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TEACHING BRIEF

Recruiting the Supply Chain Professionals of the Future: A Supply Chain Summer Camp for Middle School Students

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INTRODUCTION

Indiana has unique advantages for becoming a strategic player in many supply chains because of its agricultural and manufacturing base, its growing warehousing and distribution industry, its central location, and its convenient access to various modes of transportation. According to the Indianapolis Private Industry Council (2006a, 2006b, 2008), manufacturing companies employ 14% of all workers in central Indiana (106,000 of 769,000 total employment), and thousands of more workers are categorized in other industries that provide services to manufacturers. Indiana's logistics industries employ more than 41,000 workers. Manufacturing and logistics drive Indiana's economy. One new job in manufacturing in Indiana causes 1.24 additional jobs. Indianapolis is one of the few upper Midwestern cities that continues to grow. State government and various economic development organizations have focused much effort in recent years on promoting manufacturing, transportation, distribution, and logistics enterprises, and on developing the workforce to support such enterprises. To capitalize on these economic development efforts, a number of universities in the state of Indiana have created or upgraded degree programs in supply chain and operations management.

For the University of Indianapolis, the greatest challenge in launching an undergraduate supply chain management degree program is recruiting students. The basic problem with supply chain management is that "it's not sexy

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but that is where the jobs are" (O'Malley, 2005). International business conjures up images of the French Riviera. Computer science or information systems make students think about high-paying jobs to play computer games. Unfortunately, the terms supply chain management and logistics either mean nothing to students or make them think of low-paying jobs driving forklifts or loading trucks.

To counter this problem, the University of Indianapolis and the McKenzie Career Center in the Metropolitan School District of Lawrence Township have partnered to fill the supply chain of students seeking college degrees in supply chain management. McKenzie Career Center houses the high school vocational, technical, and career-oriented academic programs for the two high schools of the Metropolitan School District of Lawrence Township. Lawrence Township is in transition from a suburban to an urban environment with one of the two high schools being primarily urban and the other predominantly suburban. McKenzie Career Center serves an increasingly diverse population with 47% of its students being African American, 45% Caucasian, 5% Hispanic, 1% Asian, and 2% multiracial. Its programs include academic courses in preengineering, business, mathematics, and computer networking that prepare career-bound students for postsecondary education at 2- and 4-year colleges. The overall plan is:

- A day camp to introduce middle school students from Lawrence Township to principles of supply chain management and careers in supply chain management, manufacturing, and logistics through a summer enrichment program.
- Supply chain instructional modules integrated into mathematics and business classes at McKenzie Career.
- Summer internships in supply chain management for high school students at McKenzie Career Center.
- A capstone course in supply chain management at the University of Indianapolis for McKenzie Career Center students that carries both high school and college credit.

This article focuses on Young Executive Camp, the middle school day camp in the summer enrichment program. Middle school students are in the fifth through the eighth grades.

In 2007, we scheduled Young Executive Camp for three and one half hours each morning of 1 week. Ten students participated: 1 eighth grader, 4 seventh graders, 3 sixth graders, and 2 fifth graders. Five students were boys and five were girls. Nine students were Caucasian and one was African American. Each day we did a variety of activities focused on a different segment of the supply chain as summarized in Table 1. The first 3 days gave the students valuable information for business decision making and the computer simulation game they played on the fourth day gave them a chance to use the knowledge from the first 3 days to make business decisions. We designed the activities for each day to be fun and to provide high-impact learning experiences. We used active learning strategies whenever possible because active learning is widely accepted as a far more effective mode

Table 1: Young executive camp schedule.

Day	Supply Chain Segment	Topics—Activities
Monday	Manufacturing	Introduction to supply chains—puzzle. Manufacturing—multimedia presentation and snack activity. Material flow and just-in-time—poker chips and dice simulation.
Tuesday	Packaging	Overview and history of packaging—packaging materials demonstration. Importance of packaging—making a foam-lined cardboard box and egg drop. Marketing value of packaging—decorating boxes.
Wednesday	Distribution	Field trip to a distribution center—Redcats.
Thursday	Retail	Virtual business—computer simulation.
Friday	All	Customer satisfaction—compiling surveys and making spreadsheet charts. Review and assess learning—games.

of instruction than lecture alone (Chickering & Gamson, 1987; Prince, 2004). Active learning strategies involve hands-on activities, discussion, teamwork, and problem solving, and are particularly well suited for high-energy middle school students.

