AC 2008-222: SUCCESSFULLY TEACHING SUPPLY CHAIN MANAGEMENT CONTENT IN A TECHNICAL CURRICULUM

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Successfully Teaching Supply Chain Management Content in a Technical Curriculum

Abstract

This paper explains how supply chain management is being taught at the graduate and undergraduate levels in engineering and technology programs. It overviews the objectives, content areas, teaching methodologies and evaluation methods that were developed for a course. For the purposes of this paper the author's university will be referred to as university A and the department will be referred to as Department E.

Introduction

The accepted practice of accumulating extensive inventories can be traced back to the industrial revolution[1]. Even as recently as in the 1990s the timeframe to deliver merchandise to the customer from inventory in a warehouse could be as long as 15 to 30 days[2]. This timeframe and approach to delivering product to the customer drove the need to stockpile inventory. Today the rules of business have changed and that type of inventory strategy is no longer acceptable[3]. Companies face intense global competition with new products being launched at a much faster pace. This has driven companies to outsource functions like design, manufacturing, and distribution to places like China, India and countries in Eastern Europe[4]. These changes have brought what some term as a new era[5] or supply chain revolution[6]. This has also caused some companies to integrate supply chain management into every facet of their business. In many cases supply chain logistics design has become the means for companies to be more competitive and advance themselves in the global marketplace. Consequently, supply chain management has been a topic of intense interest for approximately two decades and has been widely examined in both the trade and academic press.

In spite of the attention it has received the field of supply chain is in a state of rapid change and development. Thompson[7] notes that many of the courses in engineering management programs are often reflective of well-established disciplines, but others are not. Quite often courses that are not reflective of well-established disciplines are considered essential for the engineering management programs. Thompson[8] argues that supply chain management falls into that category of courses.

There is widespread agreement on the part of universities and schools that supply chain management coursework is needed in engineering and technology programs. It is also needed in organizations to help insure their success. What is not clear is what a supply chain course, or program, should include. In the meantime universities are responding to business needs and student interest in what is thought to be a field of growing importance and student numbers.

Today several Masters Degrees in Engineering Management exist which include supply chain management related content[9-12]. The very first of these programs began to be offered in the early 1990s and in some cases have been revised since then. Some Engineering Management

Programs were designed as interdisciplinary degrees between business and engineering schools[13]. As manufacturing has continued to move off-shore since the beginning of these programs the requirements and content emphasis has shifted and in several cases included more on supply chain management. A few programs have moved in the direction of offering modules with specializations in such areas as project and program management, security and safety management, and supply chain and e-logistics management[14].

At the undergraduate level in technology and engineering departments supply chain management is being included in the curriculum in a wide array of different formats. In some cases students take a production operations management course where they learn about supply chain management and then apply it in another course in a technical department[15]. This approach is in keeping with the tradition of having supply chain management content being taught in the business schools. While it is still the trend there are more and more exceptions occurring to this practice. Today it has become important for students in other disciplines, such as engineering and engineering technology, to become familiar with the concepts of supply chain management as organizations must carefully manage their operations and supply chains in order to prosper and survive. One only has to look at the fact that purchasing costs as a percent of sales for all industry in 2006 was 52%[16] to understand that inventory is a huge expense to companies. It stands to reason that supply chain management has become an area that companies are giving much more attention.

Another approach to teaching supply chain content is to include it in the undergraduate engineering and technology curriculum as a subset of content in related coursework such as lean manufacturing and engineering management. Often this content is taught in an industrial engineering program[17].

