of ethics, and procedures manuals) and assess the client’s governance structure (including its control environment, risk assessment procedures, information and communication, and monitoring) and its general IT controls. To help guide their inquiries, students are able to use an internal control questionnaire organized along the lines of the COSO Integrated Framework of Internal Control (COSO, 2004). To enhance realism and interest, students may assess the company’s code of ethics and consider the results of an employee survey to assess employee awareness and their sense of how well the ethical values are being communicated and enforced by management. Following the acquisition of information, students must synthesize what they have learned and critically evaluate the entity-level control and identify any control deficiencies (and classify them as inconsequential, significant, and/or material). Their conclusions must then be entered into the work program and be assessed by the scoring system.

Figure 3 shows a portion of an interview with the director of internal audit, which is necessary to understand and test the entity-level controls. The dialogue system involves multiple choices of text, which can be selected and in turn produce a response from the client and then another set of choices for the student. As students make choices, they can move progressively deeper into dialogue trees of possible topics and questions that can be several levels deep.

Understanding and Testing Activity-level Control

After evaluating entity-level control, the student moves on to the activity level including the expenditure and revenue cycles. To test activity-level control, students are able to conduct walkthroughs with client personnel utilizing the dialogue system and complete an internal control questionnaire. This allows the student to assess the design of the cycle. Students may also inspect a sample of transactions to determine whether the controls are actually being followed. Students must then use the work
A SOX 404 Simulation

Research Questions and Results

While a growing body of literature suggests the need for more active methods of learning and argues that interactive technology can be useful in filling this gap, very little research has been conducted in accounting education to investigate these issues. The goal of this research was to create an alternative way of acquiring experiential learning of internal control using interactive technology that students might find to be realistic, interesting, and useful. The SOX 404 simulation gave students the opportunity to participate in a learning exercise that involved an
evaluation of internal control that could be controlled and which emphasized both “soft” and higher-order thinking skills.

Although developing alternatives to internships contributes to accounting education by creating new ways of acquiring experiential learning, the following research questions arise: 1) do accounting students find the use of simulated tasks and people a realistic way of acquiring experiential learning, 2) do accounting students find a learning environment using interactive simulations to be more interesting than just reading and discussing the subject matter, 3) do accounting students find the use of interactive simulation to be a useful and helpful way to enhance their learning of internal control and emphasize the need for interviewing and higher-order thinking skills, and 4) what are accounting students’ overall perception of this new type of experiential learning environment.

To address the research questions, a survey was administered to fifty-seven students who used the software as part of an auditing or accounting systems course: ten in a graduate auditing course at a college in the northeast, fourteen in an undergraduate auditing course at a university in the Midwest, and thirty-three in two different sections of an undergraduate accounting systems course at the college in the northeast. Of the fifty-seven students, sixteen had prior work experience. The average time spent performing the simulation tasks was reported as 6.25 hours.

Means and standard deviations were computed for each of the questionnaire items. For items using a 5-point scale from strongly disagree to strongly agree, t-tests were performed on the difference between the reported sample means and the neutral value of (3) on the scale. Table 1 contains a summary of these quantitative results. Given the novel use of the instructional technology and the potential complexity of the tasks, it was also necessary to control for prior work experience and ease of use.

The responses are reported according to the four research questions:

**Research Question 1:**
Do accounting students find the use of simulated tasks and people a realistic way of acquiring experiential learning?
Quantitative results: This question was addressed with two items. The first was: “I believe the tasks performed in this SOX 404 simulation would be similar to what I would perform in a real internal control evaluation.” Students responded on a 5-point scale ranging from strongly disagree (1) to strongly agree (5). On average, the students agreed that the tasks were similar to a real internal control evaluation ($M = 3.88$, $SD = 0.47$).

