The Case for a more rigorous approach to teaching spreadsheet and database applications

M. Pamela Neely
Thoms Pray

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THE CASE FOR A MORE RIGOROUS APPROACH TO TEACHING SPREADSHEET AND DATABASE APPLICATIONS

M. Pamela Neely
Saunders College of Business
Rochester Institute of Technology
pneely@saunders.rit.edu

Thoms F. Pray
Saunders College of Business
Rochester Institute of Technology

ABSTRACT

Although most schools offer and/or require a course in spreadsheet and database applications, the amount of meaningful learning derived from the class varies widely, due in part to a lack of rigor in adjunct instructor led classes. The approach described in this paper involves a combination of demonstration and hands-on practice using two term-long cases to be used in an introductory course in spreadsheet and database applications. These cases, packaged together with slides emphasizing theory, hands-on quizzes and exams that foster critical thinking, can be used across the multiple sections that are taught to maintain consistency within the course and encourage faculty members and students to take the course to a higher level. In order to illustrate that the new methodology makes a difference, we focus on the percentage of As and Bs under both methods. We looked at grades between the New and Old Method for full-time faculty members as well as adjunct faculty members. Also, we looked at a comparison across faculty members for each method. We show that adjunct performance across methods was not significantly impacted, but that full-time faculty members show a statistical change. We also found that the disparity in grading between full-time faculty members and adjunct faculty members is reduced with this New Method of teaching.

Keywords: excel, access, student retention, adjunct faculty, teaching methodology
I. INTRODUCTION

Spreadsheet and database application skills are increasingly being required both in MIS programs and in Colleges of Business. Discussions with colleagues who teach the course from other universities indicate that these skills are frequently taught in an introductory MIS course. Other schools teach these skills in a dedicated applications course. These courses are either designed as 3-4 credit courses where all Office applications, as well as an introduction to the Internet are covered, or, in many cases, as 1 or 2 credit courses that teach a subset of the applications.

Regardless of the course structure, the time available to teach the individual applications is usually short. In many schools adjunct faculty members teach the courses. They use very detailed, step-by-step, textbooks. Anecdotal evidence indicates that many times the process of teaching these courses involves the instructor putting together a list of exercises from the end of chapter material and allowing the students to work on the exercises during a lab session. The student exercises generally involve modifying a worksheet or database that has been partially completed. Very little effort is placed on teaching spreadsheet or database theory or explaining why something is done a particular way. Students become adept at following instructions and mimicking the finished product. However, they do not know how to design a spreadsheet or database, whether to use a pie chart or bar chart, and under what circumstances to use a VLookup rather than an IF statement. They become technically proficient during the course but have not learned how to act independently. Down the road, when they are required to use Excel in an accounting class or Access in a database class, they are unable to make the leap to abstract thinking, not to mention that they have forgotten the specific “how-tos” of creating a chart or using a function.

II. LEARNING BY DOING

Although we are beginning to see textbooks that approach spreadsheet and database applications from a problem solving perspective (e.g. the
Succeeding in Business series by Course Technology), there are still many textbooks that include hands-on step-by-step instructions explaining how to implement the functionality. All of the books, regardless of orientation (problem solving or step-by-step), include a great deal of text explaining the theory of when and how to use the application. Unfortunately, most of the students do not read this detailed text, and thus can not benefit from this approach. Based on self-evaluation, in any given class, roughly 25% of the students will have had no exposure to spreadsheet or database applications, roughly 50% have come into the course with a foundation in spreadsheet techniques learned in a high school class and 25% of the class will be fairly proficient in spreadsheets and have had some exposure to databases. How can the course be taught so that everyone leaves with a broader knowledge base than they started with? This paper addresses a method that may help to resolve this issue.