Other Schools or Colleges take yet another approach in teaching supply chain management content at the undergraduate engineering and technology level by offering industrial distribution programs. Currently about 9 universities offer this type of program in the United States. These programs are usually housed in Schools or Colleges that are blends of business, technology, and/or engineering technology. The course work in these programs is related to distribution, logistics and supply chain[18]. These three fields of study are closely related. Figure 1 shows the relationship between them. The definition of the three terms helps explain the relationships shown in figure 1. Bozarth and Handfield[19] define a supply chain as a network of manufacturers and service providers that work together to convert and move goods from the raw materials stage through to the end user. Three flows link these groups together: physical flows, information flows and monetary flows[20]. The emphasis is on minimizing total costs while meeting the customer's needs. Khiewnavawongsa, Schmidt and Newton[21] define industrial distribution as a field of study about moving raw materials and products from the supplier along the supply chain to the end customer. They contend that industrial distribution is a subset of supply chain management because it involves several activities such as sales, inventory management, purchasing, warehousing and transportation. These are all activities or components of a supply chain. Bozarth and Handfield[22] define logistics as that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet

customers' requirements. Several activities found in industrial distribution such as inventory management, warehousing, and transportation are also part of logistics. Additionally, activities like material handling, packaging, and logistics information systems would also be part of this field.

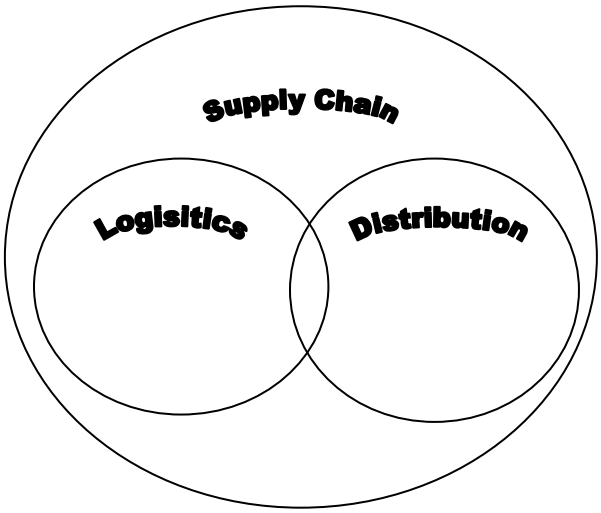

Figure 1. Relationship between the fields of study.

Thompson[23] states that "the challenge for supply chain courses is the overlap with other courses." One merely has to review some of the texts in the field of study to see this dilemma. Some texts that once emphasized operations management now have included a substantial amount of content in supply chain management[24]. This further confuses the issue and demonstrates the overlap. In addition, Thompson[25] points out that the supply chain management field is constantly changing. Strategies and tactics that are considered successful today may soon be obsolete.

In response to the growing importance of supply chain management, University A's Department E decided to develop a supply chain management course. Careful attention was given to the dynamics of supply chain management and the curricular approach to the treatment of the subject matter in colleges and universities today.

The Supply Chain Course

The supply chain course that emerged at the University A is an overview course that consists of a blend of some of the content areas previously described. It needed to be a broad-based course because it is listed as an elective in the four undergraduate programs in Department E. These programs consist of Construction Management, Graphic Communication, Industrial Computer Systems, and Integrated Manufacturing Systems. The Construction Management Program is the largest, consisting of approximately 230 students. Consequently, it was assumed that the enrollment for the course would consist of quite a few Construction Management students. The balancing act in teaching this course is meeting the needs such a diverse student population. The course description was written with this in mind and focuses on supply chain logistics for

technology-based companies. Supply chains encompass all the activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows. Materials and information must flow both up and down the supply chain to leverage strategic positioning and to improve operating efficiency. These types of activities can be found in all four of the fields of study in the department and should have importance to the students in those programs.

The course objectives and other key components of the course proposal were reviewed by an industrial advisory board prior to the course being submitted for approval in the university curriculum process. Those advisory board members who did not work directly in the supply chain area of the company were asked to have a subject matter expert in their organization review the proposal and provide feedback. This resulted in the objectives or student goals that are found in the course syllabus shown in figure two. They serve as a driver for the content and activities of the course.

