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Selecting an Audit Software Package for Classroom Use

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ABSTRACT: External, internal, and government auditors increasingly use audit software to improve the efficiency and effectiveness of audits. Incorporating technology such as generalized audit software into the classroom not only exposes students to "tools of the trade," but, more importantly, also facilitates student learning of audit concepts and procedures. The purpose of this paper is to provide information on two audit software packages, ACL and IDEA, so that instructors can evaluate the appropriateness of including one or both of these packages in their courses. We compare the packages from both a functional and pedagogical perspective, describing several uses in the classroom. We also provide student and instructor feedback from package use. An accompanying web page provides numerous resources for instructors considering adopting ACL or IDEA, including exercises, exam questions, slides, review questions, and syllabi.

Keywords: generalized audit software; computer-assisted auditing techniques; audit command language (ACL); Interactive Data Extraction and Analysis (IDEA).

I. INTRODUCTION

External, internal, and government auditors are increasingly utilizing audit software to improve the efficiency and effectiveness of audits. As enterprise-wide systems eliminate the traditional paper-based audit trails and environments become heavily automated, auditors are increasingly using audit software (Gelinas et al. 2001; McCollum and Salierno 2003). By incorporating technology, including computer audit software, into the curriculum, instructors help prepare students to apply new technologies in innovative ways. Technology heightens the learning experience by providing an opportunity for active student participation in understanding and interpreting the environment (Thompson et al. 1992).

Using an educator's perspective, this paper compares two computer audit software packages available on the market—Audit Command Language (ACL) and Interactive Data Extraction and Analysis (IDEA). In Section II, we discuss several reasons why an educator might adopt audit software in an accounting course. Section III presents an overview and a comparison of the two packages' basic training materials and features. In Section IV, we describe how the authors and instructors at other universities incorporate the packages into their curriculum. This section also

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provides student feedback, pedagogical suggestions, and a link to an accompanying web page offering student-ready materials, answer keys, and other resources. The paper concludes with an overall evaluation of ACL and IDEA.

II. WHY USE AUDIT SOFTWARE?

Given that the accounting curriculum seems to expand endlessly, why would an instructor consider adding an audit software package to his or her course? Teaching students the "tools of the trade" makes them more aware of current practice and therefore more marketable. Accounting students typically get exposure to other technological tools of the trade such as spreadsheets, accounting packages, database software, and online research resources (Bain et al. 2002). Incorporating audit software into the curriculum helps complete this toolkit and prepares students for the content of the computer-based Uniform CPA exam. Moreover, using audit software can help students develop high-order cognitive skills because it encourages them to actively participate in applying theory to real-life situations. Audit software activities become more relevant, allowing students to gain a better understanding of the software and studied environment (Hakeem 2001; Thompson et al. 1992). The following section expands on these points.

Use of Audit Software in the Accounting Profession

Professional organizations have developed professional standards and guidance to help auditors evaluate electronic evidence and advance toward continuous auditing. In 1998, the Information Systems Audit and Control Association (ISACA) established an audit guideline specifically addressing the use of Computer Assisted Audit Techniques or CAATs (ISACA 1998). In 1999, the AICPA and the Canadian Institute of Chartered Accountants (CICA) published a joint research report identifying six preconditions necessary for continuous auditing, including auditor proficiency in information technology (IT) and the system (CICA 1999). In 2001, the AICPA issued SAS No. 94 to warn auditors that a substantive-only audit approach may not be feasible in complex IT environments (AICPA 2001).

The AICPA recognizes the role that IT plays in educating future accountants, stating, "All professional accountants, irrespective of their primary work domain or role, must acquire both relevant theoretical knowledge and practical IT skills" (AICPA 1996, para. 12). Incorporating technology such as generalized audit software (GAS) into the classroom exposes students to current audit practices (Nieschwietz et al. 2002) that can be used for any audit requiring data extraction and analysis. Accounting firms and internal auditing functions are increasingly utilizing GAS because of its user-friendly interfaces and its ability to quickly examine 100 percent of a population (Lanza 1998; Sayana 2003). GAS efficiently performs many manual procedures, allowing auditors to focus on understanding clients' businesses and creating more value for the client (Lanza 1998).

Larger firms initially used internally developed GAS programs that required specialized programming knowledge. As the storage and processing capabilities of PCs have increased, firms have generally abandoned the proprietary GAS programs in favor of commercial GAS programs, which do not require any programming knowledge (Warner 1998). GAS is used by hundreds of organizations across the world, including all Big 4 accounting firms, hundreds of governmental agencies, and almost all of the *Fortune* 100 firms (ACL Services Ltd 2004). Moreover, almost 50 percent of internal auditors report using GAS in their operations (McCollum and Salierno 2003). This increased popularity of GAS in practice, together with its user-friendly interface, makes it a serious candidate for inclusion in courses such as accounting information systems, auditing, and information systems auditing.