The tasks in the SOX 404 simulation seemed very realistic. ($M = 3.79$, $SD = 0.64$)

The SOX 404 simulation made learning internal control more interesting than reading and discussing it. ($M = 4.02$, $SD = 0.69$)

The SOX 404 simulation gave me a deeper understanding of what internal control is about. ($M = 3.93$, $SD = 0.49$)

The SOX 404 simulation helped me better understand the COSO framework. ($M = 3.77$, $SD = 0.52$)

The SOX 404 simulation helps me retain the subject matter better than just reading and discussing it. ($M = 3.74$, $SD = 0.53$)

The SOX 404 simulation helped me understand the importance of interviewing skills. ($M = 3.72$, $SD = 0.60$)

The SOX 404 simulation was an effective way of achieving higher-order learning outcomes (e.g., being able to apply the knowledge and being able to evaluate how well things work). ($M = 3.88$, $SD = 0.61$)

Notes. The $t$-tests used the neutral value (3) as the comparison. $N = 57$.

* $p < .05$  ** $p < .01$
SD = .47, t(56) = 14.83, p < .001). The second item asked whether “The tasks in the SOX 404 simulation seemed very realistic.” On average, the students agreed that the tasks were very realistic (M = 3.79, SD = .64, t(56) = 9.27, p < .001).

Qualitative results: Table 2 contains a summary of the students’ written responses to the questionnaire. The following are several examples of student comments that support the quantitative results on the first research question: “It was really helpful and I feel like we sort of gained real experience in evaluating internal control even though it was only a simulation, “It had real life examples of things that are said between two parties – I felt like I was really talking to the people.”, and “what we had to do with it was pretty much right on,” suggest that the students felt the simulation was an accurate portrayal of a SOX 404 evaluation and that the tasks they had to perform seemed realistic.

One of the main purposes of this research was to create a realistic learning environment for developing practical knowledge of internal control. Research in educational psychology suggests that positive perceptions of the learning environment are important in creating motivation and that motivation to learn for many students is important to achieving actual learning (Svinicki, 2004). These results are important

<table>
<thead>
<tr>
<th>TABLE 2. Summary of Comments Added to Explain Students’ Responses.</th>
</tr>
</thead>
</table>

Realism:
I think the simulation is an accurate portrayal of a SOX 404 audit, and gives student's an opportunity to utilize the skills learned in class.
Very realistic simulation, liked the interview places and how you had the options of what to say next.
I thought the program was realistic and related to real-life situations.
It gave hands on experience.
Material and what we had to do with it - I felt - was pretty much right on.
It was really helpful and I feel like we sort of gained real experience in evaluating internal control even though it was only a simulation.
Actually performing the tasks was better than just reading about them.
It had real life examples of things that are said between two parties – I felt like I was really taking to the people.
A SOX 404 Simulation

Interest and Perception of Learning Environment:
Being more active makes it more interesting.
Yes, especially the control environment and risk assessment.
Showed what was included in each piece of COSO framework.
It allowed me to see different kinds of interviewing approaches – some obviously
were much more beneficial than others.
Knowing the COSO framework and then doing the simulation helped me apply (my
knowledge).
Hands-on application gives depth to concepts.
Very good learning tool!
It showed me examples using the internal control questionnaire.
The simulation was easier to do, because it was fun, and more like a game than
reading which becomes monotonous with 5 courses.
It gave me a concrete and visual example to learn the framework rather than
memorize.
Helped to apply ideas to an illustrative interactive case.
I could actually apply the information to a situation which helped me learn it.
I learn more from actually doing something rather than just reading and memorizing
it – applying it is much better.
Made critical thinking a part
It was really helpful to see what it would be like to actually go in and interview
members of a company and discuss internal control.
It helped me understand the difference between entity and activity-level control.
Overall:
It was very beneficial for someone who has never been on an audit to gain some
knowledge of the experience.
I believe the degree of difficulty was fair.
I felt it was challenging without being overboard.
Good path, … should be a great tool to use for simulating a real audit.
I like how one must answer questions and get adequate evidence
in order to proceed.
(Keep the same) If you make it easier, people faced with a similar
situation in the real world might not know how to answer and deal with the problem.
I think that the simulation is a good start. … , it will be a great tool.
Very helpful in learning material and made the course fun.
It was well worth the time and devotion of the class and students.
It puts the whole process from class in perspective. No longer are you just retaining
info for tests, but you get to see what a system evaluation is really like and whether
or not you really know your principles.
I can honestly say I have learned a whole other side to accounting through the
simulation that I enjoyed and am now able to use in (the) future.
because if the students didn’t feel the SOX 404 simulation was realistic then they would be less likely to see its relevance and thus be less interested and motivated to learn. The results also suggest that this alternative way of gaining experiential learning could be a possible substitute for an internship.

