

# **Evaluating the Instructional Methodology Focus for Teaching the Introductory Finance Course (Conceptual vs. Spreadsheet Tool – Which is Best?)**

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## ***ABSTRACT***

*This paper examines the determinants of student performance in an introductory finance course using two different instructional methodologies in the lab (recitation) sections of the course. The evaluation of the course focuses on whether students perform better in the course if the design and delivery of the lab instruction is “conceptually-focused” versus “spreadsheet focused”. Also explored are student attitudes about the use of spreadsheet modeling in the introductory finance course. Using OLS estimation techniques does reveal a positive relationship for “conceptually-focused” lab instruction and student cognitive achievement as measured by course grade. A student’s cumulative GPA, number of semester credit hours earned, and the post-assessment score for assurance of learning purposes are also positive determinants of the level of grade received in the course. I find that the background student characteristics such as ethnicity, gender, transfer student, and student’s major play no significant role in determining performance. Effort, measured by hits on WebCT, is not significantly correlated with the grade received. Students overwhelmingly liked using spreadsheets in the finance course and the lab instructors indicated that they much preferred teaching the lab in a “conceptually-focused” manner. Survey results also indicate although students generally prefer “conceptually-focused” lab instruction, they also prefer using Excel as the tool for doing financial analysis versus using a financial calculator.*

## **I. Introduction**

A major goal in our introductory finance course is to help students develop an intuitive and conceptual understanding of finance. Accomplishment of this goal would expand a student’s ability to think beyond the numbers and the use of formulas rather than on relying on memorization or blind use of finance tools such as calculators and Excel. We want to teach in a way that bridges the gap between computationally-focused and conceptually-focused instruction. At the same time, budgetary pressures have meant that at many universities, larger and larger introductory courses are the norm rather than the exception.

Given the constraints, what is the best instructional methodology to use in an introductory finance course? Of course, this question most often leads to a debate among a group of finance

academics. The finance faculty at my institution has debated this issue many times over the past few years. On one hand are those who believe that the use of excel in the introductory course is optimal because spreadsheets are used comprehensively in all functional areas of business. On the other hand are those who believe the use of Excel in the introductory course is more of a distraction than an enhancement to learning. In fact, there are some who believe that students focus more on learning the excel tool itself than on learning finance and want to see it eliminated from the course entirely.<sup>1</sup>

This paper presents experimental evidence on the relative effectiveness of a “conceptually-focused” pedagogy versus a “spreadsheet-tool focused” pedagogy in achieving cognitive outcomes for a sample of undergraduate business majors in an introductory finance course in the spring of 2008. The questions explored in this study using cross-sectional analyses of my large lecture class and four lab sections are:

- Does “conceptually-focused” instruction increase student understanding of finance compared to a “spreadsheet-focused” instruction?
- What student characteristics contribute the most to increased understanding of finance comparing the two instructional methodologies?

Using survey data and anecdotal evidence, I also address the following questions:

- Do students have positive attitudes about using Excel in the introductory finance course and are they prepared to use Excel upon entering the finance course?
- Do students have a preference for the type of analysis tool (spreadsheets versus financial calculator) used in the finance course?

## **II. Literature Review**

Haley (1975) provided a rationale for the nature of the first course in finance by stating that the course structure is determined by: (1) the constraints on the time available, (2) the observation that the course is a terminal course for many students, and (3) the desire to cover the essentials of the entire subject while focusing on managerial or business finance. Numerous studies have been conducted since this article was written that examine factors related to student performance in the introductory finance course. The largest study by Andy Terry (2002) found that student performance is significantly related to gender (men performing higher than women), major, exam type, credits in prerequisite courses, GPA, and whether the introductory finance course was taken during the summer (Students who took the course in the summer significantly outperformed students who took the course during the regular semester). Didia and Hasnat (1998) found a strong positive relationship between cumulative GPA and grade received in the introductory finance course. They also found that better performance in introductory accounting, economics and mathematics were positively correlated with better performance in introductory finance and instructors do have a differential impact on student performance. Marcal and Roberts (2001) found that students who had completed a statistics requirement received higher grades in the introductory finance course. Ely & Hittle (1990) report that the completion of accounting courses improved performance in a finance course but performance was not influenced by mathematical background. Henebry (1997) found that students had a higher

probability of passing an introductory finance course if the course met more than once a week. Moore (1999) found that students learn as well in structured cases as in lectures, but they may prefer lectures.