We built several themes into each day's activities. These were:

- cooperation and teamwork,
- mathematics,
- manufacturing, and
- marketing and customer satisfaction.

Cooperation is the basic competitive strategy in supply chain management, so we had the students do most of the activities in teams to emphasize cooperation through teamwork. Mathematics is the unifying discipline behind most courses of study leading to careers in supply chain management, including engineering and various aspects of business. We incorporated math exercises into activities wherever possible, although we tried to hide the math in other activities because most middle school students do not like math. Manufacturing and the marketing of manufactured goods is fundamental to supply chain management so each day one or two teams of students were required to design and manufacture a snack, market it to the class, track the costs, and minimize waste. Students marketed the snack on the basis of taste, presentation, customer service, and nutrition. Based on a marketing survey done on the first day, most teams manufactured their snacks from some combination of bananas, peanut butter, semi-sweet chocolate chips, and marshmallows with some groups using gummy bears or some other candy to enhance customer appeal.

Teams could earn points on all of their activities that we tracked over the course of the week. We gave daily door prizes for the teams that scored well on

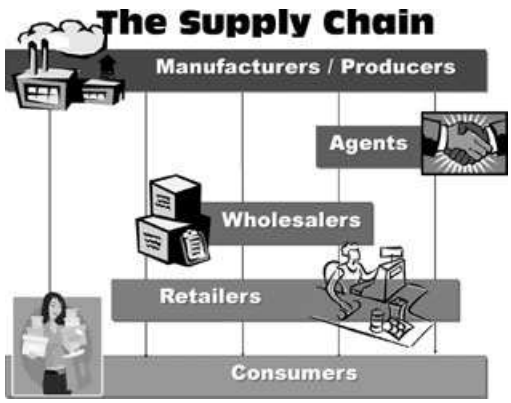
daily activities and we gave a grand prize at the end of the week to the highest scoring team. Corporate sponsors assisted us with many of the activities, served as judges for activities such as taste-testing and presentation of the snacks, and donated the door prizes. The camp itself was funded by a grant from the Indiana Department of Workforce Development.

INTRODUCTION TO SUPPLY CHAIN MANAGEMENT AND MANUFACTURING DAY

We opened our first day with an activity for students to learn each others' names and what they liked to do. We then let students self-select into teams of two or three, name the team, and design a team logo. Naming the team and designing the logo doubled as team building activities. Prior to designing the team logo, we gave the students a quick marketing lesson by showing slides of corporate logos. The teams tried to recognize as many logos as possible, to identify what characteristics of the logos made them easy to remember, and to determine what impression of the company the logos conveyed.

We introduced students to the concept of a supply chain with a scavenger hunt. We created a poster-size diagram of a supply chain as illustrated in Figure 1, cut it up like a jig-saw puzzle, and hid the pieces and clues in various parts of the building. We even hid some pieces in the principal's office and other administrator's offices so that the students had to learn the valuable networking skill of introducing themselves. Because logistics requires some knowledge of geography and map reading, we provided each student with a map of the building. Finding the clues also required students to use their map skills to find various locations throughout the building. Students had to collect the pieces of the puzzle and reassemble it as a team (Fawcett & McCarter, 2006). The scavenger hunt served the triple purpose of introducing students to the parts of a supply chain, teaching teamwork, and being a recruiting tool for McKenzie Career Center by the introducing students to the McKenzie Career Center building and administrators.

Figure 1: Supply chain poster used for scavenger hunt.



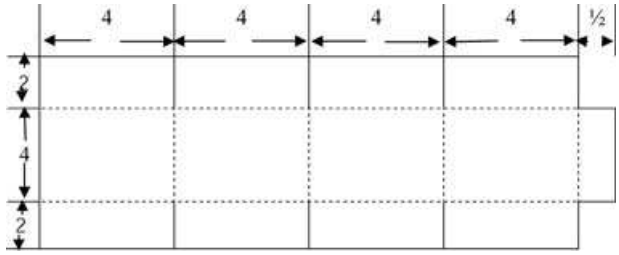
Following the snack manufacturing and marketing activity, Steve Wallen, Director of Plant Operations for IMMI, showed a child safety seat manufactured by IMMI. He introduced the students to problems of material flow and the concept of just-in-time (JIT) manufacturing by combining a poker chips and dice simulation of material flow (Adams, Flatto, & Gardner, 2005) with a slide show of the plant where the child safety seat was manufactured. IMMI develops, markets, and manufactures quality safety systems for the heavy truck, off-highway (construction and agriculture vehicles), child seating, emergency vehicle, and outdoor industries. The poker chips and dice activity gave students a fun introduction to concepts of probability, expected value, simulation, and calculating output. More important, it introduced students to the concept of a pull system that eliminates waste by making exactly what is needed, when it is needed, and not before it is needed. Making exactly what is needed was reinforced throughout the week with the daily snack manufacturing activities.

