

# Active Learning Based on Student Career Aspirations

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*Due to the current economic conditions, students want education to be relevant to their future careers. This paper presents an active learning environment (CALOPS) for an operations management course based on the career aspirations of each individual student. CALOPS employs the Auster-Wylie active learning framework. Because this framework focuses on the four dimensions of the teaching process - context setting, class preparation, class delivery, and continuous improvement - the techniques presented here may be modified for other types of business (not just management) courses. The entire CALOPS environment is available on the author's website.*

**Keywords:** *career-based active learning; class preparation; class delivery; career interest inventory; web-enabled class participation*

## 1. Introduction

Students today want to develop the critical thinking and communication skills necessary to be successful in business. They seek class environments where they can not only obtain knowledge, but also learn to apply that knowledge to situations meaningful to their future careers. This paper presents an active learning environment developed for an undergraduate operations management course based on the career aspirations of each individual student. The techniques are quite general and may be modified for other types of courses. All that is required is a wordprocessed assignment that can be summarized in three or four short phrases (less than 200 characters). These short responses are submitted by each student and stored in a file. The professor uses the file as an aid in guiding subsequent class discussions. This process will be described in later sections.

Student motivation to learn management theory increases as the student actively learns more about applying that theory to his/her future career. For some students, it's not unusual to hear, "I don't have any idea about how to apply a course topic to my future career, because I don't have a clue about my career." To give such a student some realistic clues, a counselor from the university Career Center visits the class and administers the Self Directed Search®, a widely used career interest inventory (Holland, 1994). Having this as a foundation, the subsequent course assignments actively engage the student in applying the course topics to the student's future career. Because these exercises have in-class verbal components, they also increase the motivation of other students with similar interests.

### 1.1. Literature Review

Auster and Wylie (2006) offer a systematic framework to conceptualize active learning along

four distinct dimensions of the teaching process - context setting, class preparation, class delivery, and continuous improvement. This paper uses the Auster and Wylie framework to present a career-based active learning environment. The purpose of the paper is to provide business educators with a model so that similar environments may be created for other types of business courses.

As discussed in Debnath, Tandon, & Pointer (2007), the Hackman and Oldman Job Characteristics Model (JCM) provides valuable insights into understanding the relationships of job characteristics to student motivation, performance, and satisfaction. When applied to an educational setting, the JCM has three major components: (a) core job characteristics, (b) critical psychological states, and (c) personal and work outcomes. The core job characteristics, in turn, can be described by *skill variety*, the breadth of skills required to perform the job; *task identity*, the clarity of the job's beginning and end with tangible outcomes; *task significance*, the perception of the value of the job to future goals; *autonomy*, the depth of job discretion; and *feedback*, the amount of clear information about job performance. All of these job characteristics were considered when developing the career-based active learning environment described in this paper.

## 1.2. Overview

This paper utilizes the Auster-Wylie framework (Auster, 2006) to describe the Career-based Active Learning environment created for an undergraduate **OPerationS** management course (CALOPS). The Auster-Wylie framework conceptualizes active learning along four distinct dimensions of the teaching process - context setting, class preparation, class delivery, and continuous improvement. The first section of this paper discusses the first dimension - context setting. Here four career exercises help create an atmosphere where students feel comfortable expressing realistic career plans. The second section discusses the second dimension - class preparation. Here the web-enabled class participation action item (CPAI) provides a class preparation aid for both the student and professor. The compact structure of the CPAI allows the students to learn quickly how course topics will apply to their future careers. The third section is concerned with class delivery. It presents the requirements of the Application of Operations Management Presentation. Both of these assignments enable the in-class environment to move from one where ping pong is played (the responses always return to the instructor) to one where the metaphor of volleyball is more apt. A question is raised, and then the students bounce the question among themselves, working through issues and challenges (Auster & Wylie, 2006, p. 338). The fourth section addresses continuous improvement and the value of student feedback.

## 2. Context Setting

Context setting is an essential first step in creating an active learning classroom. It consists of establishing norms, expectations, and ground rules (Bonwell & Eison, 1991). Auster & Wylie (2006) discuss implementation tips for context setting. They include obtaining basic background information from students such as previous work experience, educational background, area of concentration, course expectations, and career aspirations.

