A Multi-Institutional Web-Based Undergraduate Food Product Innovation and Marketing Course

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ABSTRACT: Food product development courses at The Pennsylvania State University and Saint Joseph's University were combined into a single course with a common faculty, syllabus, and web-based course management system. Industry specialists made weekly presentations on critical aspects of the product development and marketing process, via compressed video conferencing and the Web, to students at both locations. Cross-institutional interdisciplinary student teams completed a comprehensive plan for developing, evaluating, and launching a new product. Assessment of student learning revealed an enhanced understanding of all aspects of the product innovation, development, and marketing processes. The net result is a model learning system transcending disciplines, place, and time.

Introduction

FOOD INDUSTRY LEADERS FREQUENTLY COMMENT that college graduates are well prepared in their respective disciplines. However, a commonly heard criticism is that these same graduates lack the critical thinking and team decision-making skills necessary to effectively address the complex issues in today's industrial world (Litzenberg and Schneider 1987). A plethora of publications underscore the need to address the development of these skills at the precollege (Herald and Wissman 1995; Kunkel 1992; Steele and others 1995) and college (Arnold 1994; Barr and Tagg 1995; Bransen 1994; Hartel 1995; Hassell 1993; Herer and others 1995; Iwaoka 1994; Iwaoka and others 1996; Labuza 1993; Reitmeier 1995; Satterlee 1990; Singh 1996; Whittington and Newcomb 1993) levels.

The Education Committee of the Institute of Food Technologists (IFT) periodically surveys industry, government, and academic personnel on how well food science graduates are prepared for the job force. The 1990 survey indicated that communications and critical thinking skills needed to be enhanced (Satterlee 1990). Subsequently, the IFT Undergraduate Curriculum Minimum Standards were revised to strengthen those skills and to include a capstone course to integrate the many food science subdisciplines (Satterlee 1992).

A workshop was conducted in 1995 with food system professionals at Penn State's Team Decision Center. The question “What attributes would be desirable in a student graduating with a bachelor of science degree in food science?” was asked in a session involving representatives from large and small food companies. Critical thinking and problem solving skills were identified among the most important attributes, along with communication skills, understanding of the basics of food science, and a good work ethic. When asked to define what critical thinking and problem-solving skills meant to them, the participants responded: the ability to relate specific expertise to practical problems, the ability to think independently, and the ability to solve problems.

Decision case-based courses have been shown to be effective in developing critical thinking and decision-making skills (Allen and others 1995; Christensen 1991; Erskine and others 1981; Hawthorne 1991; Turgeon and others 1996). They offer students the opportunity to make use of the information and knowledge they have acquired and to use higher-order cognitive skills such as analysis of situations, application of ideas and facts, and evaluation of various alternative approaches to solve the problems presented in the cases. Case analysis provides students with a framework for analysis that can be applied in situations other than the cases [that is, identify the problem(s), consider alternatives, analyze pros and cons of alternatives, and select a course of action].

Our course casts the appropriate role of the student as a thinker who can make judgments and, as such, seeks the most viable solutions to problems. Knowledge becomes increasingly uncertain and speculative, requiring students to treat knowledge as whatever is adequate to address an ill-structured problem. As a result, students learn how to critically analyze problems and make judgments in an imperfect environment. Our approach is for the course instructor to serve as a facilitator, an expert playing the role of a resource to the learners, rather than as the authoritative source of knowledge. Active and collaborative learning scenarios are more effective mechanisms for developing critical thinking skills than the traditional model...
wherein the instructor is the source of knowledge, the “sage on
the stage.”

The need for food system professionals to have effective critical
thinking and team decision-making skills is commonly acknowl-
ledged and well documented. The food industry is expecting profes-
sionals to have these skills, and university educators and ad-
ministrators are searching for viable and effective approaches for
developing them. Our course provides a model for addressing
this need.

The goal of our course was to create a multi-institutional inter-
disciplinary problem-based capstone learning experience that
was designed to promote career-enhancing skills (critical thinking,
decision making, team work, communication, and so forth) in the
context of industry’s approach to developing and marketing new
and improved food products.