PACKAGING DAY

On packaging day, Caesar Watkins, a packaging consultant with his own business, and Dan Cunningham, president of Parish Manufacturing, introduced the students to the history of packaging, showed them a variety of packaging materials, and led them in the activity of constructing a foam-lined cardboard box to protect an egg from breaking during shipment. Constructing a cardboard box is a mathematically rich activity that uses geometry, fractions, measurements, precision, and accuracy. It also requires students to think in three dimensions.

Mr. Watkins gave each team of students a piece of cardboard, a piece of foam, scissors, a ruler, and glue. Next, he drew the diagram of a box shown in Figure 2 on the chalkboard to illustrate how to construct a cardboard box. Solid lines indicate where the students should cut the cardboard and dotted lines indicate where the students should fold the cardboard. The dimensions are given in inches. The flap on the far right should be glued to the inside of far left after the cuts and folds are made. Students had to draw straight lines parallel to the edge of the cardboard by marking two points the correct distance from the edge and drawing the line through the points. This is a valuable skill for the students to have when they take algebra and have to plot equations of lines. Lining the box with foam required students to use fractions. They had to shorten the height of the foam used

Figure 2: Layout of cardboard box with measurements.



on the sides by the twice the thickness of the foam to compensate for the top and bottom and shorten the width by the thickness of the foam to compensate for the next side. This required some three-dimensional thinking.

Mr. Watkins and Mr. Cunningham also introduced students to the marketing value of packaging by showing them a variety of boxes that are designed to sell the product inside. Each team of students decorated their box to make it appealing to the customer.

The favorite activity of the day was the egg drop. The students dropped their boxes with an egg in it from successively higher locations until the egg broke. This was messy but wonderful fun for the students. We awarded door prizes for the box with the egg that survived the highest drop, the box with the highest quality of construction, and the box that was most appealing to the customer.

DISTRIBUTION DAY

The highlight of the week was a field trip to the Redcats Distribution Center in Indianapolis. Redcats, United States, is a multichannel home shopping company specializing in apparel, lifestyle, and domestic goods and sporting goods. The students arrived at the distribution center via limousine because the school busses were having their annual inspection the week of Young Executive Camp and were unavailable for use. The limousine ride definitely made the students feel like executives, even if only for half an hour. At Redcats, the students received name badges and were ushered into a conference room where they saw a presentation on the history of the facility that was originally built in 1962 as a mail order facility for Lane Bryant and acquired by Redcats in 1998. Next, the students toured the 750,000 square foot distribution center with Brian Steele, the operations manager. They had the opportunity to see a variety of types of conveyors, sortation systems, pallet trucks, lift trucks, and other material handling equipment. Mr. Steele taught the students about safety throughout the tour and introduced them to the concept of ergonomics. The climax of the tour was when a worker demonstrated the safety procedure of escaping from an operator-up turret truck stuck in the fully extended position by rappelling. They also learned about material flow, cross-docking, bar-coding, and RFID.

Mr. Steele explained to the students how the quantities of products flowing through the facility changes with the seasons. For example, more golf equipment flows through the system in the summer, but the combined volume over all products is highest just before the Christmas holidays. He described how workers can be shifted from one department to another to compensate for changes in volume and how staffing levels have to be increased during certain seasons of the year. For the mathematics activity of the day, Mr. Steele provided the students with a worksheet of story problems to calculate the staffing levels at different times in January and October for the receiving, returns, and shipping departments. The worksheet reinforced the differences in volume due to seasonality and the differences in departments. We had to postpone the worksheet until the next day because the students had so many questions on the tour that we spent all of our time on the tour and there was no time left to do the worksheet.