Over the years, the inquiry into the students' background has evolved into a one page

questionnaire distributed the first day of the semester and a series of four career exercises. The questionnaire asks about career plans, work experience, most interesting college course, and an open ended question, “I wish my professor would ...”. Although the career exercises are done throughout the semester, all of them are explained on the first day of the semester in order to set the context of the course as one that will be tailored to individual student career aspirations. In fact, the course syllabus states that the overall objective for each student is that the student will apply at least three of the course topics in the first three years after graduation and significantly advance their career because of these applications. The four career exercises concentrate on identifying a realistic career strategy for each student by:

Exercise 1 - using a career interest inventory to determine a realistic career,

Exercise 2 - finding an actual job opportunity consistent with their realistic career,

Exercise 3 - finding information about the organization offering the job opportunity, and

Exercise 4 - formulating their career strategy for the next five years.

### **2.1. Career Exercise 1**

In Career Exercise 1, a counselor from the university’s Career Center visits the class and administers the Self Directed Search<sup>®</sup>, a widely used career interest inventory (Holland, 1994). The students record in a booklet their likes and dislikes for various activities divided into six groups - Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. In a similar fashion, they indicate their competencies, occupations that appeal to them, and self-estimates of their skills. This information is then used to create the computerized Self Directed Search<sup>®</sup> Interpretive Report, which lists specific careers that people with similar likes and dislikes have followed. A sample report can be viewed at [www.self-directed-search.com/sdsreprt.html](http://www.self-directed-search.com/sdsreprt.html). This report contains an individualized list of realistic career possibilities for each student. Using their personal Interpretive Report, each student selects at least three realistic career possibilities that are most appropriate for their present and future higher education degree(s). If a student has difficulty with this, then he/she sees a career counselor to determine at least one career possibility. The full text of Career Exercise 1 may be seen at <http://www.patlyons.com/m3325/hw/career1.htm>.

### **2.2. Career Exercise 2**

For Career Exercise 2, the student uses his/her most interesting career title from Exercise 1 to determine one job opportunity that truly fulfills his/her career aspirations. The job search starts with the job opportunities on the career center’s website. If none of these are appropriate, then the student expands the search to the major job search websites and/or any other websites until the student finds a job opportunity that truly fulfills his/her career aspirations. If necessary, the student sees a career counselor. Next, the student creates a 50-500 word summary of this job opportunity, including the company name, job location, job description, and job qualifications. As time permits, the students present the results to class. The full text of Career Exercise 2, along with a sample job opportunity summary, may be seen at [www.patlyons.com/m3325/hw/career2.htm](http://www.patlyons.com/m3325/hw/career2.htm).

### 2.3. Career Exercise 3

The purpose of Exercise 3 is for the student to find information about the organization offering the position found in Exercise 2 that would be helpful to him/her in an interview. The exercise starts with a search of the Google Business Directory located at <http://directory.google.com/Top/Business/> for general information about the threats and opportunities in the environment of the organization found in Exercise 2, by browsing some of the categories, such as accounting, advertising, economics, financial services, management or marketing. Next, more specific information about the strengths and weaknesses of this organization is found by returning to the Google Business Directory, inputting the name of the organization, following, and printing a few interesting links. For details, see [www.patlyons.com/m3325/hw/career3.htm](http://www.patlyons.com/m3325/hw/career3.htm).

### 2.4. Career Exercise 4

In Exercise 4, each student wordprocesses a one page summary of the Self Assessment exercise conducted in Career Exercise 1 containing a short paragraph on each of the following topics:

1. What Do I Like to Do Most in Terms of Interests (refer back to pages 4 and 5 of Assessment Booklet),
2. What Do I Do Best in Terms of Skills (refer back to pages 6 and 7 of Assessment Booklet),
3. What Life Style Do I Wish to Lead (work time, work location, home location, travel time, firm size),
4. What Matters to Me - Values (adding new skills, having a leadership role, advancing within the organization, working in an ethical environment),
5. What is My Career Strategy for the Next Five Years.

After considerable reflection, the student uses the information found in Exercise 3 and his/her career strategy to create a resume to obtain the position found in Exercise 2. For details, see [www.patlyons.com/m3325/hw/career4.htm](http://www.patlyons.com/m3325/hw/career4.htm).

