AN INTEGRATED APPROACH TO TEACHING SPREADSHEET SKILLS

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Abstract

As teachers in management courses we face the question of how to insure that our students acquire the technology skills needed to succeed in the workplace. Specifically, in the accounting profession, we face the question of how to insure that students develop competency in using spreadsheet software. A variety of methods have been used by educational institutions to teach spreadsheet skills. Workshops, full semester courses, and on-line self paced training are three methodologies commonly used. These approaches often fall short of delivering computer competency. A less used approach to teaching computer skills is to integrate technology training with content areas. In this paper I present a model for integrating teaching spreadsheet skills with the teaching of an introductory financial accounting course. I also present the results of the integrated approach by reporting and comparing pre- and post- training self assessment and standardized assessment of spreadsheet skills.

INTRODUCTION

As teachers in management courses we frequently face the question of how to insure that our students acquire the technology skills needed to succeed in the workplace. Specifically, from the prospective of an accounting professor, I have faced the question of how to insure that my students develop a basic competency using spreadsheet software. A variety of methods have been used by educational institutions to teach spreadsheet skills. Workshops, full semester courses, and on-line self paced training are three methodologies commonly used. For a variety of reasons, these approaches often fall short of delivering computer competency. A less used approach to teaching computer skills is to integrate technology training with content areas. In this paper I present a model that integrates teaching spreadsheet skills with the teaching of an introductory financial accounting course. I also present the results of the integrated approach by reporting and comparing pre- and post- training self assessment and standardized assessment of spreadsheet skills.

One often used approach to teaching spreadsheet skills is through workshops. Workshops may be offered by staff from the educational institution or by contract trainers such as New Horizons. Workshops are typically structured around teaching a predetermined set of specific features, such as sorting, creating formulas, and formatting completed worksheets for example. The upside of this method is that it allows those students who need support to get it on an as needed basis. There are two down sides to this method of instruction. First, technology skills are taught in a vacuum. Features are presented, but there is no context for use. Students must still make the links between use of spreadsheets and the demands of an academic or professional area. Second, while workshops increase the number of features that students know and can use, learning

individual features or functions does not necessarily lead to competency in developing and using spreadsheets. Competency is more than knowing a laundry list of features. To be a competent user of spreadsheet software, students must be able to identify a data need, start with a blank worksheet, and use the features and functions of spreadsheet software to develop a model that addresses the predetermined need. Granted to build the model, students need to know how to use features, but the point is that features by themselves are not enough.

Full semester courses are another method for teaching computer competency skills. Full semester technology courses are offered typically by the computer science department. The courses present a broad exposure to technology competency covering word processing, presentation, and spreadsheet software. This approach has some advantages over workshops. Courses provide more contact hours than workshops which allows for developing more in-depth and integrated skills. A course can go beyond a set number of features to develop a more sophisticated skill set. This approach is somewhat redundant, though, as an increasing proportion of students come to college with some computer competency. Specifically, students often arrive with highly developed skills in the use of word processing and presentation software. A second disadvantage of the "technology" course model is the lack of context. The examples used and the context presented may or may not be aligned with the needs of accounting, management, or business students. A gap still remains between the ability to use spreadsheet software and the ability to apply spreadsheet software skills in a management or business context in order to analyze data and solve context specific problems.

Finally, self teaching either through the hunt and peck method of help menus, campus computer labs, or through online training are often offered as technology training alternatives. While these methods work for some students, my experience is that these methods are not an efficient use of time, that they lead to frustration, and that they do not result in mastering spreadsheet software use. These methods focus on learning features to solve an immediate need rather than developing spreadsheet modeling skills. Here as in the methods mentioned above, students are left to make the link between general skills and functions and a specific data need.