RETAIL DAY

After completing the worksheet from the previous day, the main activity for retail day was a software-based simulation of a convenience store—Virtual Business—retailing. In the simulation, students make decisions about where to locate stores, opening and closing stores, pricing, promotion, what products to carry, allocating shelf space to products, market research, staffing levels, purchasing, physical inventory, borrowing money, and more. They learned to use charts and graphs of market information, financial information, traffic flow, product sales reports, and population changes to support their business decisions. The software is also entertaining to the students because of the animations of traffic flow in the city and the ability to zoom in on stores and see customers buying product. It is even possible to zoom in on the shelves in the stores to see product displays and to look at stockrooms to see what is in inventory.

The Virtual Business simulation is mathematically rich, not only giving opportunities for students to do calculations of costs, profits, how much to buy, and other quantities, but also requiring them to process and analyze information from charts and graphs, to look for trends, to project what they see into the future, and to use critical thinking skills to make sound business decisions based on their analyses. It teaches them business terminology and concepts in an engaging format.

For the game, students were to open up a convenience store and run it for a simulated year. The team earning the most cumulative profit at the end of the first year was the winner and received the day's prizes. Many of the students learned first-hand the harsh realities of entrepreneurship. Their cash flow was inadequate and they did not survive the first year. However, we let them play again and again until our time in the computer lab ran out. Virtual Business is as engaging as any other video game. The less successful students were convinced that they would win the next time if they could just play it once more. One group of students was so wildly profitable that we had to convince them that they needed more education before they could take over a chain of real convenience stores and make hundreds of thousands of dollars. None of the students were ready to leave the computer lab when our time was up.

ALMOST APPRENTICE STYLE COMPETITION DAY

The final day of Young Executive Camp Cash focused on competitions to assess and review what the students had learned during the week. We labeled this the almost apprentice style competition day because we did not let students criticize each other to preserve the spirit of teamwork and cooperation.

The first activity of the day was a board game called "Cash Flow for Kids" developed by Robert Kiyosaki and distributed by CASHFLOW® Technologies, Inc. The game is designed to teach the basic principles of personal finance. In the game, players must save their money and invest it wisely in order to get themselves out of the rat race. In order to win, players must accumulate enough passive income (income from investments) to pay all of their monthly expenses. By doing so, they have gotten themselves out of the rat race and would no longer need to work for someone else for a salary. Throughout the game, students had to update and

track their personal financial progress on personal income statements and balance sheets. They also learned first-hand how purchasing unnecessary luxury items and unexpected expenses such as home or car repairs could directly impact their financial position.

The second activity was for each team of students to take the customer feedback data they collected from the day they manufactured their snack, to compile it in a spreadsheet, to compute appropriate averages and other summary statistics, and then to create charts and graphs to present their data and to draw conclusions. Because most of the students had never used a spreadsheet before, we had the opportunity to introduce students to this powerful business analysis tool in a fun environment. The students took great delight in creating charts and graphs with lots of colors and special effects. This activity reinforced skills the students gained in reading charts and graphs in the Virtual Business Simulation and took those skills to the next level by enabling them to make their own charts and graphs.

The final game was a review of what we learned in the format of Jeopardy. The categories for the game were centered on the themes for each day and included "First Day Stuff, Channel Members, Packaging, Field Trip, and Games." Questions were developed around the key concepts such supply chain, batch, variance, just-in-time manufacturing, distribution channel members, cash flow, ergonomics, profit, expenses, and passive income. Students eagerly participated and were able to answer most of the questions indicating that they had mastered the concepts covered throughout the camp.

At the end of the day, the Young Executive Camp's new apprentices were announced. Each day points were awarded based on each team's performance in the tasks, and the group who had accumulated the most points throughout the week won the title as well as a prize. Because the camp was completely voluntarily and no grades were assigned, the competition was used to motivate student participation. Students were eager to find out at the end of each day their standings and enthusiastically competed in each event to win the title. Several students also expressed interest in returning next summer to either defend their title or try to become next year's apprentices.

We chose not to debrief the students on supply chain careers because middle school students can relate to things they can see and touch such as packages flying around on overhead conveyers, foam-lined boxes to protect eggs from breaking, and even cash building up in a video game. Specific careers are too nebulous of a concept at their age. Debriefing middle school students on careers would have been boring to the students, would take up time that could be spent on exciting activities, and is best left for the high school program. Before supply chain professionals can be recruited, they have to be introduced to supply chains and supply chain concepts, which is what the camp accomplished.