### 2.5. Other Assignments

There are two other assignments that add to the career-based active learning environment. They are the Class Participation Action Item (CPAI) and the Application of Operations Management Presentation. Throughout the semester, the student prepares four CPAIs and one presentation. Both of these assignments involve applying course topics to the specific position that the student found in Career Exercise 2. On the first day of class, the general requirements for these assignments are briefly explained, so that the student understands how the career exercises, CPAI, and presentation are interrelated. As a result, the context of the course is set to an active learning environment based on student career aspirations. Detailed requirements for the CPAI and presentation will be explained in later sections of this paper.

## 3. Class Preparation

Although context setting is important, class preparation is essential for conducting each class effectively. Unlike a lecture, which focuses primarily on content, preparation for active learning requires attention to both content and process. Some strategies used to ensure that content is

addressed in a meaningful order are to organize content: (a) around a theoretical framework, (b) according to time sequence, (c) by posing a problem and subsequently exploring solutions, (d) by starting with a concept and moving to application, (e) by moving from the general to the specific, and (f) by addressing pros and cons prior to working toward a resolution (Auster & Wylie, 2006).

### 3.1. Traditional Active Learning Strategies

CALOPS uses several of these strategies. There is a traditional class website ([www.patlyons.com/m3325](http://www.patlyons.com/m3325)) with webpages for a course outline, calendar, and class discussion outlines (see Figure 1), which present the theoretical framework and time sequence of coverage. In addition to the career exercises explained above, there are four homework sets consisting of conventional quantitative problems.

## Ch 6 - Managing Quality

**I. Definitions** (Items preceded with an \* are appropriate for class participation.)

A. \*Quality - the degree to which a product meets specified standards. These standards occur in three categories: (p195)

1. User-based - concerned with fitness for use, such as performance, safety, appearance, reliability, durability, maintainability.  
Ex. - user wants a safe, family car with 20 mpg, \$20,000 price, \$500 maintenance/year.
2. Design-based - concerned with specific characteristics designed into the product.  
Ex. - car design has 4 doors, air bags, 3 liter engine.  
This is consistent with above user-based standards.
3. Production-based - concerned with conformance of the produced product with the design.  
Ex. - produced car has 0.05" door clearance, 0.0004" piston to cylinder clearance, \$17,000 production cost, 33 labor hour production time.  
This is consistent with above design-based standards.

B. Example of Quality Definition for a Service

1. Within the next 5 years, I may manage a branch office producing banking services for families.
2. User-based quality standards: my customers may desire safe reliable banking with 4% growth when their total deposits are at least \$20,000.
3. Design-based quality standards that I may establish for my customers:  
No fee checking with 1% interest  
Savings account with 3% interest when at least \$4,000 is on deposit  
Mutual funds with 5% return when at least \$12,000 is on deposit
4. Production-based quality standards that I may establish (in order to satisfy the design-based standards) are:  
Check clearing - error rate .01%, cost \$.044/check  
95% of all in bank deposits made within 5 min  
95% of all PC deposits processed within 30 sec.

C. Discussion Item

1. Identify a service that you will produce or manage within five years of graduation.
2. Identify two user-based quality standards for this service.
3. Identify two design-based quality standards for this service consistent with the two standards identified in part 2.
4. Identify two production-based standards for this service consistent with the two standards identified in part 3.

D. ISO 9000 - a series of quality management procedures established by the European Community. Some firms require suppliers to be ISO 9000 certified (p197).

E. ISO 14000 - a series of environmental management procedures established by the European Community

**II. Total Quality Management (TQM)** (p198)

A. Def - TQM - management of an entire organization so that it excels in all aspects of products that are important to the customer.

B. Components of a typical TQM program

1. Continuous Improvement
2. \*Employee Empowerment - giving employees power to make more decisions - quality circles
3. \*Benchmarking - selecting a demonstrated (external) standard of performance that represents the best and taking action to achieve it.  
Ex. - Xerox benchmarked L. L. Bean for order filling, p201.
4. \*Just-In-Time (JIT) - central idea is to eliminate waste (more in Ch 16)
5. \*Statistical Process Control - (more in Ch 6 Supplement, p206)

Figure 1 - Part of Typical Class Discussion Outline

### 3.2. Class Participation Action Item (CPAI)

A contribution of this paper is the concept and implementation of a Class Participation Action Item. It evolved over the years, starting from comments from students after class that they had interesting ideas about applying course topics, but did not volunteer during class because, by the time they formulated their contribution, the class was on another topic.