Audit Software as a Learning Mechanism

Horsfield (1995) suggests that auditing students should understand the following three areas: audit theory, the relationship between audit theory and audit practice, and current audit techniques.

Unfortunately, traditional audit classes do not provide students with concrete experience (Siegel et al. 1997). Incorporating audit software into the audit curriculum can reinforce students' understanding of audit concepts (Nieschwietz et al. 2002). In terms of Bloom's (1956) taxonomy, instructors can use audit software as a learning mechanism to move students from knowledge and comprehension of audit concepts to application of those concepts, and with well-designed instructional cases, perhaps to analysis, synthesis, and evaluation of audit problems. Specifically, using audit software in conjunction with comprehensive audit cases can develop strategic and critical thinking skills (Gelinas et al. 2001), defined as the accountant's ability to "link data, knowledge, and insight to provide quality advice for strategic decision making" (AICPA 1999, 17).

Bryant and Hunton (2000) note that research addressing educational technology in the accounting discipline is not as well developed as in the pure educational research realm. The most recent accounting research into education technology is descriptive rather than empirical and focuses on distance learning and hypermedia (Bryant and Hunton 2000). Thus, research has not empirically shown the value of incorporating audit software into the accounting curriculum. In the last two years, accounting education journals have included a small number of instructional cases using audit software (e.g., Gelinas et al. 2001; Nieschwietz et al. 2002). Gelinas et al. (2001) report that their students agree or strongly agree that using the audit software supplemented their understanding of risk and audit procedures (72 percent) and helped them understand the use of technology in auditing (91 percent). As we discuss later in this paper, our students also view audit software as an effective learning tool.

III. OVERVIEW AND COMPARISON OF ACL AND IDEA

ACL and IDEA are the most common commercial GAS packages (McCollum and Salierno 2003). Both external and internal auditors use these packages for data extraction, data analysis, and fraud detection/prevention. This section presents comparisons of functional and pedagogical features of ACL and IDEA.

Training Manuals

Both products offer self-guided training manuals: *ACL for Windows 7.0 Workbook* (ACL Services, Ltd. 2002; hereafter *ACL Workbook)* and *IDEA 2002 Workbook* (Audimation Services, Inc. 2002; hereafter *IDEA Workbook*). The training manuals include data sets, click-by-click instructions, and screen shots of command results. However, the training manuals are not educational textbooks; thus they do not include certain pedagogical features such as discussion questions, additional exercises/problems, or conceptual material. The *ACL Workbook* is over 400 pages long and is *organized by audit task.* Users proceed through a series of lessons organized into nine modules. Each lesson covers a type of task that an auditor might perform using ACL (e.g., sort, sample, age). The first five modules cover the basic functionality of ACL, while the last four modules cover more advanced functions (see Table 1). The *IDEA Workbook* is over 250 pages long and is *organized by audit area.* Users proceed through five sections, with the middle three sections devoted to accounts receivable, accounts payable, and inventory, respectively (see Table 2).

Functionality

Both ACL and IDEA provide a broad spectrum of data analysis and extraction functions. Users can easily sort, summarize, stratify, age, and calculate data statistics. Users can extract records by setting data filters. Both software packages also permit the selection and evaluation of samples using a number of methods. Users can examine files for duplicates, gaps, and proper sequences. The packages allow the comparison of multiple files, creation of new files, customization of reports, and documentation of audit tasks in several different ways. Users can also save commands in batches for repeated use. Table 3 compares ACL and IDEA software functionality. In sum, both packages are powerful and extensive in their functionality.

TABLE 1
***ACL Workbook* Modules**

Module 1: Welcome to ACL
Reviewing the ACL Interface
Accessing/Downloading Data
Understanding Fixed Point Arithmetic

Module 2: ACL Fundamentals
Working with ACL Projects, Files
Defining Input Files and Fields
Formatting the Data View
Understanding the Command Log

Module 3: Understanding Data
Counting Records
Obtaining Field Totals, Statistics
Testing for Sequences, Duplicates, Gaps

Module 4: Manipulating Data
Extracting and Exporting Data
Sorting and Indexing Data
Summarizing/Classifying Data
Stratifying Data
Aging Data
Joining, Merging, Relating Data
Sampling
Preparing Confirmation Letters
Performing Benford's Law Tests

Module 5: Creating Applications
Filtering Data
Using Mathematical Expressions
Using Batches
Processing Multi-Type Files

Module 6: Communicating Results
Formatting Reports
Graphing Command Results
Executing the Notify Command

Module 7: Customizing ACL
Setting Preferences

Module 8: Troubleshooting Data Errors
Troubleshooting Data Errors

Module 9: Using the Dialog Builder
Using the Dialog Builder

Source: *ACL for Windows 7.0 Workbook* (2002, Table of Contents).
In June 2003, ACL released version 8.0. User documentation changed with this version, and the *Workbook* was replaced with three smaller training manuals for ACL 8.0. Please see the ACL and IDEA Information Resource Page (Table 5) for specifics on the newly released manuals, which have yet to be classroom-tested by these authors. The *Workbook* for ACL 7.0 is still available from ACL.