Fewer studies have been conducted that look specifically at the use of spreadsheets in the introductory finance course. Kent Saunders (2002) examined the use of computers, group work, writing assignments and presentations in the introductory finance course and found that most professors use computers as an in-class teaching method and for out-of-class assignments but large class sizes are associated less with the use of computers. Bailey and Heck (2002) surveyed finance faculty regarding their use of technology in the classroom. They indicated that the business community wants more technology used in business education and state, "More likely, business managers are referring to students' familiarity with technological tools like spreadsheets that assist in managerial decision-making." Gitman and Vandenberg (2003) found in a survey of practitioners and academics that business schools need to prepare future managers for a changing set of responsibilities that are more strategic, more global and more demanding in their use of technology.

According to Hess (2005), the teaching of quantitative aspects in accounting and finance pose inherent challenges and even if students possess an understanding of the use of quantitative skills, they may find it hard to grasp the meaning of the concepts or theories. He advocates embedding the teaching of financial concepts into spreadsheet modeling exercises. He believes that courses that put modeling at the forefront of course delivery enable students to acquire the applicable concepts in finance and accounting almost automatically along the way because it is a practical, "hands-on" method that enhances understanding and retention. An added bonus is that it is likely to improve employability of students because they become more adept in the use of analysis tools widely used in today's work environment.

Finally, Holden & Womack (2000) discuss the benefits and motivations for spreadsheet modeling in finance and investment courses for students to be (1) conquering equation phobia, (2) bridging from concepts to problem solving, (3) outfitting the student with real-world tools, (4) providing a rich canvas by which to build a complex, realistic finance models, and (5) as a natural platform for quantitative models. The authors caution that the use of a spreadsheet templates in instruction can be problematic if they are "Black Boxes" to students and if students do not learn to build the equations or graphs themselves. Students may not appreciate how they get from inputs to outputs or even have a clue as to what the spreadsheet is doing. Sometimes spreadsheet templates have substantial value, however. For example, showing the dynamics of options valuation and visualizing this as inputs vary. These authors also discuss the debate related to the calculator vs. spreadsheet modeling in finance courses. Their perspective is that the computing platform required in most business schools has changed and far more business schools require the students to own a laptop. These schools also provide hard-wired and/or wireless connections in classrooms. This makes calculators no longer the only viable option for financial analysis in courses.

### **III. Overview of the FNAN 301 financial management course**

The introductory finance course (FNAN 301) at my university is taught each semester to all School of Management students, regardless of their major. The course was restructured in 2005 because of the growing number of students taking it each semester. Previously, the course was taught to no more than 60-80 students in a section meeting two times a week. Students now attend a large lecture (180-200 students) one day a week for an hour and fifteen minutes and a smaller lab section (45-50 students) one day a week for an hour and fifteen minutes. The instructional design and delivery of lectures helps students to develop critical thinking skills and to gain an intuitive understanding of finance. The instructional design and delivery of the labs helps students to apply the concepts and principles using spreadsheet analysis as the primary tool. Lab instructors use "Spreadsheet Workbooks" and go over finance problems in these workbooks using Excel. Lectures are staffed by three full-time professors and the labs are staffed by adjuncts, and MBA students. In addition, voluntary study sessions, staffed by an MBA student are provided and the course is supported by a one-half time administrative assistant. There are about 600 students each semester taking the introductory finance course.

The assessment structure of the course includes the use of an online algorithmic Homework Manager. Concept quizzes are administered six times during the semester in either the lecture or the lab and three exams are given throughout the semester in the labs. Students are provided with a blank spreadsheet to use to complete the exams. Security is put in place to ensure that the spreadsheets are blank at the beginning of the exam period. Additional features of the course include providing "Homework Hints", posted to WebCT to help students to intuitively think through a solution to a homework problem. Students can also access practice problems, narrated lectures, I-Pod content, practice exams, flash cards, etc. We encourage students, but especially the finance majors, to learn how to use a financial calculator and provide an online tutorial to help them.