COURSE SYLLABUS: TEC 370 Supply Chain Logistics

INSTRUCTOR: Dr. Ken Stier
132 Turner Hall

OFFICE HRS: Mondays and Wednesdays from 1:00 - 3:00pm OR by appointment in advance

LOCATION: 127 Turner Hall

TIME: 1:00 P.M.- 2:15 P.M.
Tuesday & Thursday (3 hours of lecture per week)

TEXT: Bowersox, D. J., Closs, D. J. and Cooper, M. B. (2007). Supply chain logistics management, 2nd ed. New York, NY: McGraw-Hill Irwin. ISBN 0-07-294788-8

MATERIALS CHARGE: None.

COURSE DESCRIPTION:

Supply chain networks for technology-based companies. Activities associated with transforming goods from raw materials through delivery to end user. Prerequisites: TEC270 or conc. reg. req. and completion of 60 hrs. req. or graduate standing.

OVERVIEW:

Supply chain logistics for technology-based companies will be the focus of this course. Supply chains encompass all the activities associated with the flow and transformation of goods from the

raw materials stage, through to the end user, as well as the associated information flows. Materials and information must flow both up and down the supply chain to leverage strategic positioning and to improve operating efficiency.

STUDENT GOALS:

Upon successful completion of this course the student will be able to:

1. Examine the push/pull views of a supply chain as related to lean and agile management strategies.
2. Analyze how a company achieves a strategic fit between its supply chain strategy and its competitive advantage.
3. Identify the major drivers of supply chain performance.
4. Forecast demand in a supply chain given historical demand data using time series methodologies.
5. Analyze demand forecasts to estimate forecast errors.
6. Develop an aggregate strategic plan.
7. Assess the role of information and technology systems in supply chain logistics.
8. Develop a conceptual model for maintaining supply chain relationships.
9. Analyze market distribution and procurement strategies, including e-commerce and auction based platforms.
10. Assess information networks and enterprise resource planning and execution systems.
11. Examine transportation infrastructures and regulations, warehousing, and packaging and materials handling.
12. Successfully participate in on-line discussion.

COURSE OUTLINE:

I. 21st-Century Supply Chains
- The supply chain revolution
- Generalized Supply Chain Models
- Integrative Management
- Responsiveness
- Financial Sophistication
- Globalization
- Digital Business Transformation
- Issues In Supply Chain Management
- Social Challenges

II. Logistics
- Logistical Value Propositions
- The Work of Logistics
- The Logistics Process
  - Order Processing

- Inventory
- Transportation
- Warehousing
- Facility Networks
- Logistical Operations
- Logistical Operating Arrangements
  - Echelon
  - Direct
  - Combined
- Flexible Structure
- Supply Chain Synchronization

III. Customer Accommodation
- Customer-Focused Marketing
  - Transactional vs. Relationships
  - Service Outputs
- Customer Service
  - Availability
  - Operational Performance
  - Service Reliability
  - Basic Service Platforms
- Customer Satisfaction
- Customer Success
- Forecasting
- Collaborative Planning, Forecasting, and Replenishment
- Customer Relationship Management

IV. Procurement and Manufacturing
- The Quality Imperative
- Procurement
- Manufacturing
- Logistical Interfaces

V. Informational Technology Framework
- Information System Functionality
- Comprehensive Information System Integration
- Communication Technology
- Rationale for ERP Implementation
- ERP System Design
- Supply Chain Information System

VI. Inventory Management and Strategy
- Functionality and Principles
- Inventory Carrying Costs
- Planning Inventory

Managing Uncertainty
Inventory Management Policies
Inventory Management Practices

VII. Transportation Infrastructure
Transportation Functionality, Principles, and Participants
Transportation Regulations
Transportation Structure
Rail
Motor
Water
Pipeline
Air
Transportation Service

VIII. Transportation Operations
Transportation Economics and Pricing
Transport Administration
Documentation

IX. Warehousing
Strategic Warehousing
Warehouse Operations
Warehouse Ownership Arrangements
Warehouse Decisions

X. Packaging and Materials Handling
Packaging Perspectives
Packaging for Materials Handling Efficiency
Material Handling

XI. Global Strategic Positioning
Global Supply Chain Integration
Supply Chain Security
International Sourcing

COURSE SCHEDULE:

Supply Chain Logistics is a three semester hour course which will consist of three hours of a combination of lecture and in-class activities each week. The course schedule is listed below and may be changed at the discretion of the instructor.