The purpose of the CPAI is to increase student motivation to listen to and participate in class discussions about applying operations management. To do this, there is a general discussion about career paths. Most students feel that they will start in technical positions, such as accountants, marketing analysts, financial analysts, or actuarial scientists. Then, they will be promoted and become managers of small groups of technical people. After discussing a few examples, the point is made that, from a general management perspective, when managing of a group of accountants processing tax returns, or a group of marketing analysts creating marketing campaigns, or a group of financial analysts evaluating acquisition targets, the same operations management techniques are applied. Therefore, it does make sense for a marketing major to listen to a CPAI being presented by a finance major, etc.

While the above discussion is necessary, it is the web-based implementation of the CPAI that gives the professor a compact wealth of information that enables more fruitful class discussions. Figure 2 shows a small sample of the CPAIs without the student names (for privacy reasons). This worksheet enables the professor to prepare for class discussions. Consider a situation where the professor has discussed the concept of time studies in a previous class, and would like to emphasize their applicability in a future class. In the Figure 2 sample, three students have submitted CPAIs about time studies. The first focuses on interviews in an HR (Human Resources) department, the second, on appointments made by financial planners, and the third, on reports produced by financial analysts. Together they form an instructive sequence. How they are used for class delivery is discussed in the next section. The details of the worksheet creation are given below.

Class Participation Action Items			
Topic	FutureWorkSituation	Application	Improvement
Predetermined	Manager of ten people at a financial corporation	To assist senior managers in the development of more loans	Number of customer complaints decrease from 12/year to 5/year.
Time Studies	Mgr of 5 supervisors ensuring full efficiency of the HR dept	Time studies for the time it takes interviewing interviewees	Time for interviewing interviewees will fall from 35 to 25 minutes
Process Chart	Mgr of 5 people in record co. financial department.	The flow of info will increase and project time will decrease.	Number of projects completed on time will inc. from 5 to 10.
Work Sampling	Mgr of 10 people doing mergers for entertainment	Implementing the work sampling method to divide, observe, and	Decrease average task time from 5hrs/task to 2.5.
labor standards	Mgr of 10 at JP Morgan doing merger analysis for small co	Reduce time and increase rate workers provide merger analysis	Reduce std time to prepare client reports from 27 to 25hrs
Standardization	Mgr of 10 people event planning in PR firm	Develop standardization for promotional materials at PR event	# errors on promotional material decrease from 8/week to 3
Learning Curves	Mgr of 6 analysts at ins co spec in prop and casualty ins.	Use learning curves to reduce time on each task.	Time to input data for approp rates decrease from 39 min to 37 min.
Time Studies	Manager of 10-20 at a fin. firm	To decrease the amount of wasted time between appointments	Increase Productive time by 45min per day in one year
Time Studies	Manager of 10 analysts in financial planning.	Use time studies to decrease both normal and standard time.	Completing reports decreases from 5 hrs/report to 2 hrs/report.

Figure 2 - Sample of Class Participation Action Items

Each student submits four CPAIs throughout the semester. The process starts with the student downloading from the class website a Word document, ClassPartAI.doc, containing the structure for the CPAI. Figure 3 displays part of the document. The student renames and modifies the file with his/her appropriate information. To specify a realistic future work situation, the student uses the format given in item I.A.1 of Figure 3. A typical response may be manager of eight people at a small marketing firm specializing in creating marketing campaigns for the beverage industry. After completing Career Exercises 1 and 2, the student includes in the CPAI the three most interesting careers and the most interesting career opportunity from Exercise 2.

**Class Participation Action Item (CPAI)**

**I. Realistic Future Work Situation**

A. Give a short statement of a realistic future work situation that you may have within five years after graduation. This situation is to be appropriate to your present (and future) higher education degree(s).

1. Format: Manager of (X number) of people at a (type of firm) specializing in (type of transaction) for (type of customers).
2. Example: Manager of ten people at a small accounting firm specializing in preparing tax returns for medical professionals.