Fraud Detection

McCollum and Salierno (2003) report that 51 percent of internal auditors surveyed use software, including ACL and IDEA, to detect fraud.[1] The *IDEA Workbook* devotes an entire chapter to using IDEA to detect fraud, making it easy to incorporate fraud into the curriculum. Section 3 of the *IDEA Workbook* has students complete an audit *and* fraud investigation for accounts payable. The *IDEA Workbook* explains how fraud is committed in accounts payable, outlines needed audit tests, and then requires students to complete a series of exercises designed to uncover fraud. Though the *ACL Workbook* provides only limited reference to using ACL for fraud detection, ACL and IDEA both provide similar fraud detection capabilities. Examples of tasks that can be applied in a fraud detection context include stratifications, extractions, duplicate key detections, joining of databases, and application of Benford's Law.

[1] Of the internal auditors using software to detect fraud, 47 percent use ACL and 6 percent use IDEA (McCollum and Salierno 2003).

TABLE 2
***IDEA Workbook* Sections**

Section 1: Introduction to IDEA
Set the Scene
Describe Workbook Organization
Use of IDEA Overview
Outline Audit Objectives
Determine Data Requirements

Section 2: Accounts Receivable Audit
Introduction
Outline Potential Audit Tests
Obtain Data
Outline Audit Program
Setup Audit
Import the A/R Transactions File
Select a Control Total Field
Generate Field Statistics
Reconcile the Database
Perform Random Record Sampling
Perform Age Analysis
Extract High Value and Old Items
Identify and Review all Credit Notes
Calculate the Net Transaction Amount
Analyze the Balances and Taxes by Acct.
Check Debtor/Authorized Credit Risk

Section 3: Accounts Payable Audit and Fraud Investigation
Introduction
Outline Potential Audit Tests
Obtain Data
Outline Audit Program
Setup Investigation
Import the A/P, Suppliers Data Files
Verify Data Files Correctly Imported

Section 3 (continued)
Analyze the Profile of Payments
Identify High and Unusual Payments
Identify Exceptional Trans.—Benford's Law
Test for Duplicate Payments
Search for Gaps in Check No. Sequence
Search for Gaps in Check Date Sequence
Analyze/Identify Favorable Terms to Suppliers
Test Payments to Unauthorized Suppliers
Analyze the Payments by Supplier

Section 4: Inventory Special Audit
Introduction
Outline Potential Audit Tests
Obtain Data
Outline Audit Program
Setup Client
Import the Inventory File
Verify Database Has Been Correctly Imported
Identify Obsolete Inventory Items
Calculate Usage Ratios/Obsolescence Provision
Calculate Total Provisions for Inventory
Test Accuracy of Automatic Reordering System
Analyze Selling Prices and Margins

Section 5: Common Options
Introduction
Design a Report
Print Preview and Print the Report
Re-Run a Task
Perform Housekeeping
Review Housekeeping
Manage the Use of IDEA

Source: *IDEA 2002 Workbook*, Audimation Services, Inc. (2002, Table of Contents).

In February 2004, Caseware IDEA Inc. released IDEA 2004. User documentation is currently being updated. Please see the ACL and IDEA Information Resource Page (Table 5) for specifics on the newly released manuals, which have yet to be classroom-tested by these authors.

TABLE 3
A Comparison of Software Functionality[a]

	ACL 7.0	IDEA 2002
Summarizing data	W	W
Getting statistics on data	W	W
Sorting data	W	W
Stratifying subsets of data	W	W
Extracting subsets of data	W	W
Comparing data files based on common fields	W	X
Creating a new file from two different data files	W	W
Testing for duplicates, gaps, and sequences	W	W
Sampling		
• Calculate Size	W	X
• Selection Types	Random, systematic, cell	Random, systematic, character/date/numeric stratification
• Evaluation	W	X
• MUS	W	X
• Record Sampling	W	W (random only)
Benford's Law Tests	W	W
Aging	W	W
Field manipulation	W	W
Batch command processing	W	X (macro called IDEAScript)
File imports including:		
• Access	–	X
• ODBC	W	X
• Dbase	W	W—automatically
• Text	W	W
• Excel	–	W—automatically
• Lotus	–	X
• Flat sequential	W	X
• ASCII Delimited	W	W
• ASCII Fixed Length	W	W
• Print Report (*.prn)	W	W
• SAP	–	X
Command/History Log	W (called Command Log)	W (called History Log)
Reports:		
• Canned	W	W
• Custom	W	W
• Graphical	W	W
Customizable screen view	W	X
Instructional Software Limitations	Processes up to 48K of data.	Files are limited to 5,000 records.