The Assurance of Learning plan includes overall goals for the course, which are translated into measurable objectives. The students are given a 24-question pre-assessment exam on the first day of class and a post-assessment is given on the last day of class. Results from statistics conducted determine how much learning has taken place as well as how to restructure portions of the course in the future.

#### **IV. Experimental Design, Data and Variables**

Using data collected in my spring 2008 introductory finance course, regression techniques, and a survey administered to the students at the end of the semester, I attempt to learn whether a "conceptually-focused" lab section leads to greater student learning versus a "spreadsheet-focused" lab section. I identify and analyze the factors influencing student performance in the course and in relation to the background characteristics of the students. Using OLS regression, analyses are conducted to determine these relationships and to determine the effectiveness of the two different instructional methods.

The sample consists of 171 students. The test and control lab sections were roughly of equal size, with 84 in the control group (excel application) and 87 in the experimental group (conceptual application). Any differences between the two groups caused by the instructor's teaching style were removed because I taught the lecture to both groups and the two lab

instructors each taught one experimental and one control group. To avoid selection bias, I did not inform the students prior to registration that the sections had different teaching pedagogies.

The Tablet PC was used in the two experimental lab sections to convey formulas, models, and financial relationships with the lab instructor talking through the models conceptually<sup>ii</sup>. In the other two sections, the lab instructors used spreadsheets as the application tool. Both sections used the same textbook, course materials, attended the same lecture, and took the same exams.

Clearly, learning financial concepts and performing financial analysis are a function of more than the instructional method used. I collected data on student characteristics that might affect performance in finance. To control for differences in learning caused by these factors, I included demographic characteristics such as major, gender, ethnic group, and transfer student. Data was collected from the registrar's office that includes proxies for initial student aptitude and achievement. Aptitude variables include total SAT score and math SAT score.<sup>iii</sup> Achievement variables include cumulative GPA, cumulative semester credit hours and a student's post-assessment score. The variable to account for individual student effort is the number of time (hits) a student accessed WebCT during the semester. In addition, each student was surveyed to collect data on their attitudes about the use of spreadsheets in the course.<sup>iv</sup>

Differences in student learning resulting from pedagogical technique were measured using the final numerical grade in the course. In order to analyze accurately the effectiveness of the specific pedagogical technique, it is essential to employ adequate measures of outcomes and defining and measuring outputs is not a simple task. The majority of studies on the effectiveness of educational programs measure student performance on standardized achievement tests. Such tests are not available in finance. I completed an item analysis on the exams used in the course and the questions do appear to be reliable. I also believe that the exams are valid because they test the concepts deemed appropriate in the finance course.

## V. Empirical Analysis

I tested the following null hypotheses against two-tailed alternatives:

1. A "conceptually-focused" lab section in the introductory finance course has no impact on student learning of finance.
2. Differential student characteristics, aptitude, and achievement have no impact on student learning in a finance course.

*1. Student learning.* The use of a "conceptually-focused" lab session should increase student learning in finance because students would develop financial intuition, which would allow higher development of critical thinking and problem solving skills. These opportunities should be reflected in the cognitive measures such as final course grade.

*2. Student characteristics.* The higher the GPA, the total and math SAT score, and the cumulative semester credit hours earned; the more students will benefit from lecture/discussions and this should increase student learning. It is not clear whether the student's major, gender,

ethnic origin, or being a transfer student matters with respect to their performance in the finance class.

3. *Time on on-line task.* The amount of time students spend on retrieving instructional materials on WebCT, the higher should be the probability of them increasing their understanding of finance and ultimately their performance in the course.

4. *Student attitudes about excel applications.* If students have positive attitudes about using Excel to do financial analysis, believe they can learn more finance effectively using Excel, and believe that the use of Excel is applicable to their work, future careers, and life; they will be more engaged in applying the concepts learned in the course and have higher levels of performance in the course. Alternatively, attitudes may not have an impact on actual performance in the course. Therefore, it is not clear whether there would be an increase in student learning outcomes if a student has positive attitudes about using excel. I do not include attitudes about Excel in the regression analysis.

To test the hypotheses, I use a standard production function approach where output is the grade received in the course and inputs are factors affecting that output such as background, achievement, aptitude, effort, and the pedagogical technique used.