**II. CPAI for Ch 5 (Design of Goods and Services) **or** Ch 6 (Managing Quality)**

A. **Topic** (must have an asterisk \*): Control Charts

B. **Chapter and Outline number** (example of full format Ch6 - II.B.2): Ch6Supp - IV

C. **Future Work Situation** - (edit your Future Work Situation given in Section I above so that it is less than 60 characters, including blanks)  
Mgr of 10 people doing medical professional tax returns.

D. **Application** (Describe how you will apply the topic. For some cases, specifying the before and after conditions helps to clarify the application.) I will apply control charts to the critical success factors of the accounting firm. Specifically, I will develop control charts for:

1. Error in Number of Exemptions Claimed (Form 1040, Line 6d).
2. Error in Dollar Value of Wages, Salaries, Tips, etc. (Form 1040, Line 7).
3. Ratio of Total Itemized Deductions (SchA, Line 28) to Adjusted Gross Income (Form 1040, Line 33).
4. Number of Days Between Actual and Promised Completion Dates.
5. Number of Minutes to Complete Schedule A.

E. **Application Summary** - (must be less than 80 characters, including blanks)  
Develop control charts for errors in exemptions, wages, deductions.

F. **Improvement in Operations** (Specify at least two **quantified** measures of performance improvements to the transactions that you are managing. See Ch 6Supp II.C - SPC Applied to Services for ideas.)  
With the above control charts:

1. Number of tax returns with errors detected by the IRS will decrease from **6.5/week** to **3.8/week**.
2. Number of audits conducted by the IRS will decrease from **3.5/week** to **2.1/week**.
3. Number of late returns (not completed by promised date) will decrease from **8.5/week** to **6.2/week**.

G. **Primary Improvement** - (must be less than 70 characters, including blanks)  
Number of IRS audits decrease from **3.5/week** to **2.1/week**.

Figure 3 - Part of Word Document to Prepare CPAI

The topics for the CPAIs are organized by textbook chapters. For example, the first CPAI is based on material from Chapters 5 (Design of Goods and Services) and 6 (Managing Quality). The topics are further restricted to those topics that are preceded with an asterisk (\*) in the class

discussion outlines. For example, part of the Chapter 6 outline is given in Figure 1. Note how some of the topics (I.A Quality, II.B.2 Employee Empowerment, II.B.3 Benchmarking, II.B.4 Just-in-Time, and II.B.5 Statistical Process Control) are with preceded with an asterisk (\*). This indicates that these topics may be selected for the CPAI. After discussing these chapters in class, the student reviews the material and selects the asterisked topic that he/she is most likely to apply in his/her future work situation. This topic is entered in item II.A of Figure 3, along with the chapter and outline number. In item II.C, the future work situation is reduced to 60 characters, for the professor's CPAI summary file. In II.D, the student describes the application of the topic. This can vary greatly from topic to topic. For example, if the student chooses the topic of control charts, then the student may say that he/she would apply control charts to various parameters as shown in Figure 3. For II.E, the statement of the application is reduced to 80 characters. In II.F, the student quantifies at least two improvements to the transactions that he/she is managing. In practice, the manager would analyze the transactions. For the control chart example, perhaps there are currently 4.2 errors per week in the number of exemptions claimed. Since a control chart will be implemented for that parameter, it may be reasonable to expect that those errors will drop to 2.2 per week. Analyzing other errors, may lead to the improvement stated in II.F.1. Since the data is not available, the student makes reasonable estimates. Although not formally required, the student may do an analysis similar to Figure 5 linking time saved to the reduction in errors. This analysis is required for the Application of Operations Management presentation, to be described later.

### 3.3. CPAI File

After completing the ClassPartAI.doc Word document, the student is well prepared to participate in class discussions. However, as explained above, collecting a summary of all the students' CPAIs provides a valuable resource to the professor for class preparation. To create the CPAI file, each student copies and pastes from his/her copy of ClassPartAI.doc his/her name, topic, work situation, application summary and primary improvement to a form on the course website and then clicks the submit button. These responses are stored in a text file on the course website. Finally, after the due date has passed, the professor copies the results to an Excel worksheet. This allows for sorting by student name, chapter, and/or topic. For example, the professor may first sort by chapter and topic to determine interesting patterns of topics, and then sort by student name to facilitate grading. As a result of using the CALOPS environment, both the student and professor are well prepared for class discussions. For details of the process to create and submit the CPAI, see [www.patlyons.com/m3325/hw/ClassPartAI.htm](http://www.patlyons.com/m3325/hw/ClassPartAI.htm).