CONCLUSION

Young Executive Camp was a teacher's dream that had come true because it gave us the opportunity to do field trips and try out hands-on learning experiences that we would never have the time to do during the regular school year. Middle school is not too early to talk about supply chains, manufacturing, and distribution. Even the

fifth and sixth graders grasped, retained, and were enthusiastic about most of the concepts we were trying to teach. Introducing students to supply chain management at the middle school level is much more effective than introducing it at the high school level because middle school students have boundless enthusiasm, are much more impressionable than high school students, and have fewer time constraints and competing activities and interests than high school students.

The hardest part of planning the camp was choosing what topics to cover because there is so much more involved in supply chain management, manufacturing, and distribution than can possibly be covered in a week. Our criteria for selecting topics were:

- Cover as much of the supply chain as possible.
- Mathematical richness at the middle school level.
- Availability of engaging, hands-on, group activities or availability of software to teach the topic.
- Availability of corporate sponsors to help teach topic.
- Visibility of supply chain principles.

Hands-on activities and group work were key components to making the camp both fun and a highly effective learning experience because they fit the high-energy learning styles of the middle school age group. The idea of manufacturing a snack was particularly good because it used so many highly visible concepts from manufacturing and marketing and kids love to eat. Making boxes was very mathematically rich and very hands-on. The field trip made supply chains real, visible, and exciting. The Virtual Business simulation enabled the students to put a lot of the ideas from the camp together, which is so important for reinforcing the concept that the whole of a supply chain is more than just the sum of its components.

It is far too early to assess whether we actually recruited any supply chain professionals because the students participating in the camp will not enter the special high school classes for at least one more year. The students participating in the camp will not enter college seeking a supply chain degree for at least 5 years and will not enter the workforce as supply chain professionals for at least 10 years if they get college degrees. We intend to track their progress but we can only do this for students who remain in the school system.

With regard to actual learning, proportion of correct answers in the Jeopardy Game and the level of enthusiasm indicated that considerable learning had taken place. We did a follow-up survey on the students attending the camp 6 months after the camp and got a 50% response rate. Our survey results cannot be generalized to the general population due to the small number of participants and the response rate. However, the survey did provide us with valuable guidance for planning the next Young Executive Camp. The questions and responses are summarized in Table 2. When asked whether they learned what supply chain management is, the students clearly grasped the many parts but manufacturing was conspicuously absent. For this reason, we intend to do a field trip to a manufacturing facility next time we do the camp. From the responses to the question about careers, the students did not grasp the specifics of careers but based on this and the next question about the

Table 2: Follow-up survey and responses.

Questions	Response Summary
1. Did you learn what supply chain management is?	All students answered yes. Most comments included: • "many different parts to a supply chain" or • a listing of parts including packaging, ordering, shipping, and delivering Other comments: • "I learned from chips and dice game that every person is important" • "I learned how hard it is to keep a business going from computer game"
2. Did you learn anything about careers in supply chain management?	Most students could not remember specific names of jobs and titles except the term manager. Many commented on "feeling like an executive" and "riding in a limousine." A few remembered functions like planning, designing, budgeting, ordering, delivering, and producing.
3. Did you like the fieldtrip to Redcats?	All students answered yes. Many commented on the limousine ride, feeling like "real executives" by the way they were treated, and getting lots of "cool, free stuff." Some commented on seeing how things worked in terms of the behind-the-scenes part of how products are delivered.
4. What did you like best about the camp?	We got a wide variety of answers on this question but the main themes in order of number of responses were: • Working in teams • Prizes • Making snacks • Field trip • Challenges (games, scavenger hunt, simulations) • No one got fired like on the Apprentice show
5. What would you change to make the camp better?	Most students responded that they either had no suggestions or did not know. One student wanted more challenges and more prizes.
6. Would you come back this summer?	All students answered yes.

fieldtrip, they liked to "feel" like executives. This did not surprise us and confirmed that our decision not to debrief the students on careers was the correct decision to make for this age group of students. The responses to the final three questions indicated that our selection of activities worked well with this age group. We were particularly pleased that all the students indicated that they would like to attend the camp again.

The main thing that we would change about the camp would be to have the students go on more than one field trip. We will add a trip to a manufacturing facility and do another trip to a distribution facility. Redcats did a fabulous job of hosting our students. Students learn so much more by seeing things first-hand than they could possibly learn in a classroom even with the best audio–visual capabilities possible. Field trips and seeing the real world in person are the most valuable experiences we can give our students. We would like to add some activities with RFID and other technologies if we can find appropriate corporate sponsors to help us with these. We would also like to bring a more global perspective to the camp to prepare the students for living and working in an increasingly global society.

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