[a] Based solely on use in described courses and instructional versions of software
W = software performs function and *is included* in respective *Workbook,* and
X = software performs function but *is not included* in respective *Workbook.*

Pedagogical Logistics

Instructors obtain the *ACL Workbook* by joining the ACL Education Partners Program.[2] A demo version of ACL 7.0 accompanies the *Workbook* and can be used on individual lab and student machines.[3] Students purchase the *ACL Workbook* and software either directly from ACL (list $50) or via the bookstore (volume discounts may be available).

Students must purchase the *IDEA Workbook* either from the instructor or via the bookstore ($25 student price before bookstore markup; retail $200). Beginning in 2003, the *IDEA Workbook* includes the training version of the software. Audimation provides the software to instructors through the Education Donation Program, which allows free installation of software and data files on campus lab stations.[4,5] Table 4 presents a comparison of the two packages' logistics for educational purposes.

IV. EXAMPLES OF CLASSROOM APPLICATIONS

This section illustrates how one may incorporate audit software into an accounting course. Recognizing that each course at each institution is unique, we briefly discuss how instructors at various universities are using the software packages. Hopefully these illustrations, coupled with a resource web page, will make it easier for the reader to incorporate the use of audit software in an appropriate course.

The primary focus of the *ACL Workbook* and the *IDEA Workbook* is teaching the basic features of the software. Completing these manuals in an academic course provides hands-on knowledge of how audit software looks, feels, and works. However, to have an enhanced learning experience, the student should *apply* this hands-on knowledge in completing additional tasks. The next section briefly describes how each author incorporates audit software into her course, discusses student feedback, and discloses how other universities are using audit software in accounting courses. We refer to a variety of course materials available online at http://www.business.umt.edu/faculty/herron/ . Some materials, like exam questions and answers, are password protected with user name = soba\jis and password = jis. To help the reader, we identify the resources available on the web page with the following parenthetical notation: (ACL or IDEA Resource 1, 2, 3,...). The numbers correspond to the table of contents for the web page, which is reproduced in Table 5. We will continue to update this web page with (1) additional materials submitted by other instructors and (2) new assignments/ information when IDEA and ACL change their software and corresponding training materials.

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[2] ACL made changes to its Education Partners Program in early 2004. These changes are briefly described in the Appendix. Information on this program is detailed at http://www.acl.com/education_partners/. This site also contains links to material for anyone to download for free (e.g., white papers, articles, and cases detailing ACL in practice). Instructors should specifically request the *ACL Workbook for 7.0* when joining the program, as this is no longer part of the program's standard package. Instructors may also want to acquire the book *CAATTs and Other Beasts for Auditors* (Coderre 2001a). For ACL materials on fraud, instructors may also want to acquire the *Fraud Toolkit for ACL* by Coderre (2001b). This book uses ACL batch code to perform eight categories of fraud detection tests, including completeness and integrity, cross-tabulation, duplicates, gaps, data profile, ratio analysis, and Benford's Law analysis.

[3] One author installed ACL on individual lab machines and encountered no technical difficulties. Instructors wishing to install ACL to utilize network capabilities (e.g., file sharing) should contact ACL for further information.

[4] One author installed IDEA on individual lab machines and encountered no technical difficulties. Instructors wishing to install IDEA to utilize network capabilities should contact IDEA for further information.

[5] Instructors making requests through the Education Donation Program also receive a 30-page written case study and related data files with copyright release for classroom use. The case study is also available for free download on the IDEA website.

TABLE 4
Comparison of Logistics for Educational Purposes[a]

	ACL 7.0	IDEA 2002
Teaching Tools Provided		
Datasets	Multiple datasets	Datasets for A/R, A/P, Inventory
Workbooks	Step-by-step workbook organized around audit tasks (not organized around datasets or audit objectives). Includes glossary and index. 407 pages.	Step-by-step workbook organized around audit area. Also provides introduction of each audit area (A/R, A/P, inventory). Does not include glossary or index but does provide a list of functionality and corresponding Workbook section (end of Workbook). 252 pages.
Tutorials	None	Tutorial available (instructor can copy for students), customer master database, sales transactions.
Frequency of Updating		
Software	9–12 months	12–18 months
Workbooks	not updated for 8.0	12–18 months
Datasets	unknown (same for 6.5 and 7.0 versions)	Unknown
Implementation		
Platform	PCs or servers	PCs or servers
Medium	CD-ROM	CD-ROM
Support	Contact Education Partners Program representative for initial questions.	Contact Audimation support staff.
Ease	Easy[b]	Easy[b]
Cost and Copyright Restrictions[c]		
Students	Workbook 7.0 and software $50 (retail direct from ACL), before bookstore markup. Volume discounts available.	Workbook and software $25, before bookstore markup (cannot buy direct).
Professor	Free workbook, software, copies of articles, case studies of user success, CAATs book.	Free software, tutorial, case, workbook, data files.
Copyright Restrictions	Professor can copy case studies and articles for educational purposes. Workbook cannot be copied. Software can be installed in lab. Students purchase software with Workbook so it may be installed on their own computers.	Professor can copy the case study or students may download it for free. Workbook cannot be copied. Software can be installed in educational lab. Students purchase software with Workbook so it may be installed on their own computers.