Week	Topics	Reading (Chapters)
1	21st Century Supply Chains	1
2	21st Century Supply Chains	1
3	Logistics	2
4	Customer Accommodation	3
5	Customer Accommodation	3
5	**Exam I**	
6	Procurement and Manufacturing	4
7	Information Technology Framework	5
8	Information Technology Framework	5
9	Inventory	6
10	Inventory	6
10	***Exam II***	
11	Transportation Infrastructure	7
12	Transportation Operations	8
13	Warehousing	9
14	Packaging and Materials Handling	10
15	Global Strategic Positioning	12

SAFETY:

SAFETY WILL BE STRESSED AT ALL TIMES DURING THE COURSE AND IS THE RESPONSIBILITY OF EVERYONE.

Safety glasses: There may be tours taken during the semester which require the use of safety glasses. It is not anticipated that the students will need to use any of the laboratories with power machines in them for this class. However, if the need arises during the semester, in accordance with the Illinois State Law, all students must wear safety glasses in the laboratory when laboratory work is in progress. During the regular school year safety glasses may be purchased through the ISU Construction Management Student Chapter.

TRANSPORTATION:

Every attempt will be made to provide university transportation for students to participate in field trip activities, but in some situations students may be asked to car pool to off-campus locations. Any student who is not riding in an ISU vehicle to off-campus sites will be asked to sign a waiver form.

ACADEMIC HONESTY:

It is assumed that all students are familiar with the ISU student conduct policy and will abide by it. This policy has been developed to promote fairness to all students. Learning opportunities are designed to promote group cooperation, effort and evaluation. Other activities are designed to be

the individual student's own efforts and are evaluated as to the individual student's own competencies and learning. Any such work submitted by a student as his/her own but not being originally and totally his/her own is in violation of the student policy and will be treated as such.

CLASS ATTENDANCE:

Attendance is the responsibility of the student and may be used in the grading process of the course. The Industrial Technology attendance policy states, "if a student is absent from a given class for a total number of hours that is equal to or greater than 1/15 (3-4 class periods) of the total number of contact hours for the course, the instructor may fail the student." This means that there are no late arrivals or unexcused absences. All excused absences must be cleared prior to the class missed. It will be the responsibility of the student to make up excusable absences.

DUE DATES:

Due dates are given for all assignments. Assignments that are not submitted on time will be assessed a deduction of 10% of the assigned value per day late. Assignments not completed within one week after the due date will be assigned a grade of zero and averaged in with the completed work.

ASSIGNMENTS:

Assume that all assignments must be typewritten, unless otherwise directed. Any student not submitting a typed assignment will be allowed to turn in the work but will be assessed the late penalty described above. Please proof-read all assignments before submitting them for grading. Points will be deducted for misspelled words and incomplete sentences.

REQUIRED TASKS:

In-class and out-of-class activities will be assigned during the semester such as:

- Verification of bar codes
- Document how auctions are used to enhance procurement practices
- Develop a plan for initiating warehouse operations
- Complete a supply chain management building activity

Case problems are used to help the student analyze and synthesize major points from the readings and assignments. There will be case problems on topics in the reading outline during the semester.

Homework assignments may be given periodically in order to help measure your comprehension of the reading material. Most homework assignments will be graded on a "**good faith**" bases. That is, I will scan your work to check that you made an honest effort to complete the assignment. If so, you will receive full credit for that assignment. However, assignments that are not complete or are not completed according to specifications will receive a reduced grade or a zero.

Quizzes may also be given periodically in order to help measure your comprehension of the reading material. Not all quizzes may be announced, therefore, it is essential to keep up with all reading assignments. No make-up quizzes will be given.

Presentations and other in-class activities may be assigned throughout the semester as well. These will be explained by the instructor in more detail at that time.