Course learning objectives focused on the multiple aspects of
product innovation and marketing (FPIM) and on personal
skills development. Objectives were to:

● comprehend the fundamental principles, generalizations,
and theories of product development
● understand the specific skills, competencies and points of
view needed by product development professionals
● appreciate the interdependencies of the multitude of stages
and aspects (for example, finance, formulation, marketing, pack-
aging, process engineering, production, quality assurance) in the
development and marketing of food products
● understand how food company managers gain knowledge
about the process for developing food products
● develop skills in analyzing and strategies for resolving ill-de-
fined opportunities
● develop the competencies of effective communication and
negotiation skills when working within groups/teams
● develop the ability to be a self-regulated learner who can en-
gage in both constructive and critical self- and peer-assessment
● enhance the ability to use contemporary communications
and information technology
● enhance oral and written communications skills

Materials and Methods

Course format

Penn State University (PSU) and St. Joseph’s University (SJU) had
been offering undergraduate courses on food product innovation
and marketing for several years. The PSU course was a problem-
based capstone learning experience targeted to food science and
agribusiness students. On the other hand, the SJU course followed
a more traditional lecture format and was a required course for
food marketing majors. Both courses enlisted industry speakers
on topics relevant to the FPIM process. Although the formats of
the two courses differed, the respective faculty believed that
merging them would result in an enriched student learning expe-
rience that could not be achieved by the separate courses.

The respective courses were combined for the first time in 1998
(Lord and others 2001). By fall 2000, the integration of the two
courses across institutions had evolved to a common syllabus,
faculty, and text (Brody and Lord 2000), shared speakers, and
cross-institutional student teams.

Computer-based learning technologies and the Web were used
in a variety of ways. Laptop computers with network connectivity
were issued to students and faculty involved in the course. The
computers were loaded with Microsoft NetMeeting, Office and
Windows; Inspiration; and communications software. CourseInfo,
maintained on the SJU server, was the common course manage-
ment system and served as the communication and information
resource for the course.

Four faculty members with discipline expertise in business
management, food science, and marketing were the course coor-
dinators and facilitators. Other faculty and food industry profes-
sionals (for example, research and development scientists, mar-
keting directors, market research analysts, packaging specialists,
and so forth) functioned as resources and mentors. Instructional
designers and technology specialists at PSU and SJU were integral
to the course development and implementation.

Synchronous collaborative class sessions (via compressed video
conferencing and the Web) were scheduled for two hours be-
tween PSU and SJU on most Wednesdays throughout the semes-
ter. Food industry representatives made presentations at one or
the other campuses. In most instances, speakers provided PowerPoint
tiles of their presentations that were made available in ad-
ance to students on CourseInfo.

Topics

Topics mimicked the common sequence that food companies
follow in developing and marketing new products. These includ-
ed:

● Overview of the FPIM process
● New products strategies and ideation
● Early stage market research
● Concept development and testing
● Prototype development and testing
● Labeling and label development
● Packaging and package development
● Manufacturing and logistics
● Marketing programs and planning
● Business and financial plan development
● Market testing and revisions to the product plan
● Preparing for, executing, and coordinating the launch

Students

Because this was a capstone course at both universities, the stu-
dents had diverse discipline backgrounds and industry experi-
ences. The SJU students had knowledge about food retail market-
ning and, in particular, about the market testing and launching
phases of a new food product. The PSU food science students
brought an evolving expertise in the science and technology of
developing a new food product, while the PSU agribusiness man-
agement students were knowledgeable about food industry eco-
nomics. This diverse mix resulted in a rich and active learning en-
vironment.

Cross-institutional teams

Students from SJU and PSU were organized into 5 to 6 person
teams. Prior to forming the teams, each student completed the on-
line Keirsey Temperament Sorter II (http://www.advisorteam.com/
user/ksintro.asp). Discipline expertise, work experience, tempera-
ment, and gender were considered in forming the teams. A work-
shop on effective teamwork was conducted early in the semester.
Each team was mentored by a faculty member involved with the
course. Communication within teams occurred during two face-
to-face team meetings, numerous video and audio conferences,
and by e-mail.

Team projects

Each team was assigned a major food company. The semester-
long project for each team was to prepare a comprehensive plan
for developing and launching the product.