In addition to the diversity of the students, as well as their propensity to ignore the readings, several issues also arise with the end-of-chapter materials. First, as stated earlier, the exercises frequently start with a template that simply needs to be modified. The rationale for this approach is two-fold. The student does not have to spend a lot of time “typing”, i.e. creating row headers and column headers. And, the student does not have to worry about how things are laid out; the design has been done for them. The second issue associated with the end-of-chapter materials relates to the necessity on the student’s part to “learn the environment” with every new exercise. By this we mean that each exercise is in a problem domain. As the domains change, the student is forced to orient themselves to a new environment. In one exercise they may be required to complete a payroll worksheet, in another one it might be an exercise to compute the amount of interest that would be paid over the life of a loan. There is no continuity between the exercises and each exercise is a stand-alone entity designed to teach a specific skill.

According to Johnson [1996], students retain 10 percent of what they
Reimann and Neubert [2000] explore some of the issues associated with learning a new application. Overall, they argue that students learn best when several conditions are met. First, learning tends to occur best when there is a specific problem to be solved. Second, learning occurs more effectively when there is an example to be followed [Chi et al., 1989; Pirolli and Anderson, 1985; Satzinger and Olfman, 1998]. Finally, the role of self-explanation in learning is critical. The student must articulate what he or she is seeing and how it pertains to what they are trying to accomplish. Reimann and Neubert's work deals specifically with learning to use a spreadsheet. However, the principles can be read, 26 percent of what they hear, 30 percent of what they see, 50 percent of what they see and hear, 70 percent of what they discuss with others, 80 percent of personal experience, 90 percent of what they say as they do it, and 95 percent of what they teach. Thus, it stands to reason that hands-on use of the software applications would improve learning and retention. However, the process of following instructions rarely encourages students to interact with each other. In addition, there is no personal experience involved when the student is simply mimicking something put before them. Critical thinking skills can be encouraged by using a case-based approach to teach the content of the course. Case-based teaching has long been used in business schools [Barnes et al., 1994; Booth et al., 2000; Jennings, 1996]. The cases used in many disciplines, such as accounting, finance or management, typically consist of a narrative describing the environment of the case and then the actual situation to be addressed. This is generally followed by a set of questions to be addressed by the student. Cases involving spreadsheets have been used to teach concepts such as statistics [Parr and Smith, 1998]. These cases can be structured as narratives describing the situation and then asking students to apply specific statistical techniques within the given scenario. The assumption when using a spreadsheet case to teach statistics is that the student is already familiar with the tool. Can we apply the principles of case-based learning in teaching the tool itself?

Reimann and Neubert [2000] explore some of the issues associated with learning a new application. Overall, they argue that students learn best when several conditions are met. First, learning tends to occur best when there is a specific problem to be solved. Second, learning occurs more effectively when there is an example to be followed [Chi et al., 1989; Pirolli and Anderson, 1985; Satzinger and Olfman, 1998]. Finally, the role of self-explanation in learning is critical. The student must articulate what he or she is seeing and how it pertains to what they are trying to accomplish. Reimann and Neubert's work deals specifically with learning to use a spreadsheet. However, the principles can be
applied to learning database applications.

III. THE CASE-BASED APPROACH

In an effort to improve consistency among adjunct faculty members teaching the spreadsheet and database course, as well as improve student retention of the principles of spreadsheets and databases, a package was developed that would ultimately be available to all adjunct faculty members teaching the course. This package consisted of the following:

- A demonstration case
- A homework case
- A set of annotated PowerPoint slides emphasizing spreadsheet and database theory
- A set of hands-on quizzes tied to the principles covered in the two cases
- Midterm and final exams

The course has been taught for three years using this material. We have had two tenure track faculty members teaching the course and five different adjunct faculty members teaching it. Over time the course has evolved and a great deal of student feedback has been received.

This course is taught without a specific textbook. The students are encouraged to purchase a generic reference book that they will be able to use in future classes. The first time the course was taught it was suggested a "Dummies"-style book for students who felt that they had no background in the application. However, the techniques included in the cases quickly went beyond these books so it is now recommend that students purchase complete references books for Excel and Access, such as those put out by Que or Osbourne.