The following regression model was used. The dependent variable is the final numerical grade in the course.

$$\text{NUMGRADE} = \beta_1 + \beta_2\text{ControlEXP} + \beta_3\text{Gen} + \beta_4\text{Eth}(1-5) + \beta_5\text{Maj}(1-6) + \beta_6\text{CGPA} + \beta_7\text{CERHRS} + \beta_8\text{TotalSAT} + \beta_9\text{MathSAT} + \beta_{10}\text{TRANS} + \beta_{11}\text{POST} + \beta_{12}\text{HITS} + \varepsilon$$

Where:

<b>NUMGRADE</b>	student's final numerical grade in the course.
<b>ContExp</b>	0 = control group; 1 = experimental group
<b>Gen</b>	0 = male; 1 = female
<b>Eth</b>	Ethnic category dummy variables (Asian/Pacific Islander; Black, Hispanic, White, Other, unknown (intercept term))
<b>Maj</b>	Undergraduate major dummy variables: (Finance, Accounting, Marketing; Management; ISOM; DMIS, undecided (intercept term))
<b>CGPA</b>	cumulative GPA at the university
<b>CERHRS</b>	Total semester credit hours earned at the university
<b>TotalSAT</b>	total SAT score upon registration
<b>MathSAT</b>	total Math SAT score upon registration
<b>TRANS</b>	Transfer student from another college or university (0 = original registration; 1 = transfer registration)
<b>POST</b>	Score on end-of-course post assessment
<b>Hits</b>	number of times students accessed WebCT



## VI. Regression Results

The regression results are given in Table 2. To evaluate each of the equations, I report an F-statistic to indicate the overall explanatory power of the entire regression. The SE and the R-square and adjusted R-square for each equation are also reported. Variations in the independent variables are sufficiently large to reject the null hypothesis that all the regression coefficients are equal to zero.

**Table 2**  
**Regression Analysis**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig. P
	B	Std. Error	Beta		
Constant	10.864	21.681		.501	.619
<b>ContExp</b>	<b>5.805</b>	<b>3.083</b>	<b>.207</b>	<b>1.883*</b>	.066
MathSAT	.025	.046	.113	.549	.585
TotalSAT	-.005	.028	-.039	-.181	.857
Black	-17.349	10.658	-.206	-1.628	.110
Asian	-4.465	6.445	-.139	-.693	.492
Hispanic	8.279	7.812	.166	1.060	.294
White	-6.319	6.222	-.225	-1.016	.315
Other	-12.805	8.153	-.236	-1.571	.123
Sex	-5.136	3.811	-.176	-1.348	.184
FINmaj	-13.839	9.618	-.255	-1.439	.157
ACCTmaj	-8.260	7.609	-.248	-1.086	.283
MKTGmaj	-7.942	8.171	-.233	-.972	.336
MGTmaj	-10.306	7.683	-.356	-1.341	.186
ISOMmaj	.087	11.728	.001	.007	.994
DMISmaj	.273	11.581	.003	.024	.981
<b>CGPA</b>	<b>11.114</b>	<b>3.820</b>	<b>.376</b>	<b>2.909**</b>	.005
<b>Cerhrs</b>	<b>.188</b>	<b>.097</b>	<b>.250</b>	<b>1.929*</b>	.060
Trans	-1.017	3.759	-.034	-.271	.788
Hits	.010	.012	.095	.839	.406
<b>Post-test</b>	<b>.376</b>	<b>.089</b>	<b>.499</b>	<b>4.205**</b>	.000

### ANOVA

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	7514.063	20	375.703	2.965	.001
Residual	6208.138	49	126.697		
Total	13722.201	69			



Predictors: (Constant), Post-test, MGTmaj, ContExp, Hits, Sex, Other, ISOMmaj, Black, Asian, DMISmaj, Trans, Cgpa SUM, Cerhrs SUM, Hispanic, FINmaj, MathSAT, ACCTmaj, TotalSAT, White, MKTGmaj

Dependent Variable: Numgrade

### Model Summary Statistics

R	R Square	Adjusted R Square	Std. Error of the Estimate
.740	.548	.363	11.25596

Students in the “conceptually-focused” labs had statistically significant higher performance in the course. The coefficient of the “Control-Experimental” variable is significant at the 90% level of confidence. Thus, the hypothesis that a “conceptually-focused” lab section in a finance course has no effect on student learning can be rejected in favor of a positive influence.