Teams completed a written analysis of their respective compa-

ties, and subsequently a new product opportunity was defined.
Both of these analyses were presented orally to the entire class.
This was followed by the creation, testing, and refining of the new product concept. A comprehensive plan for developing, evaluating, and launching the new product was devised. The product prototype and business and marketing plans were prepared and presented to the company management team (simulated by the course facilitators) during the 12th week of the semester, seeking a commitment of the financial resources to complete development and to launch the product. In the final week of the course, each team made a self-instructional presentation to retail buyers and prepared a comprehensive written recommendation for management.

**Pedagogy**

Lecture-based courses are characterized by the lecturer presenting a body of knowledge and his/her connections within that body of knowledge. Problem-based learning (PBL), on the other hand, is characterized by the student using a variety of resources to uncover a body of knowledge and make his/her own connections with this learning activity motivated by a driving question or issue. The distinction between the two approaches is most striking when considering whom the active constructor of knowledge and meaning really is. Learning theory suggests that an individual learns best when he/she is actively involved in the process. The “activity” can range from simple organization techniques such as note-taking to more sophisticated activities like hypothesis formation and testing. The more sophisticated activities should lead to more meaningful learning and a more integrated and accessible knowledge base. The more constructivist the approach (that is, where the student rather than the lecturer is the constructor of knowledge), the more time is spent in meaning making and integration. However, the potential exists for less information to be accumulated with the PBL approach compared to the lecture-based approach.

Our three approaches involved a combination of lectures, PBL, and case studies that were project-based team activities.

- **Lectures:** One section of the course was offered in a lecture format, for SJU students only, one evening each week. Students acquired knowledge from lectures and team project work.
- **PBL and Lectures:** SJU and PSU students were formed into cross-institutional teams with two-hour weekly synchronous class meetings. SJU students also received lecture-based material for an hour each week. Students acquired knowledge from self-directed study, direct lecture contact, and team project work.
- **PBL and Cases:** PSU students received no lectures, but worked on decision cases for two hours each week. Thus, PSU students acquired knowledge from self-directed study, team project work, and case study work.

**Evaluating student learning**

Multiple-choice pre- and post-course examinations were used to evaluate student acquisition of content knowledge and information. The exam had 20 questions involving the major aspects of the FPIM process and took 15 to 18 minutes to complete. It was done the first and last days of class. The questions were exactly the same. At the time of the first exam, students were not told that they would be seeing these same questions in the post-test. The test was not designed to be graded on a standard grading scale. In fact, senior product development professionals who have taken the test have never scored over 70%. This is not surprising, since the test has a broad array of items related to food technology issues, new product marketing, regulatory issues, food industry economics, and so forth.

In addition, each student was required to write an essay at the end of the course on the plan they would recommend for developing and marketing a hypothetical product. Quality of the final project report: A rubric, or scaling procedure, was used to grade the reports and essays. The rubric defined a set of criteria. Three general areas were assessed:

- The ability to identify and elaborate on the various stages of the FPIM process, including the market opportunity, ideation, concept definition, prototype product development, market testing, and launching the product.
- The ability to identify and elaborate on appropriate issues such as financial feasibility, food safety, opportunity analysis, quality assurance, packaging, and success criteria.
- The ability to integrate the different stages of the framework and to integrate issues within a stage.

**Assessing performance of individual team members**

An important measure of learning is an assessment of an individual’s growth as a productive team member. This is usually not addressed in summative outcome measures of project evaluation, nor is it addressed in the individual assessment of conceptual understanding.

While peer assessment is often used for such purposes, students may be reluctant to comment on another’s performance. One concern commonly expressed by students is that they feel less qualified to evaluate each other’s work, or even to provide feedback on each other’s work. This may be a realistic concern if the students are asked to comment on the quality, the accuracy, or the completeness of another’s cognitive efforts. Students may, in fact, not be expert enough to provide an evaluation of another student, especially when that evaluation centers on another’s conceptual understanding. They may also be reluctant to expose their own incomplete understandings by risking the provision of feedback and claiming ownership of that feedback, even if their own understanding is only exposed to the teacher.