Field trips may be worked into this course to assist the students in their understanding of the reading and assignments. Other appropriate field experiences may also be arranged. Each student will be required to submit a one page word processed report/memo that describes and summarizes the concepts and practices observed during the field experience. The report will be due at the start of class ONE week following the date of the field trip. On all field trips, you must dress appropriately (i.e. no sandals or open toed shoes) and wear appropriate personal protective equipment such as safety glasses. It is also useful to have a notepad and pen/pencil. Please be punctual and respect guest speakers, jobsite or plant rules and parking protocol.

There will be three exams given during the semester. Each exam will be a unit exam. However, questions concerning material covered earlier in the course may be included in later tests.

There are no make-up exams unless the student has been in contact with the instructor before the exam and has an alternate date scheduled.

The required tasks may be modified during the semester as needed at the discretion of the instructor.

EVALUATION – UNDERGRADUATE STUDENTS:

On-line discussions……..... 10%
Activity based assignments and case problems..... 20%
Homework, quizzes, presentations, field trip reports, etc…..... 20%
Examinations..... 45%
Participation……. 5%
Total -100%

EVALUATION – GRADUATE STUDENTS:

On-line discussions……. 5%
Activity based assignments and case problems..... 20%
Homework, quizzes, presentations, field trip reports, etc…..... 20%
Examinations..... 40%
Graduate Student Activity……10%
Participation……. 5%
Total -100%

ADDITIONAL REQUIREMENTS FOR GRADUATE STUDENTS IN TEC370:

In addition to fulfilling all the course requirements expected of undergraduate students, graduate students must complete one of the additional activities listed below for graduate credit. The instructor must approve the topic during the second week of class.

- Analyze the advantages and disadvantages of supply chain management or logistics software, such as warehouse management software packages, identify the companies selling the software, costs involved, etc. Findings must be prepared as a report and the results presented or demonstrated to the class.
- Select a supply chain/logistics related technology like RFID tags and investigate the status of the technology, how it works, how it is being used, where it is being used, advantages and disadvantages of using the technology, cost savings it is providing, etc. Based on review of the literature, contact with field professionals, and perhaps personal experience with the technology, write a report and present or demonstrate the results to the class.
- Other project ideas mutually agreed to by the instructor and the student.

Grading Scale:
The following grading scale will be used in assigning grades:

100-90% =	A
89-80% =	B
79-70% =	C
69-60% =	D
59- 0% =	F

Additional Notes and Policies:

1. Please read assigned material *PRIOR* to the scheduled date.
2. Incomplete "I" grades are reserved for students who have a serious life crisis in the final weeks of the semester and are therefore unable to complete the required assignments or projects.
3. Extra credit assignments may occasionally be given during the semester at the discretion of the instructor. NOTE: Failure to meet regular assignment deadlines is considered by this instructor to be bad management and not a reason for second chance extra credit work.
4. **Please turn cell phones off or to vibrate during class.**
5. In order to maintain a positive and professional atmosphere and to minimize distractions during classroom activities, please refrain from putting your feet on the tables or chairs, reading newspapers or other material not pertaining to the course, and using any tobacco products.

NOTE: Any student needing to arrange a reasonable accommodation for a documented disability should contact Disability Concerns at 350 Fell Hall, 438-5853 (voice), 438-8620 (TDD).

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Figure 2. Course Syllabus

The supply chain course at University A is a three semester hour course which consists of three hours of a combination of lecture and in-class activities each week. Class sessions examine a number of topics such as those listed in the course schedule table of the syllabus in figure two. The students are expected to read information from the textbook for the class and additional references to gain baseline knowledge and be prepared for discussions in class. Students are also expected to attend class and participate in the discussion and activities that occur during that time. Several required tasks are used to meet the objectives of the course and emphasize the content of the class. These course activities and outcomes are identified in the required tasks section of the syllabus. The weighted percentages used for determining grades are listed in the evaluation section of the syllabus.