My approach to computer competency, especially in regards to spreadsheet software builds on the strengths of the prior models while eliminating some of their weaknesses. My approach integrates teaching spreadsheet software application into an introductory course in financial accounting. In this way students learn technology skills in conjunction with an academic content area. Projects are assigned throughout the semester that introduce spreadsheet software and teach basic skills. Further, the projects develop and apply spreadsheet modeling skills in a business context providing an opportunity to review and reinforce content. This integrated approach provides a context for students develop technology skills which facilitates the acquisition and retention of relevant spreadsheet features and reinforces learning of the underlying content.. This contextual learning frames spreadsheet skills as a tool to support decision making. Further it supports the development of modeling skills that can be used across accounting and business curricular content, rather than the acquisition of isolated tools. The paper proceeds as follows. In section 2, I provide overarching goals of the integrated method. In section 3, I provide an overview of the approach. Section 4 presents an overview of the

assignments and the spreadsheet skills covered. Section 5 discusses the empirical and anecdotal findings and section 6 concludes.

OVERARCHING GOALS

The overall goal of the integrated technology training is to insure the technology competency of our graduates while reinforcing the content knowledge. This goal addresses the AACSB requirements around technology skills as well as improving the employment prospects of our students. Among other objectives, AACSB accreditation standards require that business and management degree programs insure that graduating students attain a degree of technology competency. The competency includes the ability to use relevant software to analyze and solve business problems. Technology competency also includes the ability to use the internet to gather information. Effectively using the internet involves not only developing search and research skills, but also developing the ability to critically evaluate information that is retrieved. To gauge the impact of technology competency on employment prospects, I circulated a survey to Simmons College alumnae, academics at New England institutions, and Boston area employers. 83% of alumnae, 98% of academics, and 87% of area employers ranked competency in spreadsheet software as being very important or extremely important in securing employment and in succeeding in employment situations.

The overarching goal of insuring technology competency translates to two specific learning objectives. First, students develop competency in using spreadsheet software to create analytic models. Competency in this case includes the ability to a) develop professionally formatted templates, b) use formulas to carry out mathematical computations, c) apply the productivity improvement aspects of Excel, for example copying formulas or worksheets, using absolute reference, and d) create a variety of graph types to display data. Second, students develop competency in internet-based business research skills. Here competency includes the ability to a) use search engines and financial content websites to generate lists of firms by industry, find firm specific financial information, and find benchmark financial information, b) locate company websites and navigate through the website to find corporate information, and c) use Edgar, the SEC website to find and download company information.

AN OVERVIEW OF THE APPROACH

Introduction to Financial Accounting is used as the primary vehicle for teaching both accounting and spreadsheet technology. The course effectively marries the learning of financial reporting and the learning of spreadsheet skills. To accomplish this marriage, students complete a series of five spreadsheet modeling exercises. Each exercise in the series is designed to progressively build both accounting skills and technology skills. All exercises require students to start from a black worksheet and build an accounting model. In addition, each spreadsheet assignment is accompanied by some sort of analysis. Students use the models and graphs that they have created to discuss the financial performance of the firm. This component of the project keeps students focused on the idea that the underlying role of spreadsheets is to analyze and respond to a business question.

The first exercise begins with basic layout and formatting. The final exercise in the series is a financial statement analysis project. For the project, students focus on a company that is publicly traded in the United States and complete an in-depth analysis of the company that melds accounting knowledge and technology skills. The project provides students with the opportunity to apply analytic tools and technology skills to a real time analysis project, to develop and demonstrate spreadsheet competency, and to produce a piece of work that could be included in a learning portfolio or be used as part of the job interviewing process.