[a] Comparison is based solely on authors' experience with the software.
[b] Lab personnel installed on individual machines; instructor and students installed on home or office computers. No problems were encountered.
[c] See Education Partners Program update in Appendix.

TABLE 5
ACL and IDEA Information Resource Pages
http://aaa-is.byu.edu
http://www.business.umt.edu/faculty/herron/[b]

Links for[a]

ACL

1. Cases, Datasets, Textbooks
2. Classroom Assignments
3. Classroom Slides
4. Errata/Clarifications
5. Exam Questions
6. Sample Syllabi

IDEA

1. Cases, Datasets, Textbooks
2. Classroom Assignments
3. Classroom Slides
4. Errata/Clarifications
5. Exam Questions
6. Sample Syllabi

General

1. Cases, Datasets, Textbooks
2. Classroom Slides
3. Fraud Resources
4. Other Websites

Updates

1. ACL Version 8.0
2. IDEA 2004

Tables from this article as of June 30, 2003:

Table 1: ACL Workbook Modules
Table 2: IDEA 2002 Workbook Sections
Table 3: A Comparison of Software Functionality
Table 4: Comparison of Logistics for Educational Purposes

Contacts:

ACL Services Ltd.
1550 Alberni Street
Vancouver, BC
V6G 1A5
CANADA
Phone: 1 (604) 669-4225
Fax: 1 (604) 669-3557
Email: info@acl.com
General Website:
http://www.acl.com/default.aspx
Education Partners Website:
http://www.acl.com/education_partners/

Audimation Services, Inc.
1250 Wood Branch Dr., Suite 480
Houston, TX 77079

Phone: (888) 641-2800
Fax: (281) 749-0205
Email: info@audimation.com
General Website:
http://www.audimation.com
Education Donation Website:
http://www.audimation.com/educational_program.cfm

[a] Each numbered item describes the materials contained on a hyperlinked webpage.
[b] Some materials are password protected: user name = soba\jis and password = jis

Using ACL in the Classroom

Illustration

ACL is used in a graduate-level, elective IS Auditing course at the University of Montana, a medium-sized (13,000 students) public university. Undergraduate auditing is a prerequisite for this class. The ACL portion of the course spans five weeks, accounts for approximately 43 percent of the course points, and requires successful completion of two large ACL assignments (eight training exercises and six application exercises) (ACL Resource 2) and an exam (ACL Resource 5). During this portion of the course, the class meets in a computer lab for approximately ten hours.

During the labs, students proceed at their own pace through the first five modules of the *ACL Workbook*, submitting various printouts from the practice exercises (ACL Resource 2) for grading. Students complete these five training modules in 10 to 15 hours. At the beginning of the lab sessions, the instructor presents mini-lectures using slides (ACL Resource 3) and printed review questions (ACL Resource 2) to emphasize the important features of ACL. This is an opportunity to compare and contrast the various ACL commands.

In addition, the instructor leads the class in completing ungraded exercises (ACL Resource 2) that provide additional practice with ACL. This is an opportunity for students to apply the mechanics of ACL while observing how the same task can be accomplished a number of ways. For example, there are at least three ways students can obtain a count and dollar amount of positive, negative, and zero balance items in a file. Doing this together in the lab allows students who approached it inefficiently to learn from students doing it more efficiently. More importantly, this provides an opportunity for the instructor to verbally introduce audit objectives that may be associated with each ACL task (recall that the *ACL Workbook* is organized by task and not audit objective). Using the prior example, counting and obtaining positive, negative, and zero balances in an accounts receivable master file highlights credit balances that may need to be reclassified. If the same procedure were done with an accounts payable master file, it would highlight potential understatements (zero balances) as well as unusual balances.

After completing the first five *ACL Workbook* modules, students complete a series of graded exercises. These "application" exercises (ACL Resource 2) require students to use the *ACL Workbook* data to apply what they have learned. In conjunction with completing many of these data manipulation and analysis tasks, students must note *why* the procedure might be performed in an audit, making the link between the ACL task and the management assertion that it examines. At the end of the semester, students complete an exam testing their ACL knowledge (ACL Resource 5).