While some lecture does occur during the semester to present basic concepts, other methods are used to highlight key points in the reading. One of these methods is to show a video and follow that up with quiz questions or a case problem to promote discussion. One example of this is a video that looks at supply chain management at a major manufacturer of luxury performance boats. The video only lasts about five minutes but gives a vivid video tour of the company that addresses its supply chain issues. The rest of the information is provided in a write-up that the students read. As the students glean further information from the written narration they are asked to answer questions about the situation such as:

1. What other techniques might be used by the company to improve supply chain management?
2. What kind of response might members of the supply chain expect from the company in response to their "partnering" in the supply chain?
3. Why is supply chain management important to the company?

The students answer the questions individually to help them analyze and synthesize the information they are presented. Once the students have completed their answers they submit them to the instructor. A discussion led by the instructor follows this three step process in an attempt to clarify the key points and help the students make the connection between this activity and the key points in their textbook reading assignment.

Another in-class activity that is used to assist the students in becoming familiar with the content is to do practice problems. These are very helpful in giving the students more confidence with the math related content in the course. Practice problems are used to familiarize the students with concepts such as perfect orders, landing costs and forecasting. Normally the instructor explains the concepts and guides the students through problems in class having them try to complete the calculations on their own or working with a partner. Then the instructor does the calculations and discusses them with the students while they correct their mistakes. Students are then given take home problems that are due the next class period and submitted for a grade. The

graded problems are used for further discussion when they are returned to the students. Figure three is a simplified version of a practice problem.

Directions: Please read through the problems carefully and answer the questions. Show your work.

1. Last year Company X experienced the following results:
   - 6.2 million orders processed
   - 35,000 delivered late
   - 25,000 incomplete
   - 25,000 damaged
   - 25,000 billed incorrectly

Furthermore, these 110,000 failures were spread across 95,000 orders, which meant that some orders had more than one problem. Calculate the percentage of perfect orders. Show your work.

Figure 3. Example of a perfect order case problem[26]

Other in-class activities are used by the instructor to stress key concepts and cause the students to work in teams. One such activity that the students seem to enjoy and learn a lot from is a construction-related supply chain management activity. This is a modified version of an existing management activity[27]. It begins by explaining how a supply chain is a network of manufacturers and service providers that work together to convert and move goods from the raw materials stage through to the end user. The students are also made aware of the fact that in both big companies and in small groups, tasks must be analyzed and objectives established in advance. In this exercise the students are told they will work in teams, competing with other groups in constructing a tower out of toothpicks, straws, and shaving cream. The success of the groups is measured by the "profit" they make (determined by the appraised value of the structure less the costs involved in construction).

The groups of students are given limited supplies at the beginning of the activity and told what they have invested in inventory at that point. Two students are chosen two deliver a specified amount of materials to the groups at timed intervals. When the materials are delivered a record is kept of the inventory and costs. Figure 4 shows a receipt slip that is used to record the delivered inventory. Students continue to receive a specified quantity of inventory at given intervals of time until the minimum required inventory is delivered. However, they can order additional inventory as the activity continues. Each group is required to use a minimum of each building material in their design. At the beginning of the activity the students are given a description of costs, told who their supplier is for each material, where their suppliers are located, and what methods of transportation are being used to deliver the inventory to the supply depot. The students are also made aware of the fact that the cost of the materials may fluctuate based on what happens with the supply chain and that extra materials will not have any redeeming value at the end of the activity.

Receipt Slip for Materials Delivered to Group #1

Material:	_____	Cost:	_____
Quantity:	_____	Date:	_____
Group #	_____	Time:	_____
Consigned to:	_____		

Figure 4. Receipt slip used to record delivered inventory

As the activity continues the instructor periodically announces changes that occur in the supply chain. For example, a hurricane may occur in an area of the country where inventory is being shipped into. That in turn may cause a delay in goods being delivered or a substantial rise in price of the material. New prices are clearly indicated to all the students by writing the revised amounts on the white board. Changes in costs are also recorded on the receipt slips.

In the end the receipt slips are used to tally up the quantity of inventory used by each group and the costs involved. The data is entered into an Excel spreadsheet as shown in Figure 5.