## 4. Class Delivery

Although context setting and class preparation are essential, class delivery is the dimension of the teaching process in which active learning in the classroom comes to life. Managing class participation effectively is an important element of class delivery (Auster & Wylie, 2006). Tactics such as ensuring well distributed "air time" (Bonwell & Eison, 1991; Keyser, 2000; McKeachie, 1999; Meyers & Jones, 1993; Silberman, 1996) and drawing on student input and experience (Gross Davis, 1993; McKeachie, 1999; Meyers & Jones, 1993) help maintain overall



interest in the class.

#### **4.1. Class Participation Action Item (CPAI)**

CALOPS incorporates these tactics in the CPAI. The life cycle of a typical chapter starts with a class discussion of the chapter topics using the discussion outline posted on the class website as a guide. See Figure 1 for a typical outline. During this discussion, any questions by the students are answered and quantitative homework problems are assigned. In the next class, the topics are reviewed and students volunteer and present solutions to the quantitative homework problems. The remaining time is spent with CPAIs. The primary in-class activity of the CPAI is a short informal role play about how the student will apply a selected course topic to a realistic future work situation consistent with the results of his/her career exercises. Students are asked to volunteer and one is chosen, based on the CPAI summaries. The chosen student comes to the front of the room, and sits in a desk next to the professor. The student and professor then have a short informal role play by following the outline given in Figure 3. In the beginning of the semester, the professor asks questions following the outline exactly and the chosen student answers directly. As the semester progresses, the professor may discuss the topic and future work situation with the chosen student, but ask the class for volunteers to discuss the application and improvement in operations. Thus, the in-class environment moves from one where ping pong is played (the responses always return to the instructor) to one where the metaphor of volleyball is more apt. A question is raised, and then the students bounce the question among themselves, working through issues and challenges. As suggested by Auster & Wylie (2006, p. 338), providing such an environment enhances active learning.

The CPAIs can also be a helpful aid for reviewing topics. Consider the situation given in Figure 2, where three students have submitted CPAIs about time studies. Instead of the professor giving examples of how the students may apply time studies in their future jobs, the professor can call on those three students and ask each to describe their applications briefly from their seats. Hearing from fellow students how time studies may be applied to interviews in an HR department, appointments made by financial planners, and reports produced by financial analysts is a powerful form of peer instruction that reinforces concepts for the entire class. Students no longer feel that operations management applies only to manufacturing.

#### **4.2. Application of Operations Management Presentation**

The project for the course, the Application of Operations Management Presentation, is an expanded version of the Class Participation Action Item. It provides a valuable aid to help students answer open-ended job interview questions, such as, “In the next year or two, how might you help us improve our organization?” It is based on the strategic case interview technique used by the major consulting firms, where the interviewee is given a case situation and is asked to solve a strategic question. As stated on McKinsey & Company website (2008), the case interview allows a student to “demonstrate his/her ability to structure thinking, respond to complex or ambiguous problems, and reach sound conclusions with limited facts in a short time.” For more details about a case interview, see the McKinsey & Company website (2008).

The Application of Operations Management Presentation allows the student to demonstrate similar skills, but to an operations management situation of the student’s choosing. Essentially,

this presentation is an expansion of the CPAI, where pairs of students perform a cost effectiveness analysis for one of their realistic future work situations from Career Exercise 2. With any operation, there are repeating transactions. The sample case supplied to the students is based on a small accounting firm preparing income tax returns. The basic transactions are processing the client data and attending any subsequent IRS audits. The students download and modify a PowerPoint presentation file from the course webpage [www.patlyons.com/m3325/hw/apre.htm](http://www.patlyons.com/m3325/hw/apre.htm). This file contains 11 slides with the overall structure, including the four slides shown in Figure 4. The Application slide summarizes the specifics of how the topic is applied, in this case, control charts to the processing of tax returns. The students modify the Application slide for their chosen topic. The Improvement in Operations slide identifies reductions in error rates and enhancements in completion rates, in this case, reduction in errors detected by the IRS, audits conducted by the IRS, and returns not completed by promised date. The students identify similar quantified improvements to the basic transactions of their future work situation.