IV. THE DEMONSTRATION CASE

It is frequently the situation that students taking this course are from diverse majors. At our school, the course is a requirement for all freshmen in all
business disciplines. Thus, the student population, in addition to being diverse in skill levels, is also diverse in interests and backgrounds. In an attempt to address all students from a common base, it was decided that the demonstration case would track gas purchases for a car. By necessity the case was somewhat contrived. However, by the conclusion of the course the students had an Access application that tracked multiple drivers with multiple vehicles. Both gas purchases and maintenance items were tracked. It is unlikely that a student would ever need this level of detail. However, the case started in week one with simple formulas for calculating miles per gallon and miles traveled between fill-ups. The students could relate to these numbers. By the time we got to the end of the course, students had been building the application, piece by piece, over the course of the term. They didn’t have to "relearn" the environment each week, and had few problems with the complexity of the solution at the end of the term. They were able to focus weekly on learning new techniques to improve their application, and were rewarded with the difference between the work on the first day of class and the last day of class. In addition, the structure of the case allowed us to emphasize the decision making process of when to use a spreadsheet application and when to use a database. The spreadsheet application at its conclusion was very complex, and it was easy to describe the benefits of moving to a database application.

The components of the package pertaining to the Car Case are:

- Instructor instructions
- Student instructions
- Solutions
- Starting files

The instructor instructions are very detailed, giving the instructor not only step-by-step instructions for completing each task, but also areas to emphasize to further student understanding. For example, a task that involves creating a line chart showing the price per gallon of gas over time would include the specific
instructions for how to create the chart. It would also include trouble shooting hints for the students. Finally, it will have specific reminders for the instructor that ties the theoretical slides into the practical application. It will remind the instructor to go over why a line chart would be appropriate in this instance, but a pie chart would not.

The class is taught in a lab and students are encouraged to work along with the instructor. This works well for some students and doesn't work at all for others. Students who have a foundation in the application and know where things are can usually keep up. Those that are still struggling with basic concepts such as formulas and cell references may find it more efficient to watch the demonstration and go back over it again on their own. The student instructions are provided for this purpose. Student instructions provide step-by-step commands in much the same way that the current textbooks provide guidance within the text of the chapter. However, there are no screen shots, and the students will have seen it demonstrated before they need to attempt it on their own. The fact that there are no screen shots allows the course to be taught from a platform independent perspective. As long as all faculty members are in agreement, the course could be taught using Excel and Access (any version) or Open Office.

We also give them a short tutorial on how to use a reference book. Many of the students depend on the help function or Internet resources rather than purchasing a reference book. It would appear however, that students who do purchase (and use!) the reference book are the ones that get the most out of the class.

The solutions and starting files are actually the same file in different folders of the CD directory given to the adjunct. The solution to week one becomes the starting file for week two. They are organized in separate folders to make it easier for the adjunct instructor. The students will be provided with both
files. Thus, they can use the starting file to follow the instructions and then compare it to the completed file.

V. THE HOMEWORK CASE

With the same rationale that was used to develop the Car Case, the homework case scenario is the Fruit Stand Case. The students track the sales of fruit for a small fruit stand and ultimately produce invoices from an Access database. Although this might be construed as an accounting exercise, all of the students have purchased things and most of them have seen a receipt or invoice with extensions and tax calculations. It is sufficiently different from the Car Case that they are not simply redoing the work that was demonstrated in class. However, the techniques that are demonstrated using the Car Case will be used in the homework. If we discussed absolute and relative cell referencing in class, that technique will be used in the Fruit Stand Case. When we create a form in Access for the Car Case using a wizard and then modify it in design view, the same technique will be used to create a different form for the Fruit Stand.