Grp #	1	2	3	4
Init. Invest.	$5,600	$8,840	$7,040	$10,640
Add. Mat.	$650.00	$300.00	$2,000.00	$1,500.00
Total Cost	$6,250	$9,140	$9,040	$12,140
A. Rating	$3.00	$2.00	$2.00	$2.00
A. Value	126	36	115	117
Q. Rating	16	18	16	12
Height (in)	42	18	57.5	58.5
Q. Value	$672	$324	$920	$702
TAV	$33,516	$6,480	$59,512	$47,911
Profit	$27,266	$2,660	$50,472	$35,771

Figure 5. The Excel spreadsheet used to show the data.

Fictitious data is being used in the example in figure 5. The rows are laid out as follows starting from the top of the table:

First row:	Shows the groups involved
Second row:	Shows the initial investment in inventory by the group.
Third row:	Shows the additional materials purchased.
Fourth row:	Shows the total cost of inventory.
Fifth row:	Shows the aesthetic rating anywhere from zero to $3 per inch of height, depending on their appraisal of aesthetic value.
Sixth row:	Shows the aesthetic value in dollars which consist of the aesthetic rating times the height of the tower.
Seventh row:	Shows the quality rating of the tower as determined by the evaluation board.

Eighth row: Shows the measured height of each tower in inches.
Ninth row: Shows the quality value of the tower which is determined by taking the height of the tower in inches times the quality value.
Tenth row: Shows the total assessed value (TAV) which is determined by adding the aesthetic value and the quality value and then multiplying the total times the height of the tower.
Eleventh row: Shows the profit or loss that each group had which is determined by subtracting the total inventory cost from the TAV.

This in-class activity reinforces the idea that inventory can play a major role in the profitability of the company. It also shows students how much of major impact changes in the supply chain can make in the performance of the company. Changes in weather, labor problems, increases in the cost of fuel, etc. all can have a huge impact on the supply chain and the bottom line of the company. This activity really brings these issues to light for the students and demonstrates how important good decision-making is.

The students are given a set of questions to answer at the end of the activity to help them analyze and synthesis what they experienced and learned. These questions are then used as discussion points in the following class period when the students submit their answers.

Homework assignments are given periodically in order to help measure student's comprehension of the reading material. Many of the homework assignments are selected questions from the end of each chapter. Usually there are about 10 questions per assignment. Most homework assignments are graded on a "good faith" bases by the instructor. That is, the instructor will scan the student's work to check that the student made an honest effort to complete the assignment. If so, the student is given full credit for that assignment. However, assignments that are not complete or are not completed according to specifications will receive a reduced grade or a zero.

Field trips are worked into this course to assist the students in their understanding of the reading and assignments. Each student is required to submit a one page word processed report/memo that describes and summarizes the concepts and practices observed during the field experience. The format required for the reports that the students submit is found under the sub-heading "field trips" in the required tasks section in the course syllabus in figure two. Other expectations for the field trips and report are also listed in this section.

In addition, students are asked to sign a liability waiver form prior to going on the field trip. This is a form that has been developed by the university legal area to try to reduce or eliminate the risk of liability as a result of the students partaking in field trips. It is similar to the type of liability waiver form that people sign to go horse back riding or rock climbing.

One field trip that is of special interest to the construction management and manufacturing students is a company that produces modular homes. The entire house is produced within a manufacturing plant and then set up on the lot. The tour shows the students the need for a well developed supply chain system in this situation.

Guest speakers are invited to present information to the students in their area of expertise. Students appreciate hearing from practitioners who can give current examples of work that they are doing in an area that relates to the content being covered. This often provides them with a contact that may be of use to them when searching for an internship or full-time employment. The speakers typically enjoy talking to the class about their area of expertise. This also gives them a chance to promote their company to the students if they are interested in hiring interns and full-time employees.