**Research Question 2**
Do accounting students find a learning environment using interactive simulations to be more interesting than just reading and discussing the subject matter?

**Quantitative results.** Interest in the subject matter was assessed with the following item: “The SOX 404 simulation made learning internal control more interesting than reading and discussing it.” On average, the responses indicate that the students agreed that the SOX 404 simulation made learning internal control more interesting than just reading and discussing it \((M = 4.02, SD = .69, t(56) = 14.28, p < .001)\).

**Qualitative results.** Most of the comments on this question such as “Being more active makes it more interesting”, “The simulation was easier to do, because it was fun, and more like a game than reading which becomes monotonous with 5 courses.”, “Actually performing the tasks was better than just reading about them.”, and “I learn more from actually doing something rather than just reading and memorizing it – applying it is much better.” suggest that the simulation was interesting and compared favorably to textbooks. This is important, as educational research in multiple domains (Prensky, 2001, Aldrich, 2004, Tyson, 1986, and Svinicki, 2004) has shown that interest is an important prerequisite to creating motivation and improving learning.

**Research Question 3**
Do accounting students find the use of interactive simulation to be a useful and helpful way to enhance their learning of internal control and emphasize the need for interviewing and higher-order thinking skills? This question was addressed with five items, which investigated perceived depth of understanding, perceived understanding the
COSO framework, perceived subject matter retention, understanding the importance of interviewing skills, and perceived ability to achieve higher-order learning objectives.

**Quantitative results.** Students’ perceptions of depth of understanding were assessed with the following item: “The SOX 404 simulation gave me a deeper understanding of what internal control is about.” On average, the students agreed that the simulation helped them better understand the subject matter ($M = 3.93$, $SD = .49$, $t(56) = 14.28$, $p < .001$).

**Qualitative results.** The following two comments are consistent with the depth of understanding results above: ”I feel that I have a much stronger understanding than other aspects of the class” and “It pounded in my head the elements of the COSO framework—so I have a deeper understanding of COSO.”

**Quantitative results.** Perceived understanding of the COSO framework was assessed with the following item: “The SOX 404 simulation helped me better understand the COSO framework.” On average, the students agreed that the simulation was helpful ($M = 3.77$, $SD = .52$, $t(56) = 11.05$, $p < .001$).

**Qualitative results.** The following student comments help clarify the results on the COSO framework above: ”I got a much better feel for control procedures, monitoring, and risk assessment.”, “It put the questions for each (COSO) component into better perspective”, and “The whole simulation was about the COSO framework so I agree that it helped give me a better understanding.”

**Quantitative results.** Perceived retention of the subject matter was assessed with the following item: “The SOX 404 simulation helps me retain the subject matter better than just reading and discussing it.” On average, the students agreed implying that they felt it was helpful ($M = 3.74$, $SD = .53$, $t(56) = 10.37$, $p < .001$).

**Qualitative results.** The following comments are examples of this result: “I think that it really helped me better understand internal controls and was much better than just reading about it”, “It made me never forget.”, and “The simulation offered a highly interactive means of learning—I have learned concepts from the simulation
I can recall and use on a long-term basis.” These responses are interesting and appear to be consistent with research in cognitive science (Ausubel, 2000).