As with the Car Case, starting files and solutions files are the same. The starting file for week two is the solution file for week one. Unlike the Car Case, students are not provided the starting file for week two until after they have turned in the homework for week one. Starting from week two they are working with a template. This keeps students on the same track. Each homework assignment differs dramatically among students. If they went forward with their own files they might not be able to implement the specific instructions in subsequent assignments. Thus, the final product of their work all looks very similar. The downside to this approach is that they are working from templates. However, they had to have put some thought into the solution before they are provided with it so it is not the same as being provided with a template that they didn't help design.
VI. POWERPOINT SLIDES

The emphasis with this approach is that students will understand why they are performing specific tasks, as well as how to choose between available options for performing the same tasks. The slides serve two purposes. They provide the rationale and essential spreadsheet and database theory. In addition, for specific tasks that are taught, many of the step-by-step instructions are included in the slides. Thus, they are an additional resource for the student to come back to when working on the homework.

Because many adjunct instructors for this course are technically proficient, but self-taught, they may lack the ability to put the theory into words. The instructor set of slides provides annotation, in much the same way that the instructor instructions for the Car Case are annotated. They provide examples and areas to emphasize. They take the burden of having to “lecture” off of the instructor and instead provide a framework within which the instructor can intertwine his or her own experiences.

VII. QUIZZES

Homework is not graded in this class. Students receive a check if they turn it in, nothing if they don’t turn it in. Our experience has been that some students will do the homework and allow others to turn it in as their own. Obviously, this only harms the student who doesn’t do the work, but the instructor should not have to spend a lot of time grading duplicate homework. The resolution to this problem is to have a quiz after each homework assignment. Unlike the Car Case and Fruit Stand Case, which are very dissimilar, the quiz is closely tied to the homework. Students who have completed the homework will generally do well on the quiz. Those who didn’t do the homework will generally not do as well. They do not have access to the solution (or the starting file for the next week) until after the quiz is completed. All quizzes are open notes so this benefits the student who has done the homework.
As indicated earlier, one goal of this teaching methodology is to provide consistency across multiple sections of the course. Kezim et al. [2005] show that there is a statistical difference in the grades given by adjunct and full-time faculty members. Although there are numerous reasons why this might be, we propose that at least part of the problem is the lack of a common pedagogical approach. By providing consistent teaching materials, including quizzes and exams, we hope to reduce the discrepancy in grades given by adjunct and full-time faculty members.

All of the quizzes are hands-on except for the quiz following the initial database lecture. An entire class is devoted to discussing topics such as entities, attributes, records and keys. Without this fundamental understanding of what a database is, the students cannot go beyond a one-table database. If restricted to one table then the concepts of forms and sub-forms or grouped reports cannot be illustrated. Thus, this quiz is a multiple-choice quiz on database terminology and concepts. The homework that is assigned after this first database lecture is to brainstorm the tables that would be in the Fruit Stand Case. Although this is a very difficult exercise and few students are able to successfully complete it, we feel that the process of thinking about entities and attributes is an important component of using the tool effectively.

IX. EXAMS

The midterm exam is on spreadsheets, while the final exam is on databases. Since a primary focus of the course is to encourage students to think in abstract ways, both exams are quite complex. Thus, they are usually given out the week before the actual exam. Initially we had an additional case that was used for both the midterm and final. The case was sufficiently complex that the student needed to think about it for a number of hours in order to effectively create it. They were encouraged to practice it several times and then were required to come into the classroom and produce it during the two hour exam
period. There were some instances of cheating and many complaints that the
time was too short to complete the exercise during the exam period.

Recently we have used a new model for the exams. Again a case is used,
but it is even more complex than the previous cases, modeling real-world
applications in business. Groups are assigned and the case is due several days
before the exam, one case per group. The case is graded and a group grade is
given. Feedback for improving and correcting the application is given so that the
students can move on to the next portion of the exam. This group grade is 1/3 of
the total exam grade. The remaining 2/3 of the grade is done in a multiple choice
format. Because most of the exam questions are of the “what-if” type, students
who have not created their applications properly will not be able to effectively
answer the questions. Interestingly, the average grade for the group portion of
the exam is 81%, whereas the average grade for the individual portion is 75%.
Clearly there were students who did not participate in the group portion of the
project as thoroughly as they should have.