Technology instruction in carried out in a regularly scheduled lab. As part of the accounting course, students register for a lab that is held in one of the college's computer labs. I have partnered with the IT department of the college to offer the labs. The interaction with the IT department serves two purposes. First, the IT trainers have provided invaluable help and insight into the sequencing of spreadsheet skills. I have used their input on the sequencing of spreadsheet skills to develop a series of exercises that reinforce accounting concepts and principles while at the same time building spreadsheet skills. Second, while the accounting component of the exercises is taught in the accounting class by the accounting professor, the spreadsheet component is taught by the college's IT staff during the required lab section that accompanies the class. A series of 5 focused workshops are taught by the IT staff. The workshops teach Excel skills using accounting applications for reinforcement. This provides the spreadsheet skills in a just in time setting, where students learn and immediately apply the skills. In fact, exercises completed in class are used as teaching examples for the lab and are followed by individual assignments that require the student to apply the newly acquired skills to a new setting. This joint teaching model leverages the skills and strengths of faculty and staff. The accounting professor can focus on the accounting issues without taking time out of class to cover the technology issues. The IT staff is provided with real applications for the skills that are taught as they are provided with examples for teaching and review.

THE ASSIGNMENTS

During the course of the semester students complete five spreadsheet projects of increasing difficulty. For each project, an example of each assignment is completed using pen and paper. This completed example is reviewed in class, so that the accounting questions are fully discussed and the concepts are fully understood. Following the class, students move to the computer lab and meet with the IT trainer to complete the same assignment using spreadsheet software rather than pen and paper. The learning here focuses on the use of spreadsheet software rather than learning the accounting. Students are given a spreadsheet printout of the example in finished format. This gives them an idea of what the finished project should look like.

Following the training session, students are given a similar problem to complete independently and to submit for grading. Students submit a printed copy of the work as well as uploading an electronic version to the course's WebCT dropbox. Having both a printed copy of the work, as well as the electronic copy allows the instructor to evaluate the "look" of the spreadsheet model as well as its functionality. The "look" is evaluated based on the professionalism of the submission including the overall layout, the formatting of numbers and text, and the use of underscoring where appropriate. The

functionality of the spreadsheet is evaluated on the use of spreadsheet functions to reference data and to complete mathematical calculations.

The first assignment presents students with a chart of accounts with account balances for two years. Students use the data to create a set of financial statements in proper format. This is accomplished by creating a data section with the chart of accounts and account balances and then constructing the financial statements for the first year by referencing the data section. Students are encouraged to perfect the first year (centering titles, underlining appropriate values, setting column widths), then are asked to create a copy of the "perfected" worksheet. They then complete the assignment by changing the account balances in the data section of the copy of this worksheet. If all the values are referenced, the changes in the account balances will filter through to the financial statements. Finally, students create a clustered bar chart to compare revenues, expenses, and income over the two year period. This assignment teaches entering text and numerical values, cell referencing, the use of adding and subtracting, formatting and centering text, formatting numerical values, and creating a clustered bar graph. It also creates an "aha" moment where students can begin to see the power of spreadsheet software. In this case the instantaneous creation of a modified spreadsheet. Beyond specific spreadsheet skills, this assignment like all of the others focuses on spreadsheet layout and design, and like the others starts with the question of what information is desired, how can it best be displayed, and how can it best be created.

The second assignment gives students a balance sheet and a listing of transactions and adjustments for an accounting cycle. Students are asked to follow a spreadsheet model developed in class in order to create an accounting system. The accounting system facilitates recording transactions and finding ending balances while maintaining the accounting equation. Students use the ending balances to create a set of financial statements as well as a pie chart of expenses and income as percents of revenue. This assignment teaches the use of the summation function, inserting and deleting rows and columns, border functions, and creating a pie chart while reinforcing formatting and layout tools.

The third assignment asks students to choose a company in which they are interested. With the help and guidance of the college's web librarian, students identify companies and obtain financial statements for a company for four fiscal years. Students use the data to create a spreadsheet model of the firm's financial statements. This assignment uses the spreadsheet skills that students have acquired up to this point of the semester. Students need to think about how to lay out the data so that it fits attractively on a single printed page. Students use the skills they have acquired in formatting text and numbers, using the border function to underscore where appropriate, and use mathematical functions and summation to combine values. This assignment is the first step in a semester long project involving the creation and analysis of financial statements of a company. As this is a first step to a semester long project, students are given feedback on this assignment so as to improve the "look" and functionality of their basic model before they move to the analysis part of the work.