Student Feedback

Feedback on the ACL application in the course was provided in two formats in the last two administrations of the course, a survey specifically addressing the ACL project and the standard course evaluation form. Seventy-seven percent of students (n = 35) agreed or strongly agreed that ACL helped them to understand *what* audit tests might be done. Fifty-one percent also agreed or strongly agreed that ACL helped them understand *why* audit tests might be done. Nearly all agreed or strongly agreed that ACL contributed to their learning experience (94 percent) and they wanted to spend more time using ACL in this or other classes (86 percent). Feedback in comment form was uniformly positive, with no negative comments about ACL appearing on either the survey or course evaluations. The most consistent comment was that they benefited from the "hands-on" nature of using ACL, with some students specifically noting that it helped them apply what they had learned in this course and other courses.

Using IDEA in the Classroom

Illustration

IDEA was used in a senior-level, required Information Systems and Control course at Texas Christian University, a medium-sized (8,000 students) private university. The IDEA portion of the course spans approximately three weeks and accounts for 13 percent of the course points earned by completing IDEA assignments (IDEA Resource 2) and answering IDEA-related questions on an exam (IDEA Resource 5). During this portion of the course, students work on IDEA primarily outside of classroom hours. Students in this course have *not yet* completed an auditing course, so the IDEA project is preceded by one and one-half weeks of introduction to basic auditing concepts and CAATs.

Students proceed at their own pace through the first four sections of the *IDEA Workbook*. While the *IDEA Workbook* directs students to print out many screen prints/reports, the instructor designates a specific subset for them to submit for grading as part of the assignment. This assignment also requires students to answer questions based on the results of tasks completed in the *IDEA Workbook*. Students complete the first four sections and related questions in approximately seven hours. Each section first outlines potential audit tasks for designated audit objectives and provides a short audit program for the particular audit area. Because the *IDEA Workbook* is organized by audit area, most tasks are duplicated across the sections. Similar to the approach with ACL, the instructor reviews the important features of IDEA and focuses on how IDEA can be used to achieve audit objectives, using both in-class discussions and lectures with slides (IDEA Resource 3).

Student Feedback

The feedback on IDEA was obtained in the same manner as the feedback for ACL. Two-thirds of the students in the class (n = 64) agreed or strongly agreed that IDEA contributed to the learning experience by helping them to both understand *what* audit tests might be done and *why* audit tests might be done. Fifty-seven percent of the students agreed that they wanted to spend more time using IDEA in this class or other classes. While the ratings did show large variation among students, responses were generally at the midpoint and more favorable end of the scale.

Examining student comments provides insights into successfully incorporating an audit software package into the class. Students liked the opportunity to use an audit software package that is used in industry. Given that the students had not previously taken auditing, using the software helped them relate to the overview of auditing included in this course. However, the timing of the project (end of the semester) was problematic. Students wanted more time to use the software. (The *IDEA Workbook* did not include the software at this point in time.) Also, several students commented on the inability to use the software outside the labs. Moreover, due to university restrictions, only one in-class lab was possible. More in-class labs would allow additional guidance to reduce the out-of-class completion times. Allowing students to complete exercises on their own computers would also increase students' access to the software. In addition, the IDEA project was completed *after* manual *and* computerized accounting practice sets. This may have affected students' perceptions of the IDEA project.[6]

Suggestions for Instructors

While students are completing the *ACL Workbook* modules or *IDEA Workbook* sections, their focus is on the mechanics of the software. Because the *ACL Workbook* is not organized by audit area, the instructor should supplement the *ACL Workbook* with information on how the tasks can be associated with audit objectives in various audit areas. As noted above, the instructor can accomplish this verbally as students are learning the software mechanics or through mini-lectures. Regardless of the package chosen, the instructor should repeatedly ask students *why* they would complete the audit procedure with the software. For example, why would an auditor look for gaps or duplicates in numbering sequences? Why would an auditor stratify items in a file? Why would an auditor join a payroll file and an employee master file? The extent to which instructors need to link software tasks with audit objectives and management assertions depends on the recency of students' audit training, if any, prior to using the software.

Both ACL and IDEA have the ability to sample. The *IDEA Workbook*, however, covers only random record sampling. On the other hand, the *ACL Workbook* has a much more extensive coverage of sampling. While auditing classes may expose some students to sampling, often they do not

[6] This conjecture is supported by written comments comparing the IDEA project to other course projects developed specifically for educational use.

calculate, select, and evaluate samples using statistical methods (e.g., MUS). When using statistical commands in ACL, the instructor should emphasize understanding statistical terminology, knowing which statistical applications are appropriate for which audit objectives, and interpreting ACL evaluation reports. Sampling is one of the more advanced applications of audit software and takes some repetition to master.