X. DOES IT MAKE A DIFFERENCE?

As stated earlier, there were two primary motivators in developing the new
course methodology. First, we wanted to improve the rigor of the course. We
wanted to be able to test students using real-world exercises that would be
similar to what they might encounter in a job situation. Secondly, we wanted to
improve consistency across the sections. A student should have the same
material regardless of who they take the class from. Additionally, a grade of “A”
should be the same whether it is taught by Professor Smith or Ms. Green.

We began teaching this course in the fall of 2002. From September 2002
through August 2003 a total of 8 sections were taught, involving 159 students.
The new cases were developed during the summer of 2003 and implemented in
the fall of 2003. Since that time (through summer 2006), we have taught 24
sections, involving 692 students Data was collected pertaining to the grades for
all sections taught (see Table 1).

Table 1. - Sections, Students, and Grades

<table>
<thead>
<tr>
<th>Year</th>
<th>Sections Taught</th>
<th>Enrollment</th>
<th>A's</th>
<th>B's</th>
<th>C's</th>
<th>D's</th>
<th>F's</th>
<th>I's</th>
<th>W's</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2003</td>
<td>8</td>
<td>159</td>
<td>41</td>
<td>51</td>
<td>27</td>
<td>7</td>
<td>12</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>2003-2004</td>
<td>7</td>
<td>190</td>
<td>51</td>
<td>59</td>
<td>32</td>
<td>15</td>
<td>14</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>2004-2005</td>
<td>9</td>
<td>265</td>
<td>103</td>
<td>65</td>
<td>36</td>
<td>14</td>
<td>16</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>2005-2006</td>
<td>9</td>
<td>249</td>
<td>82</td>
<td>75</td>
<td>33</td>
<td>15</td>
<td>16</td>
<td>0</td>
<td>28</td>
</tr>
</tbody>
</table>

Rigor of the course is evidenced by the ability of the student to solve complex, real-world exercises. The exam average on the Excel portion of the course under the Old Method was 76%. The Access exam average was 77%. Under the new methodology, exam averages have risen to 81% for both the Excel and Access portions of the course (see Table 2). Hands-on exams exemplifying real-world exams were used in both methodologies. However, the complexity of the exams has increased over time. For example, under the Old Method, all functions used on the exam had been discussed in class. Under the New Method, there are functions on the exam that the students need to figure out how to use on their own, without having first seen it in class. Thus, we are seeing an improvement in test scores, while at the same time increasing the rigor of the exams.

Table 2. - Exam Averages

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Excel Exam Average</th>
<th>Access Exam Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old</td>
<td>76%</td>
<td>77%</td>
</tr>
<tr>
<td>New</td>
<td>81%</td>
<td>81%</td>
</tr>
</tbody>
</table>

Data pertaining to faculty member status was also obtained. Distribution of grades under the Old Method of teaching and under the New Method of teaching is shown in Table 3, detailed by teaching status (adjunct or full-time).
Table 3. - Grade Distribution by Faculty member Status

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Status</th>
<th>A's</th>
<th>B's</th>
<th>C's</th>
<th>D's</th>
<th>F's</th>
<th>I's</th>
<th>W's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old</td>
<td>Full-time</td>
<td>13</td>
<td>22</td>
<td>15</td>
<td>4</td>
<td>7</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Old</td>
<td>Adjunct</td>
<td>28</td>
<td>29</td>
<td>12</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>New</td>
<td>Full-time</td>
<td>92</td>
<td>110</td>
<td>56</td>
<td>18</td>
<td>21</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>New</td>
<td>Adjunct</td>
<td>141</td>
<td>83</td>
<td>44</td>
<td>26</td>
<td>23</td>
<td>5</td>
<td>38</td>
</tr>
</tbody>
</table>

From our second motivator, aligning the course content for all sections of a course, we test the hypothesis against the findings of Kezim et al. [2005]. Their findings were that faculty status influences the grades given, with adjunct faculty members giving higher grades than full-time faculty members. We assert that, given similar content and assessment tools, grades across sections will not differ between adjunct and full-time faculty members. Although we recognize that there are many reasons for the disparity in grades given by adjunct and full-time faculty members, we believe that at least part of the disparity stems from pedagogical structure. Since we had data on proportion of grades we thought we would do some preliminary data analysis and hypothesis about grading. The data was grouped into proportion of A and B grades given by either adjuncts (Pa) or full-time faculty members (Pf) for the two different methods and four hypotheses were investigated.