The fourth assignment provides students with comparative financial statements for a company over two or three years. Students are required to complete a vertical and trend analysis, calculate a set of financial ratios, and complete a set of line graphs. This assignment teaches the use of division and multiplication in formulas, copying formulas,

understanding and using relative and absolute reference, and creating line graphs while reinforcing formatting and layout tools.

The fifth and final assignment asks the students to take the company model that they created and complete a vertical, trend, and ratio analysis for three years. This assignment provides the capstone for the labs and is used to assess the technology competency of students relative to use of spreadsheet software.

FINDINGS

My main finding is that the quality of the spreadsheet work has improved since instituting the lab. PreValuate was administered at the start of the semester and again at the end. While not an ideal tool or the best reflection of overall learning, the pre and post tests indicated that every student improved. All students scored higher on a post test of their skills than they scored on a pre-test with the average student score improving by 50%.

[Insert Figure 1 About Here]

The improvements seen in each student's score is further reflected in a change in the overall distribution of grades for the entire class. The Fall 2004 pretest results showed an average score of 50% with a minimum of 25% and a maximum of 81%, while the posttest showed an average of 75% with a minimum of 38% and a maximum of 94%. The Fall 2005 pretest results showed an average score of 62% with a minimum of 34% and a maximum of 81%, while the posttest showed an average of 77% with a minimum of 34% and a maximum of 91%.

[Insert Figure 2 About Here]

It should be noted that the PreValuate assessment changed between 2004 to 2005, so that scores across the two years are not directly comparable. Overall, the main comparison is that post test scores for both years were considerable higher than pretest scores for each student individually and for the entire class as a group.

In addition to improved scores on the post-test, students self-reported that the amount of time needed to complete the assignments by students taking the lab was less than have the time spent by students from the prior semesters, when no lab was offered. For example, before instituting the lab, students reported that it took them 4-6 hours to complete the initial spreadsheet assignment. With the lab, most students reported that the initial assignment took only 1-2 hours. Over the course of the semester, students reported that subsequent assignments took even less time and self-reported that they felt that the use of spreadsheet software reduced the amount of time that the assignment took to less time than it would have taken using pen and paper.

CONCLUSIONS

I have a few initial observations on the impact of this integrated method. First, the integrated efforts of faculty, library staff, and IT staff has the power to make a significant

contribution to the technology fluency of students. Integrating the technology learning in a "just in time" framework gives students an opportunity to learn, use, and reuse the technology component throughout the semester, improving the acquisition and retention of skills. In addition, the integration brings specialists in various fields together allowing each faculty or staff member to bring his or her special skills to the table.

Second, the just in time nature of the lab workshops helps reinforce the accounting concepts while reducing the amount of time spent on learning spreadsheet software. Before instituting the lab, I would spend a few minutes on spreadsheet skills in every class. I found that this ate into the time I had for teaching accounting and left the students frustrated in regards to spreadsheet modeling. The students wanted to "get their hands dirty" with the software, not just hear about it or see a demonstration.

Third, over the course of the semester, the lab provided us with a growing number of "aha" moments when students begin to realize the potential of spreadsheet software. These moments come when students are completing very repetitive calculations such as dividing all income statement accounts by total revenue as in a common size analysis or calculating ratios over an extended time period. They also come when students realize that spreadsheet software cuts down the number of calculation errors that they make such as repeatedly summing a series of numbers that they can't seem to get them to balance only to discover that they transposed or omitted numbers when imputing them into their calculators.

In conclusion the addition of a required lab to Introductory Financial Accounting has met both a student and faculty need. Students get technology training and support in a just in time framework. This facilitates acquisition of technology competency while reducing the time spent on assignments. In addition, content learning is reinforced through reworking problems using spreadsheet. Faculty and staff get to leverage their knowledge and skills while faculty can leave the technology training to the experts. IT staff are aided with the provision of real analytic examples and with having a training group that has fairly homogeneous needs and expectations. While we are currently using this model to provide basic technology competency, the method can be easily replicated to expand technology training options and continually expand the technology competency of students.