In-class lab time is key to the success of using either package. Students using ACL or IDEA are both learning a new software package (e.g., interface, commands) and learning how to relate the commands to audit objectives. Support from both the instructor and other students in a classroom lab environment can greatly facilitate these learning processes.

Both the *ACL Workbook* and *IDEA Workbook* contain a number of minor errors or items needing clarification, which the instructors corrected via errata sheets (ACL Resource 4, IDEA Resource 4). Most students have sufficient computer intuition to easily handle these corrections.[7]

How Other Universities Use ACL and IDEA

Given the lack of instructional materials that accompany the software and the scarcity of a wide variety of cases published in academic journals, we solicited additional input from other instructors using ACL and IDEA. Using contacts obtained from ACL and Audimation (the U.S. distributor of IDEA), as well as personal contacts, we emailed instructors regarding how they were currently using the software. Eight of 20 ACL users (45 percent) and 12 of 32 IDEA users (38 percent) responded to the qualitative survey.[8] Table 6 summarizes the qualitative responses, while the quantitative responses are discussed below.

Respondents use ACL (IDEA) more often in graduate (undergraduate) courses. The courses in which both ACL and IDEA are most often used are audit-related and both packages consume an average 14 percent (13 percent) of the course schedule. Most respondents use the respective *Workbook*, but more ACL users have developed their own materials and datasets. The average time respondents had been using the software was 2.8 and 2.7 years for ACL and IDEA, respectively.

When asked why they selected the particular software package, the reason ACL users indicated most often (50 percent) was that the package was an industry leader and widely used. IDEA users also cited this reason (27 percent), as well as free software (27 percent), ease of use (18 percent), and exposure to IDEA at a conference (18 percent) as common reasons for their choice. Consistent with our experiences, few respondents (13 percent for IDEA and 22 percent for ACL) had technical problems with the software installation.[9] Table 6 describes the technical problems encountered.

Some respondents also provided the materials they used in their courses and course syllabi. We categorized syllabi resources by type of software, level of course, and focus of course and posted them on the ACL/IDEA resource web page (ACL Resource 6, IDEA Resource 6). One respondent suggested a no-cost way of using IDEA. First, to learn the software features, students complete the Audimation "Getting Started Guide," which instructors can copy. Next, students complete the Audimation Case study 2001 materials, which instructors can copy. Finally, students complete supplemental exercises provided by Nieschwietz et al. (2002).

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[7] The instructor should be aware that copies of the *ACL Workbook* obtained at different times might have slight differences, most notably margin changes or minor corrections that, in turn, change page numbers. Page numbers in the 2002 book were one to three pages different compared to the 2001 book (same title and version of ACL), a fact that was impossible to discover until the course began. This necessitated last minute corrections to all assignment sheets, instructor notes, and errata notes that referred to page numbers.

[8] Numbers of users surveyed does not reflect the number of instructors actually using the software. Neither ACL nor Audimation could provide a list of active users; they could only provide a list of those participating in their educational programs.

[9] This survey was conducted prior to IDEA including the software in the *IDEA Workbook*. However, instructors could have independently arranged for students to legally use the software at home or used software accompanying a textbook.

TABLE 6
Open-Ended Survey Response[a] Summaries from Instructors Using ACL and IDEA
(n = 20)

Description	Response	ACL		IDEA	
		#[b]	%[c]	#[b]	%[c]
Used in graduate or undergraduate class?	Undergrad	4	33	5	56
	Grad	7	58	1	11
	Both	1	8	3	33
Type of class?	IS Audit	4	33	2	18
	Adv Audit	1	8	3	27
	Audit	3	25	4	36
	Internal Audit	1	8	0	0
	Fraud	0	0	1	9
	Systems	2	17	1	9
	Comp. Apps.	1	8	0	0
Type of materials used?	Workbook	6	43	6	60
	Own Materials	4	29	1	10
	Textbook	0	0	2	20
	Gelinas Case (ACL only)	3	21	0	0
	Under Development	1	7	1	10
Have you developed additional datasets?	Yes	4	33	2	20
	No	5	42	6	60
	In Process	1	8	1	10
	Modified ACL/IDEA dataset	2	17	1	10
Did students use lab or home computers?	Lab	2	17	1	11
	Home	2	17	2	22
	Both	8	66	6	67
Why did you select ACL/IDEA?	Free Software	2	14	3	27
	Industry Leader/Popular	7	50	3	27
	Conference Paper	0	0	2	18
	Easy to Use	1	7	2	18
	Practical Experience/Exposure	1	7	1	9
	Gelinas Case (ACL only)	1	7	0	0
	Good Support	1	7	0	0
	Students Can Have Software	1	7	0	0
Did you encounter technical problems?	No	7	78	7	88
	Yes	2	22	1	13
What type of problems did you encounter?	ACL • Software freezes up for students when using Citrix to access the software remotely (1 response).				
	• Initially had problems opening Gelinas Case files, but later resolved it (1 response).				
	IDEA • Information cannot be stored on hard drive, must be stored on disks (1 response).				