The four tests of hypotheses using difference in proportions were conducted. Two were comparing grades across different methods for full-time and then adjuncts. Two additional tests were conducted looking at grades of adjuncts versus full-time grades for a specific method.

**ACROSS METHODS**

Hypothesis 1: The proportion of A and B grades given by the full time faculty members (Pf) across methods would be the same.

Hypothesis 2: The proportion of A and B grades given by the adjunct faculty members (Pa) across methods would be different. The New Method would lower percent of A and B grades given by adjuncts.
ACROSS FACULTY

Hypothesis 3: Looking solely at the Old Method, we would expect there to be a larger proportion of A and B grades given by the adjuncts vis-à-vis full time faculty members.

Hypothesis 4: Looking solely at the New Method, we would expect there would be no difference in the proportion of A and B grades given by the adjuncts vis-à-vis full time faculty members.

XI. RESULTS

The results are initially somewhat surprising and are summarized in Table 4. The first hypothesis focused strictly on the full-time faculty members across methods. The results were contrary to the null hypothesis. Under the New Method full-time faculty members gave a larger proportion of A and B grades (Pfn = 61.02%) than under the Old Method (Pfo = 44.87%). The test had a p-value of .0093.

The second hypothesis was focused on the adjunct faculty member grades across methods. When we compared the proportion of A and B grades given by adjuncts using the Old Method (Pao = 70.37%), we found that it is not statistically different from the proportion given by them under the New Method (Pan = 62.06%). The p-value was .1596. However, we obviously see a trend towards a lower percentage of A and B grades.

The third hypothesis focused on the Old Method and compared adjunct grading performance (Pao = 70.37%) to full-time faculty members performance (Pfo = 44.87%). The results are as expected- the adjuncts gave a larger proportion of A and B grades than did the full-time faculty members. The p-value was .006.

The fourth hypothesis focused on the New Method and compared adjunct grading performance (Pan = 62.06%) to full-time faculty members performance
We found that there was no significant difference in percent A and B grades using this New Method. The p-value was .1596.