Cumulative GPA and the score earned on the post-assessment were also strong determinants of performance at the 99% confidence level. The more semester-credit hours a student had earned, the more positive the impact on grade at the 95% confidence level. Thus, the hypothesis that differential student characteristics have no impact on student learning in the introductory finance course can be rejected. No other student characteristic variables were significant in the estimation. The lack of significance for the total SAT score and math SAT score were surprising results.

Students who accessed WebCT more during the semester (Hits) did not perform better in the course, which was a surprise. Perhaps the number of times a student accessed WebCT during the semester was not a good proxy for student effort. Thus, the hypothesis that time on on-line task has no impact on student learning is accepted. I will need to find a better measure of student effort in future analyses. An interesting result was that a student’s major had no significant impact on their performance in the course. Finance and accounting majors did not significantly outperform other School of Management majors. In fact, finance and accounting majors had a negative effect on course grade in this analysis. Gender or ethnicity had no significant effect on course performance as well.

### VII. Student attitudes about using excel.

I administered an end-of-course questionnaire to obtain survey information on students’ likes and dislikes about using excel as the main application tool in the course. About 98% (167) of the finance students completed the end-of-course survey because it was given on the final exam review day. The first six questions on the survey were “yes or no” responses and these results are listed below:

## Excel Use Questionnaire Results

Question	Student positive responses (Yes)	Student negative responses (No)
1. I have used excel in the past.	98% - Sometimes & Often	2%
2. I have taken the (ISOM 102) introductory excel course in the past.	49%	51%
3. I liked using excel in FNAN 301	96%	4%
4. I prefer using Excel over a financial calculator.	82%	18%
5. I learned more finance because of using excel to do finance problems.	64%	36%
6. I would enjoy taking other finance classes that use Excel.	46% - yes 36% - it depends	18%

The overwhelming majority of the students, 98%, indicated that they had sometimes or often used excel in the past. Only 49% of the students indicated that they had taken a one-credit hour introductory excel course (ISOM 102) before enrolling in FNAN 301. 96% of the students indicated that they liked using excel in FNAN 301 and 82% indicated that they preferred using Excel versus a financial calculator. Fewer students (64%) indicated that they learned more finance because of using excel to do finance problems.

When students were asked what the best thing was about using excel in the course, the most often-mentioned comments include the following:

- It kept me focused on studying finance: 16%.
- It provided me with a quick & easy way to solve finance problems: 44%.
- It allowed me to be flexible in the way I solved finance problems: 26%.
- It taught me how to better think intuitively about finance: 15%.

Other written responses to this question were that Excel helped keep everything in order on a worksheet, it provided more organization than using a calculator, and it allowed them to more easily find out what they did wrong more easily than with a financial calculator. The overall results from this survey question indicate to me that students generally view Excel as simply a tool that can be used to conduct financial analysis. Excel was not generally viewed by most students as a way to help them learn finance or develop an intuitive understanding of finance.

I also asked the question, “What is the most frustrating thing about using Excel in FNAN 301 this semester?” About 20% of the students indicated that nothing at all was frustrating about using excel, but one student said that everything was frustrating! Overwhelmingly, student frustration centered on the lack of time when using excel to complete exams. The concern voiced was that it took a lot of time to set up problems in Excel and this was frustrating under the

time constraint of an exam. Some students were frustrated because they wanted to be provided with excel templates during exams to complete problems. We used spreadsheet templates during the lab instruction, but do not allow them during exams. Another frustration related to technology problems while taking the exam, such as a computer crashing during an exam or having a laptop battery die. Having to carry the laptop back and forth to class was mentioned by several as a frustration. Only one or two students mentioned their lack of Excel preparation before taking the course as a frustration. Finally, one student indicated that his biggest frustration was that there was “No magic button” in excel.

I also asked the students for general comments about using Excel in FNAN 301. The most often-listed positive comments to this question were:

- Do use Excel next semester. It was very helpful.
- Excel should be included more in the textbook – what formulas to use.
- Keep using Excel for other finance courses as well.
- I enjoyed Excel rather than using the formulas by hand.
- I wished I learned more Excel. Great tool.
- Functions on Excel are great.
- Keep it. Love it.