FIGURE 1

Comparison of PreValuate test scores, Fall 2004
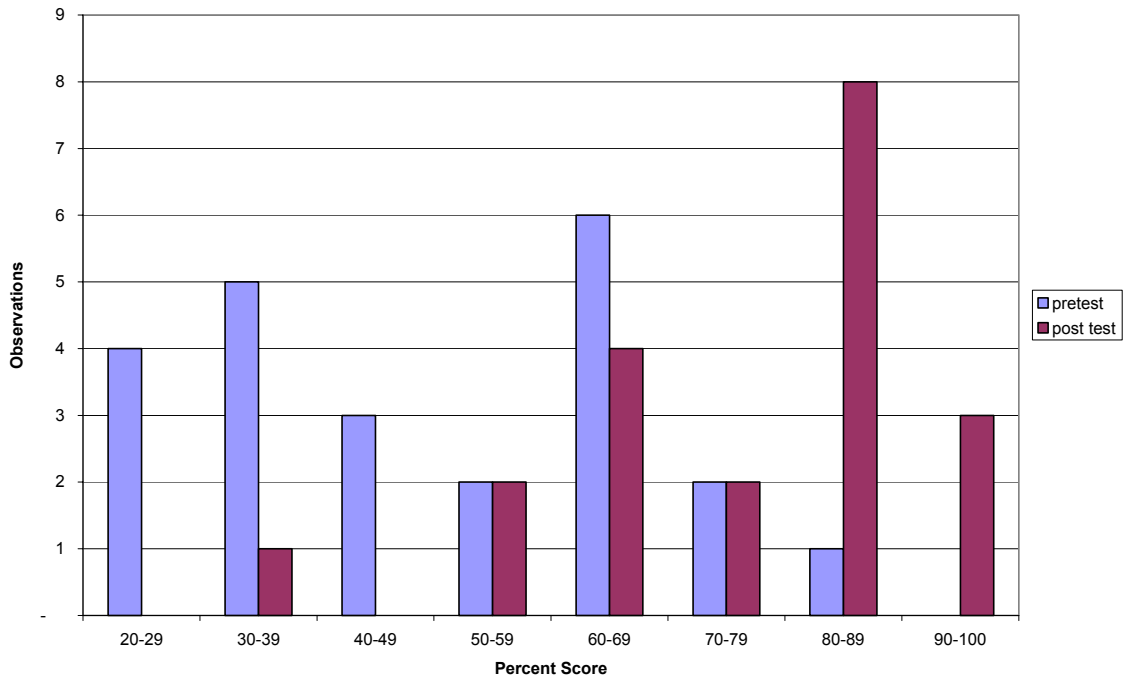**By student comparison**
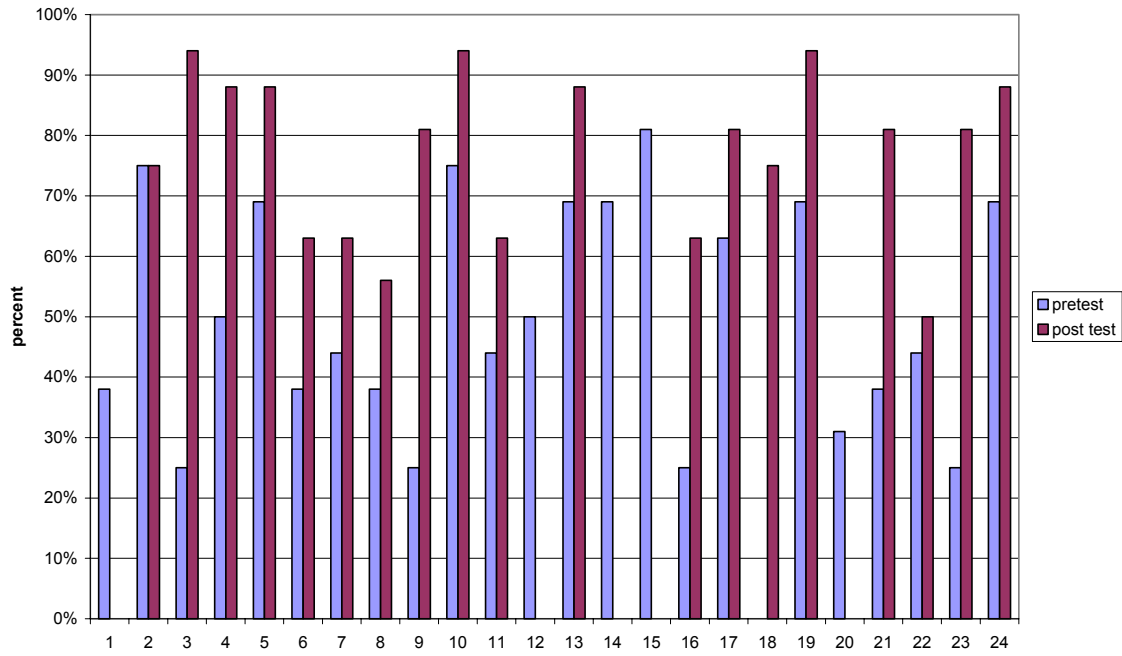