**Application** (Ops Mgr)

- Apply control charts to the critical success factors of the accounting firm.
- Specifically, develop control charts for:
  - Error in Number of Exemptions Claimed (Form 1040, Line 6d).
  - Error in Dollar Value of Wages, Salaries, Tips, etc. (Form 1040, Line 7).
  - Ratio of Total Itemized Deductions (Sch. A, Line 28) to Adjusted Gross Income (Form 1040, Line 33).
  - Number of Days Between Actual and Promised Completion Dates.
  - Number of Minutes to Complete Schedule A.

As of June 21, 2008 Page 6

**Improvement in Operations** (Consultant)

- With continued use of control charts and training:
  - Number of tax returns with errors detected by the IRS will decrease from 6.5/week to 1.8/week.
  - Number of audits conducted by the IRS will decrease from 3.5/week to 0.7/week.
  - Number of returns not completed by promised date will decrease from 8.5/week to 2.2/week.
- Note: have at least 3 **quantified** improvements.  
See Chapter 6 Supp outline number II.C for ideas.

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**Impact on Human Resources** (Consult.)

- One sample of ten returns taken daily.
  - Time to review returns and post data to control charts will take 5 hours/day, or 25 hours/week.
- Returns with IRS detected errors decrease.
  - Time spent reworking errors will drop from 29.3 hours/week to 8.1 hours/week.
- Number of IRS audits decrease.
  - Time spent attending audits will drop from 49.0 hours/week to 9.8 hours/week.

Note: have at least 3 **quantified** impacts.

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**Cost Effectiveness** (Consultant)

- Costs
  - Develop control charts - \$600, Employee training - \$800
  - Time to review and post data in 12 week tax season  
\$40/hr \* (25 hrs/wk) \* (12 wks/season) = \$12,000
- Benefits
  - Time saved not reworking IRS detected errors  
\$40/hr \* (21.2 hrs/wk) \* (12 wks/season) = \$10,152
  - Time saved not attending IRS audits  
\$40/hr \* (39.2 hrs/wk) \* (12 wks/season) = \$18,816
- Benefits - Costs
  - \$28,968 - \$13,400 or **\$15,568.**

◊ Have at least 3 **quantified** financial factors.

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Figure 4 - Part of PowerPoint Document to Prepare Presentation

The Impact on Human Resources slide presents the positive and negative impacts of the

proposed change on the people involved. For the supplied case, the accounting firm will spend an additional 25 hours/week processing data for the control charts. This is a negative impact. However, since it takes 4.5 hours to correct each tax return with an IRS error (see Figure 5), the accounting firm will spend 21.2 hours less per week. Similarly, since each IRS audit takes 14 hours, they will spend 39.2 hours less per week. On balance, the firm will spend 35.4 (21.2 + 39.2 - 25.0) hours less per week by implementing control charts. The students identify similar impacts on the people involved in their chosen case.

<b>Supporting Data for Cost Effectiveness Analysis</b>				
<b>Examples for Sample Case</b>				
Transaction - Prepare income tax return		Before	After	
Errors detected by IRS (errors/week)		6.5	1.8	
Time to correct each error (hrs/error)	4.5			
Time spent correcting errors (hrs/week) ☒		29.3	8.1	
Hourly cost of time spent correcting errors (\$/hr)	\$40			
Cost of time spent correcting errors (\$)		\$1,170	\$324	
Benefit of reducing errors detected by IRS (\$/week)				\$846
Transaction - Audit conducted by the IRS		Before	After	
Audits conducted by the IRS (audits/week)		3.5	0.7	
Time to attend each IRS audit (hrs/audit)	14			
Time spent attending audits (hrs/week)		49.0	9.8	
Hourly cost of time spent attending audits (\$/hr)	\$40			
Cost of time spent attending audits (\$)		\$1,960	\$392	
Benefit of reducing audits with IRS (\$/week)				\$1,568

Figure 5 - Part of Excel Document to Prepare Presentation

The Cost Effectiveness slide of Figure 4 quantifies the costs and benefits of implementing the control charts during the 12 week tax season. The primary costs are to develop the control charts (\$600), train employees (\$800), and process data (\$12,000). As developed in Figure 5, the value of time saved not reworking IRS detected errors is \$846 per week, or \$10,152 for the tax season. The value of time saved not attending IRS audits is \$1,568 per week, or \$18,816 for the season. The net result to the firm is \$15,568. The students identify similar costs and benefits for their case.