A higher-order objective for the use of student peer assessment is to develop a set of learning strategies and skills that can be applied post graduation. These skills are not only important to support the chosen direction of professional activities, but to contribute to the resolution of societal issues as well. These learning strategies include developing the student’s ability to be a self-regulated learner who can engage in both constructive and critical self- and peer-assessment. The learning skills include the competencies of effective communication and negotiation skills when working within groups. Becoming better learners involves the students taking responsibility for their own learning. Peer assessment is one of the constellation of assessment activities that can be utilized to provide students with feedback as they engage in team-based activity so that they may be responsible for their own learning as well as providing an external accountability check on their progress.

Students were asked to rate their team members on eight different criteria, and then to offer an overall weight by assigning the portion of a hypothetical $10,000 bonus to be distributed to each team member (Stefanou and others 2001). Self-evaluation was also requested in order to provide a base line (Form 1). This evaluation was done twice during the semester and at the end of the semester.

The data were summarized and peer collaboration scores generated according to the procedure outlined in Form 2. Results were communicated to each student team within a week of completing the ratings. Individual feedback was given in the form of an overall percentage of the total possible points that could have been earned and as item averages. The individual ratings provided by team members were not given to the students in an effort to maintain confidentiality and ensure valid ratings. However, each student did receive their respective individual peer collaboration score.
Assessing overall team performance

Team presentations (oral and written) were evaluated on the following topics: Company analysis, category analysis, concept development and testing, preliminary business analysis, recommendation to the management committee, and the sell-in presentation to retail buyers. The latter two presentations contributed to the course grade.

The course facilitators evaluated the oral presentations. Both the plan and the presentation were critiqued. The evaluation of the plan involved assessment of:

**FORM 1—PEER ASSESSMENT**

You must turn in this form by the deadline to receive credit for peer evaluations.

As indicated in class and in the course syllabus, the peer evaluation constitutes a significant portion of your final grade.

You are working as a Food Product Development Team for a major client. It is time to distribute the quarterly bonuses. Your team has $10,000 to distribute among the team members. Think carefully about assigning a rating value from 1 to 5 for each of the statements. These are the criteria for assigning bonuses to your team members and yourself:

The team member:

1. Is dependable in attending group meetings
2. Willingly accepts assigned tasks
3. Contributes positively to group discussions
4. Completes work on time or makes suitable alternative arrangements
5. Helps others with their work
6. Does work accurately and completely
7. Contributes a fair share to the written reports
8. Works well with other group members

Rating:

1—Hardly Ever 2—Occasionally 3—Sometimes 4—Frequently 5—Almost Always

<table>
<thead>
<tr>
<th>Team Member</th>
<th>Statement Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.</td>
</tr>
<tr>
<td>1. Myself</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
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</tbody>
</table>

Total $10,000

Print Name: ___________________________ Sign Name: ___________________________
● The product idea is clearly defined
● The market opportunity is clearly defined
● The financial impact of the development plan is fully developed
● The test marketing plan relates to the research and development process
● The target market is clearly articulated
● The test marketing strategy is reasonable
● The barriers to product introduction are understood
● The assumptions underlying the research and development aspect of the plan are well conceived
● The criteria identifying success for the product are clearly stated
● The overall plan is flawed

The evaluation of the presentation and discussion addressed the following questions:
● Did the presentation contain content meaningful to the product development plan?
● Was the delivery smooth and unhesitating?
● Did the speaker(s) use correct grammar?
● Did the speaker(s) look at his/her (their) audience?
● Did the speaker(s) present himself/herself (themselves) in a professional and respectful manner?

Course grade
A student's grade for the course was based equally on individual and team performance.

Individual performance
● Product development and marketing essay ................... 15%
● Peer evaluation ...................................................... 20%
● Class participation .................................................. 15%

Team performance
● Presentation to management (oral) ................................. 15%
● Project report (written) ................................................ 20%
● Presentation to retail buyers (oral) .................................. 15%

Results and Discussion

Peer assessment
The peer assessment conducted three times during the semester yielded variable results among teams (Table 1).