Table 4. - Statistical Test by Method and Faculty Status

<table>
<thead>
<tr>
<th>Notation</th>
<th>Full-Time Performance across Methods</th>
<th>Adjunct Performance across Methods</th>
<th>Old Method</th>
<th>New Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypothesis</td>
<td>Ho: Pfo = Pfn</td>
<td>Ho: Pao = Pan</td>
<td>Ho: Pa = Pf</td>
<td>Ho: Pa = Pf</td>
</tr>
<tr>
<td>a = adjunct</td>
<td>Ha: Pfo/= Pfn</td>
<td>Ha: Pao &gt; Pan</td>
<td>Ha: Pa &gt; Pf</td>
<td>Ha: Pa /= Pf</td>
</tr>
<tr>
<td>f = full-time</td>
<td>o = old</td>
<td>n = new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample results</td>
<td>Nfo = 78</td>
<td>Nao = 81</td>
<td>Na = 81</td>
<td>Na = 331</td>
</tr>
<tr>
<td>Pf ave</td>
<td>Pfo ave = 44.87%</td>
<td>Pao ave = 70.37%</td>
<td>Pa ave= 70.37%</td>
<td>Pa ave = 44.87%</td>
</tr>
<tr>
<td>Nfn = 331</td>
<td>Nan = 361</td>
<td>Pf ave = 61.02%</td>
<td>Pan ave = 62.06%</td>
<td>Pf ave = 62.06%</td>
</tr>
<tr>
<td>N sample size</td>
<td>Nf = 78</td>
<td>Nf = 331</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Z statistic</td>
<td>Z = -2.6</td>
<td>Z = 1.41</td>
<td>Z = 3.255</td>
<td>Z = -0.276</td>
</tr>
<tr>
<td>p-value</td>
<td>P = .0093</td>
<td>P = .1596</td>
<td>P = .0006</td>
<td>P = .7823</td>
</tr>
<tr>
<td>95% Confidence interval for</td>
<td>-28.33 &lt; Pfo-Pfn &lt; -3.97</td>
<td>-3.28 &lt; Pao-Pan &lt; 19.92</td>
<td>10.18 &lt; Pa-Pf &lt; 40.85</td>
<td>-8.27 &lt; Pa-Pf &lt; 6.23</td>
</tr>
<tr>
<td>Conclusion</td>
<td>Reject Ho if Pfn &gt; Pfo</td>
<td>Fail to Reject Ho if Pao = Pan</td>
<td>Reject Ho in favor of Pa &gt; Pf</td>
<td>Fail to Reject Ho if Pa = Pf</td>
</tr>
</tbody>
</table>

In summary when we compared grading across methods, it appears that the full-time faculty members are giving higher grades under the New Method as compared to the Old Method. While this is contrary to our expectations, this could be attributed to the students having learned the material better under the new structured and rigorous approach. The New Method is more focused, allowing the students to learn the material and achieve mastery of it, while at the same time understanding the material at a higher level for future use.
When looking at adjuncts there is no statistical difference in their grading when comparing results over methods. But there is some directional evidence for a lower percentage of A and B grades under the New Method. This may indicate that adjunct faculty members are using the New Method in such a way that the sections are taught to students in the same way, thus student achievement is the same, regardless of the instructor.

The third hypothesis results were as expected. When we looked at adjunct grades versus full-time faculty members grades for the Old Method, adjuncts were giving a larger percentage of A and B grades. Anecdotally, this is what we would expect.

The fourth hypothesis is supported, in that there is no statistical difference in the proportion of As and Bs by either the adjunct faculty members or the full-time faculty members under the New Method. Not only is the hypothesis supported, but it indicates that we are achieving our goal of grading parity, regardless of who teaches the course.

**XII. CONCLUSION**

The actual skills that are covered in an introductory spreadsheet or database course are only a fraction of what the student should be taking out of the class. The likelihood that they will remember exactly how to do a VLookup or calculated control two years after taking the course when they first need to use it in Accounting or Database Management Systems is very small. The version of the software they must use two years later may not be the same version that they learned on. Students need to be able to get to a level of meaningful learning in the introductory course so that they will have the tools to **find out** how to do things, not necessarily **remember** how to do them. Students need to understand what spreadsheets and databases are used for. They need to know when to choose one application over the other. Within each application, they need to determine what functionality should be used to accomplish specific tasks. And,
most importantly, they need to know how to find out how to accomplish specific tasks. In order to reach this level of meaningful learning, we suggest that a case-based approach to teaching the class is very effective. A demonstration case, along with a homework case, coupled with slides to emphasize theory and a collection of quizzes and hands-on practical exams, can allow this course to be taught at a level so that the end product is a full application.

Student feedback from this approach has been favorable. The approximately 75% of students who come into this course with some knowledge of spreadsheets and/or databases find that they really increase their knowledge base. The other 25% of the students struggle with the material, but will master it if they spend enough time on it. The single biggest criticism of the course is that it goes too fast. The demonstration case is geared for the 75%, not the 25%. Thus, students who do not have a basic foundation cannot keep up with the demonstration. However, the resources are available to get these students up to speed quickly if they are willing to put in the time. Students like the continuity of the cases although some find the Car Case contrived. They like the fact that the techniques are reinforced with homework and quizzes, as well as the exams.