There were some who were not as enthusiastic about Excel as evidenced by the following comments:

- It kind of takes away from understanding the concepts.
- Excel makes the course more difficult if you do not know how to use it.
- Was not really that big of a determinant of whether you succeeded or failed in this course.
- I would recommend not using Excel. I feel I would learn more if I had to use a calculator and write out problems by hand.
- I prefer the calculator hands down! I learn better that way. I may also be biased since I have just a basic knowledge of Excel.

One student’s comment that I would like to single out is the following: “This thing is, you have to figure out how to do the problem. Since there are many ways of doing the same thing, Excel really only gives you flexibility. A financial calculator would do the same thing. Excel is easy, fast and saves time, but you are not really learning finance if you are dependent on Excel. You need to understand the concepts first and then apply those concepts using a tool, such as Excel.”

Overall, the questionnaire results indicated to me that the students were fairly well prepared to use excel in the FNAN 301 course. They did not have an aversion to using Excel and they liked using Excel as an analysis tool in the course. However, the majority did not generally believe that Excel helped them to learn finance.

The two lab instructors overwhelmingly preferred teaching the lab in a “conceptually-focused” manner rather than in a “spreadsheet-focused” manner. They told me that the students interacted more with each other and with them, asked more questions, and seemed to be more actively involved in the learning process. Attendance was dramatically higher in the “conceptually-focused” lab as well. My discussions with students about their preference for the “conceptually-

focused” lab vs. the “spreadsheet-focused” lab also confirmed what the lab instructors believed about this pedagogical approach.

### **VIII. Recommendations and Further Work**

The results of this study suggest that there are beneficial effects from a “conceptually-focused” lab instruction in the introductory finance course. This modest contribution indicates that the design and delivery of a “conceptually-focused” lab section of an introductory finance course has the potential to enhance the learning of finance.

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<sup>i</sup> The introductory finance course is conducted consistently from section to section and the large lecture format saves time and money from the previous format. However, despite the greater consistency in curriculum, delivery, and learning assistance, some concerns have been raised by the finance faculty teaching upper-level finance courses professors about the structure and pedagogy used in the introductory course. Some believe that many students do not understand finance conceptually when they enter their upper-level courses. Others say that the “spreadsheet-tool” focused labs leads many students to merely memorize the key strokes of the tools (Excel/calculator) without internalizing the underlying concepts of the problems they are attempting to solve. Some give short pre-tests on the first day of the upper-level class to assess student financial understanding and find the results disappointing. Others believe that the lecture/lab structure is to blame and students need more time with the professor in lecture rather than in lab. Finally, some upper-level finance professors believe that the average fail rate of the course, which is between 25-30% of the students in a semester, indicates that the course is not structured to bring about the optimal learning desired. Others have voiced concerns that many students lack basic algebra, analytical, and spreadsheet skills. They believe that the use of spreadsheet analysis in the introductory finance course may be more of a distraction rather than an enhancement to learning finance.

<sup>ii</sup> A **Tablet PC** is a notebook mobile computer that has a touch screen technology that allows the user to operate the computer with a stylus, digital pen, or fingertip, instead of a keyboard or mouse. This form offers a more mobile way to interact with a computer. Tablet PCs are often used where normal notebooks are impractical or unwieldy, or do not provide the needed functionality. A big advantage is that taking

- 
- No \_\_\_\_\_
5. I find the biggest benefit of using Excel over a calculator to be: \_\_\_\_\_
6. I learned more finance because of using excel to do finance problems:  
Yes \_\_\_\_\_
- No \_\_\_\_\_
7. The best thing about using excel to do financial analysis is that:  
It kept me focused on studying finance \_\_\_\_\_  
It provided me with a quick & easy way to solve finance problems \_\_\_\_\_  
It allowed me to be flexible in the way I solved finance problems \_\_\_\_\_  
It taught me how to better think intuitively about finance \_\_\_\_\_  
Other? \_\_\_\_\_
8. I would enjoy taking other finance classes that use Excel  
Yes \_\_\_\_\_  
No \_\_\_\_\_  
It depends \_\_\_\_\_
9. The most frustrating thing about using excel in FNAN 301 this semester was  
\_\_\_\_\_
10. Any other comments about using excel in FNAN 301 this semester?  
\_\_\_\_\_