As with the CPAIs, the presentations start in the ping pong mode, where the two students give the presentation uninterrupted. They alternate in their roles as operations manager and consultant. The professor gives comments at the end. After more presentations are given, the format changes to one where the students pause after each slide. After presenting the Application slide (see Figure 4), the professor may tell the presenters to pause and ask the class for volunteers to suggest what they feel would be the primary improvement in operations (the next slide), or after presenting the Improvement in Operations slide, the professor asks for volunteers to suggest a primary impact on human resources (the next slide). This way the class members are not passive listeners, but active participants demonstrating their skills at applying operations management topics to realistic future work situations.

## **5. Continuous Improvement**

Continuous improvement is the fourth dimension of the teaching process that is essential to creating active learning in the classroom. The primary input is feedback from students. This feedback can include nonverbal cues ranging from inattention to students sitting on the edge of their seats. Feedback can also include quick verbal checks during class, midterm written feedback, and comprehensive end-of-term evaluations (Grasha, 1996). Monitoring in-class understanding and energy is essential to sustaining an active and engaging classroom environment. For example, a question, such as “Any questions, thoughts, comments?” or “Are we ready to move on?” can provide a quick read on whether a change of pace is needed (Auster & Wylie, 2006).

### **5.1. Verbal Checks**

The class discussion outlines of the CALOPS environment (see Figure 1) facilitate quick verbal feedback. The class following the discussion of a given chapter begins with a brief review. If there are no questions, then the professor can be proactive and ask a few questions to obtain appropriate feedback. As discussed in the Class Delivery Section above, the CPAIs may be used for feedback purposes, especially when they are used in the volleyball (not ping pong) mode. Here the professor discusses the topic and future work situation with the chosen student, but asks the class for volunteers to discuss the application and improvement in operations. This checks not only knowledge of the topic, but also the ability to apply it.

### **5.2. End-of-term Evaluation**

The primary end-of-term evaluation is an anonymous paper-based form with several specific questions and one open ended question, “The course would be more useful for your future career if ...” This open ended question has been the source of many major improvements, whereas the specific questions provide information for minor adjustments. For example, the motivation for the four career exercises came from a student who honestly said, “I don’t have a clue about my future career.” The Self Directed Search<sup>®</sup> of Career Exercise 1 certainly provides the students with clues. In the most recent end-of-term evaluation, the first set of questions inquired about the career exercises. Thirty-five students responded, with 13 saying that the career exercises reinforced their existing career plans, while 22 said that they gained new insights into career options. The next group of questions asked about the helpfulness of the CPAIs in understanding the application of the topics. Six students felt that they could learn to apply course topics without using the CPAIs directly. However, 29 students felt that the CPAIs were helpful. Some did list topics that they felt they will apply in their future careers. The third set of questions related to the Application of Operations Management presentation, in general, and the cost effectiveness analysis, in particular. Twenty-six students felt that they did improve their skill in performing a cost effectiveness analysis, while three felt they did not improve, and six students did not respond.

This is the first semester where the students were provided with the Excel worksheet (see Figure 5) to develop the cost effectiveness analysis. Previously, the students would modify the PowerPoint file (see Figure 4) directly. Without the worksheet, there were a significant number

of in class questions. But with the worksheet, the number of questions is reduced and the consistency of the analysis is improved.

## 6. Conclusions

Faculty members are interested in applying Internet technology to create active learning in the classroom. This paper has presented the CALOPS active learning environment. Based on student surveys, the first conclusion is that, because the students found it straightforward and relatively easy to create and submit CPAIs, other faculty should consider creating similar exercises for their courses. The second conclusion is that basing the CPAIs on each individual student's career aspirations increases student motivation and should be considered when updating courses.

The third conclusion is that the effort to create the CPAI file is well worth the improvement in class discussions. In a sense, the CPAI file is similar to Twitter. Instead of asking the question: what are you doing now, the CPAI file contains short Twitter-like responses to the question: what will you be doing in the future. When students hear how others will apply course topics to future work situations, the other students gain more insight into the application of operations management to business and become more engaged in the class.

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