One of the most impressive footnotes to the fact that this method of teaching works comes from student comments (two and three years after taking the course):

"I just wanted to let you know that taking your Business Software Applications course really helped me when I was on my co-op. It got me the job! At the interview, my employer was impressed by my level of understanding and proficiency in Microsoft Access."

"The co-op has been going great. Been working so much with Access and Excel, the need for our classes has quickly become apparent."

"I would like to take this opportunity to thank you very much
for the knowledge you have passed down to me from the Business Software Applications class. When I first took your class I thought it was interesting in general except I'd never imagine when I'd start using the skills you taught us in class ever again. I figured it would be a couple of years until I would find a purpose or reason to start using MS Access. However, in my part-time job where I call people to hire as financial advisors/consultants, I decided to create a database from MS Access to keep a record of all the people I call and therefore I'll be more efficient and keeping record of whom I call. I didn't realize it at first but tools such as MS Access and Excel are so incredibly useful than I had imagined before. I just thought I should thank you because it has personally made my life easier and has allowed me to become more productive, thank you! I hope other students can benefit in similar ways as I have in the future!

From a pedagogical point of view, the opportunity to provide a consistent course to all students, regardless of who teaches it, is extremely attractive. An "A" in Professor Smith's class will be the same thing as an "A" in Instructor Jones' class. An analysis of the data shows that there is no statistical difference in the percentage of As and Bs given by adjuncts and full-time faculty members under the New Method. Full-time faculty members are giving more As and Bs under the New Method, while adjunct faculty members are giving fewer.

With the new methodology, only a handful of specific functions are taught. The students are given the tools that they need for their respective majors. All students will be able to use a reference book-in effect they are "learning how to learn." And isn't that the ultimate goal of going to college in the first place?

XII. REFERENCES


**ABOUT THE AUTHORS**

**M. Pamela Neely, Ph.D, CPA**, is an assistant professor in the department of management information systems at the Saunders College of Business, Rochester Institute of Technology. She has published numerous conference papers at the Americas Conference on Information Systems (AMCIS) and the International Conference on Information Quality (ICIQ). She has also published in The DATABASE for Advances in Information Systems, the Journal of College Teaching and Learning, and the Review of Business Information Systems. Dr. Neely's primary research area is in the realm of data and information quality. She will be program chair of ICIQ in 2008 and is vice president of the forthcoming special interest group in information quality connected with the Association of Information Systems (AIS).

Dr. Neely has taught the software applications course for the last several years,
both at RIT and Marist College. She also teaches Database courses, as well as various accounting courses. She frequently receives e-mails from students two and three years after taking a course, expressing their thanks for the thorough coverage of the topics.

Dr. Neely received an undergraduate degree in Environmental Studies for SUNY Buffalo, a Master of Science in Accounting from the University of Colorado, and a Ph.D. in Information Systems from the University at Albany.

Thomas Pray, Ph.D., is a nationally recognized leader in the development and application of business simulations. A professor of Decision Sciences at RIT's College of Business and past chairman of the Department of Decision Sciences and MIS, he has lectured on and used computerized business simulations throughout the US and in Canada, Australia, England, Scotland and India – in both industrial and academic contexts.

Dr. Pray began his career by co-authoring three business simulation books and corresponding software. Recently, he has been active in the development of two new strategy-oriented simulations: DECIDE: A Total Enterprise Simulation and INNOVATE: A Strategy Simulation with New Product Development Elements.

He always receives the highest evaluations. At the university level, he has received two major awards for outstanding teaching: the Eisenhart Award for Outstanding Teaching, awarded by RIT in 1985, and the Chancellor's Award for Excellence in Teaching, awarded by the State University of New York in 1980 when Dr. Pray was teaching at SUNY Geneseo. Dr. Pray received his bachelor's and master's degrees from Clarkson University in industrial engineering and industrial management, respectively, and received his doctorate in managerial economics from Rensselaer Polytechnic Institute.