Comparison of PreValuate Test Scores, Fall 2005
by student comparison
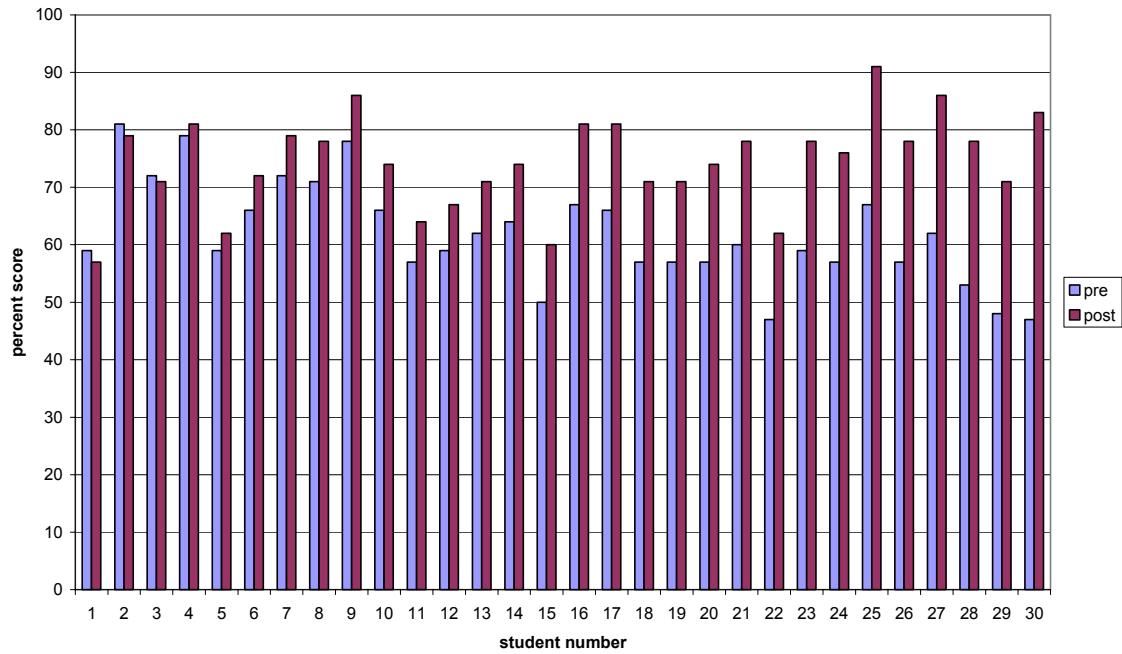
FIGURE 2

Distribution of Pre & Post Test, Fall 2004

Distribution of Pre and Post Test, Fall 2005