**Quantitative results.** Understanding the importance of interviewing skills was assessed with the following item: “The SOX 404 simulation helped me understand the importance of interviewing skills.” On average, the students agreed that the simulation was useful in this respect ($M = 3.72$, $SD = .60$, $t(56) = 8.92$, $p < .001$).

**Qualitative results.** Agreement was further illustrated by the following students who commented: “You have to ask the right questions”, “It allowed me to see different kinds of interviewing approaches—some obviously were much more beneficial than others.”, and “It was really helpful to see what it would be like to actually go in and interview members of a company and discuss internal control.”

**Quantitative results.** Perceived ability to achieve higher-order learning objectives was assessed with the following item: “The SOX 404 simulation was an effective way of achieving higher-order learning outcomes (e.g., being able to apply the knowledge and being able to evaluate how well things work).” On average, the students agreed that the simulation was useful in helping them apply their knowledge ($M = 3.88$, $SD = .61$, $t(56) = 10.70$, $p < .001$).

**Qualitative results.** Agreement was further illustrated by the following students who said “I learn more from actually doing something rather than just reading and memorizing it – applying it is much better” and “We definitely learned more and were able to evaluate their controls better because we did it on our own.” These results are important because these skills are essential to bridging academic knowledge to the real world.

**Research Question 4**

What are accounting students’ overall perceptions of this new type of experiential learning environment?

**Quantitative Results.** The overall evaluation of the interactive SOX 404 simulation was done on a six-point scale ranging from outstanding
A SOX 404 Simulation

(6) to poor (1). Given the fact that interactive simulation is a relatively new and complex educational technology, it was encouraging that the average response was very good or 4.07 on the scale.

The present researcher also controlled for ease of use and prior work experience to determine if student responses might have been affected by these variables. Two questions were used to assess ease of use. The first asked students to rate the level of challenge presented by the simulation and the second asked whether the level of difficulty should be changed. On average, the students rated the level of difficulty as “moderate” on a five-point scale ranging from too difficult to too easy and fifty out of the fifty-seven students using a three-point scale (make easier, keep the same, and make harder) indicated that the level should not be changed. Given the students’ ease of use rating and their overwhelming agreement that the level of difficulty was appropriate, it was concluded that usability was not an issue in this study. Independent samples t-tests were also performed to determine whether students with prior work experience evaluating internal control responded differently to the questionnaire items than students without prior work experience. Results revealed that students with prior work experience did not respond differently to the questionnaire items than students without prior experience.

Qualitative results. The final group of comments, which addressed the overall goals and perceptions of a SOX 404 simulation, were positive and suggested that interactive simulations can be a useful way to learn about internal control. In particular, such comments as “it could be very beneficial for someone who has never been on an audit to gain some knowledge of the experience”, “It puts the whole process from class in perspective.”, “No longer are you just retaining info for tests, but you get to see what a system evaluation is really like and whether or not you really know your principles.”, and “I can honestly say I have learned a whole other side to accounting through the simulation that I enjoyed and am now able to use in (the) future.” indicate that they can be a useful way to gain relevant experience.
SUMMARY AND CONCLUSION

Both the quantitative and qualitative results of this research and development project indicate that interactive SOX 404 simulation can provide an alternative experiential learning environment that students find to be interesting and realistic as well as helpful in improving their understanding and appreciation of internal control evaluation. These results are encouraging given calls by the profession and researchers for more active and realistic learning environments and exercises that emphasize higher-order learning objectives. They are also important due to the recent introduction of simulations on the uniform CPA examination. Hence, based on this study, it appears that interactive simulation of internal control evaluation can be a valuable supplement to standard auditing and accounting systems textbooks and can provide experiential learning that could substitute for an internship in the event that one cannot be arranged or be utilized if a more controlled experience where students are able to uniformly evaluate both entity-level and activity-level control is needed. When internships are required, the present author believes that the interactive simulation can serve as a low risk way to prepare students for what is coming.
REFERENCES