ACTIVITY ASSESSMENT

At the end of the semester the students are asked to rate the activities that were part of the class. Table one shows an example of the assessment form used. It asks the students for their feedback by using a rating scale. The students are asked to identify both if they learned from the activity and if they liked the activity. The directions on the assessment form ask the student to indicate how much they learned and how much they liked each activity by using a rating scale from one to ten (1 means the student did not like it and a 10 means they really enjoyed it). They are also asked to comment on what they liked most about the class and what they liked least about the class. The activities in the example in table one have been written generically for the most part to respect the privacy of companies and people involved.

Table 1.

Assessment Form to Evaluate Course Activities.

TEC370 Activity Assessment

Please respond to each of the activities that were completed this semester. In the first ( ) indicate how much you **learned** (a 1 means not much and a 10 means a lot). In the second ( ) indicate how much you **liked** the activity (a 1 means you did not like it and a 10 means you really enjoyed it). Numbers between 1 and 10 may be used to indicate which way you lean (if your opinion is not strongly held). In the space below the activity write a comment as to why you gave the activity a certain rating.

Learn	Like	
(7.4)	(6.6)	The first video of the semester
(7)	(7.1)	Case problem #1
(7.6)	(8.9)	In-class activity #1
(8.8)	(8.7)	Tour #1
(8.1)	(8.2)	Guest speaker #1
(7.2)	(7.2)	Guest speaker #2

(8.2) (7.4) Bar code assignments #1

(8.2) (7.4) Bar code assignments #2

(8.4) (8.7) Tour #2

(8.2) (8.2) In-class activity #2

(8.3) (8.4) Guest speaker #2

(7.7) (5.9) Practice problems and questions

(6.4) (4.2) Reading the chapters in the textbook

(6.8) (3.7) Answering the end-of-chapter questions.

Please comment on what you liked most about this class.

Please comment on what you least liked about this class.

Thank you for completing this survey. Have a good holiday season!

The ratings shown in table one are from one class and are rounded up to the nearest tenth. As can be seen the students felt they liked most of the activities and learned quite a bit with the exception of the last three. The reading, practice problems, end-of-chapter questions were rated the lowest of all the activities. The data also indicate that they learned from these three activities, even though they didn't like them very much. The student comments and the ratings also seem to indicate that they felt the book was too difficult for this type of class. This concern is being investigated further.

When asked to comment on what the student liked most about the class it seemed that they really appreciated the wide range of activities that were part of the class. One student even stated this in the comment section. They also indicated that the activities made it easier to learn the content and that they learned a lot.

The comments with regard to what students liked least about this class seemed to focus on the last three items in the ratings. Some students commented that the book was hard to read and understand. Another student indicated that he felt the book was too high level for the introductory class. Student feedback from this course is being used to make decisions about a new book for future semesters.

Summary

This paper focused on the current status of supply chain management and a course that has been developed and taught by the author. An overview of the literature shows that the field of supply chain is in a state of rapid change and development. It also seems to indicate that supply chain management is not reflective of a well-established discipline. While there is widespread agreement that supply chain management should be part of engineering management and technology programs, it is not clear what content needs to be included because of overlap with other disciplines like operations management. Supply chain management encompasses industrial distribution and supply chain logistics while the later two fields overlap each other. At the graduate level supply chain management is being taught as a course in Engineering Management Masters Degree Programs. At the undergraduate level in technology and engineering departments there is wide variation in how supply chain management is being included in the curriculum. It is commonly found in a production operations management course in business departments or schools. Supply chain content can also be found in technical programs as a single course or as part of the content of another course.

This paper focused on a supply chain course that was developed at University A. It is an overview course that consists of broad-based content to serve the elective needs of the students in four undergraduate programs in the department. The objectives and content outline are given for the course. Several different teaching methodologies such as guest speakers, in-class activities, case problems, homework assignments, field trips, quizzes and exams are used to meet the objectives of the course and emphasize the content in the class. Examples of these methodologies and materials used to implement them were given. An end-of-the-semester assessment form used to allow the students to evaluate class activities was shown. The results of the evaluation were described to show the students' perception of these activities.

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