[a] Responses summarized in this table were obtained from open-ended questions.
[b] Not all respondents answered all questions. For example, some respondents gave the course title for the course in which they used audit software but did not specify whether the course was graduate or undergraduate. In addition, some respondents answered questions twice for different applications of audit software used in different courses. Therefore, the sample size for each question varies.
[c] Percentages may not add to 100 percent due to rounding.

Additional Methods for Implementing GAS in the Classroom

While a growing number of internal auditors are using ACL or IDEA to analyze audit data, over 50 percent still use Excel® or Access® (McCollum and Salierno 2003).[10] Therefore, instructors may (initially) prefer to use Excel or Access to implement GAS and the associated concepts in the classroom. Several resources have been developed for Excel and Access. For example, Borthick et al. (2001) provide a case where students develop basic queries for an Access database containing automobile customers, makers, and dealer information. Assignment files and multiple choice questions are available on our accompanying website (General Resource 1). A second excellent resource is *Computer-Assisted Auditing with Great Plains Dynamics* (Lehman 2003). This workbook provides 15 step-by-step exercises that require students to, first, export selected data from Great Plains Dynamics, and to then, analyze them using Word®, Excel, or Access.

V. CONCLUSION

This paper is a case study of the use of two audit software packages in educational settings. Our goals are to provide examples as to how audit software might be included in courses, and, to provide insight into whether ACL, IDEA, or some other application would best suit students' needs. Incorporating audit software into appropriate accounting courses can facilitate learning of audit concepts and procedures. ACL and IDEA are both fully functional audit software packages that are easy to use. The primary differences between the educational versions of these packages are that the *IDEA Workbook* is organized around audit area and is shorter. Due to the organization of the *IDEA Workbook* and ease of use, IDEA may be better suited for undergraduate courses; however, instructors may find less success with IDEA (or any other GAS package) in undergraduate courses crowded with other projects.

While both ACL and IDEA have education adopter programs that provide free software, they both lack additional educational materials. Two comprehensive cases have recently been published that include additional datasets: Gelinas et al. (2001) using ACL and Nieschwietz et al. (2002) using IDEA. This paper briefly describes how we use ACL and IDEA, including student feedback. More importantly, we have assembled numerous resources for educational adopters of ACL and IDEA on a resource web page, which we will continue to update with new information.

Finally, instructors must exercise judgment when considering use of audit software in a class. Its effectiveness depends on many factors, including time spent on the project, the students' knowledge of auditing prior to the project, available in-class lab time, and the number of other projects students complete in the course. In addition, the nature of audit software assignments can range from training tasks to integrated cases. We hope the availability of these resources, coupled with our descriptions of the easy to use packages, will assist others in selecting appropriate audit software package for classroom use.

[10] Currently, approximately 40 percent of internal auditors use ACL or IDEA for data extraction and analysis (McCollum and Salierno 2003).

APPENDIX
ACL UPDATES

ACL Version 8.0

On June 22, 2003, ACL released version 8.0 of its software, also referred to as *ACL*™ Desktop/Network Edition. This author opted to continue with version 7.0 for the Fall 2003 course in which ACL was used, since version 8.0 and related user training manuals were not yet available to educators by late summer 2003. Version 8.0 is functionally similar to version 7.0, with changes primarily improving the user interface and file management.

The user documentation for version 8.0 includes *ACL in Practice* (tutorial), *Data Access Guide* (desk reference), and *Getting Started Guide* (overview). These items may be purchased directly from ACL for $25 each or as a bundle for $50. Since these items have not been tested by the authors in a classroom setting, they are not reviewed in this article. The *ACL Workbook* has not been updated for version 8.0.

ACL Education Partners Program

In early 2004, ACL made changes to its Education Partners Program. Prior to that time, the program was free. Benefits primarily included training materials (including the *ACL Workbook*, a demo version of the software, and related data files), and permission to use the demo software in a classroom lab for educational purposes.

Now, member institutions of the Education Partners Program receive one full commercial desktop version of ACL and a fully functional commercial network version of ACL for use in a lab (20 users, maximum). User documentation may be downloaded for each user at the ACL website. The instructor also receives the "Standard Support" package, including email, fax, and phone support, as well as reduced rates for ACL-sponsored training courses.

The most notable change in the administration of the Education Partners Program is that institutions joining the program must pay a one-time $500 fee to receive the benefits listed above. Member institutions that are already members of the Education Partners Program are grandfathered into the revised program and will not be assessed the $500 fee.

Complete information on the ACL Education Partners Program can be found at http://www.acl.com/education_partners.

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