Team A: In the first round, the distribution indicated that there were two members whose contributions to the team were less than the other team members. There was considerable improvement by these two individuals in the second round. Progress continued in the third round with the mean score for the group continuing to increase and the variation of scores (as measured by the

FORM 2—CALCULATION OF PEER ASSESSMENT SCORES

The ratings on the 8 statements in Form 1 plus the distribution of the bonus money were used to create a summary peer assessment measure of each individual's performance within the group. The peer-assigned student assessment score quantitatively measured an individual team member's collaborative functioning. The computed score used all of the data supplied in Form 1, with the exception of the student's self-evaluation.

The overall assessment score for a student i, OAi, was computed as follows:

\[
O_{Ai} = \frac{\sum_{i=1}^{N} \frac{\text{BONUS}_{iy}}{\text{AVGBONUS}}} \frac{\sum_{j=1}^{N} S_{yk}}{\sum_{j=1}^{N} S_{yk}^{(\text{max})}} \text{ where}
\]

\[
\text{AVGBONUS} = \frac{\sum_{j=1}^{N} S_{yk}}{\sum_{j=1}^{N} S_{yk}^{(\text{max})}} \text{ where}
\]

\[
\text{BONUS}_{iy} = \text{the bonus assigned by team member i to}
\]

\[
\text{team member j,}
\]

\[
\text{the uniformly distributed bonus (for example, $2,500 in the case of a 4-member team),}
\]

\[
\text{the rating team member j receives for statement k (k = 1, ..., 8) from team member i,}
\]

\[
\text{the maximum score possible across all k categories (excludes the don't know responses)}
\]

\[
\text{that team member i assigns to team member j, and}
\]

\[
\text{total number of team members.}
\]

If a team member was rated with the highest response in each category by his peers and received an equal share of the bonus, then the peer collaboration score would be 1.0 for that team member. A team member would receive an overall score higher than 1.0 if that team member received a proportionally higher share of the bonus from the other members of the team.
coefficient of variation) continuing to decline. Although this team had a shaky start, it developed into a harmonious group by the end of the semester.

Team B: In the first round, this team had two members (with scores of 0.71 and 0.64) who were not contributing effectively to team activities. In the second round, the PSU students were severely criticized. The SJU team members recognized that one of their classmates was doing a disproportional amount of the work. In the final round, the mean score continued to drop while the variation was lower than in the earlier rounds. The absence of teamwork among the SJU and PSU members continued throughout the semester.

Team C: In the first round, one person (with the 1.17 score) was acknowledged to be working harder than the others – or, at least, this team member's contributions were valued much greater than the others. On the other hand, peer assessment indicated that one team member (with the score 0.86) could have been more involved. In the second round, the distribution indicated slippage for most of the team members. This was not interpreted as a split emerging among team members. In the final round, the mean score continued to fall and the variation in the scoring (as measured by the coefficient of variation) increased to a point greater than the initial round. This team ended well, with one team member never quite meeting the team's expectations.

Team D: In the first round, this team functioned well except for one team member (with a score of 0.5) who was not viewed to be contributing effectively. Every team member was doing well at the second round. After the final round, the mean score dropped slightly from the second round score, but remained above the initial round score. The variation in the scoring increased dramatically over the second round due to the team's assessment of one team member. While one team member seemed to be viewed as not carrying his weight, the rest of the team worked well together.

Cross-institutional teams

Recognizing the difficulties with team members working at a distance, there was much less communication between SJU and PSU team members than was anticipated or possible. While all PSU students used the University computer access accounts, the SJU students often used free e-mail accounts (for example, hotmail or yahoo) from off-campus Internet service providers. Keeping track of the e-mail addresses students actually used was troublesome. Telephones with conference-calling capability were made available to each team. Even video conferencing times were available with some notice. Unfortunately, students did not display sufficient planning coordination to take full advantage of this conferencing opportunity. It was not unusual to receive a request on Friday afternoon to set up a weekend video conference.

In all teams, the team members compartmentalized the work into PSU efforts and SJU efforts; moreover, there was very little sharing about what work one compartment accomplished with the other group. Within groups, the SJU team members assumed responsibility for market test and business analysis and the PSU members covered the food technology issues. There was little intergroup discussion critiquing the results of a subgroup's activities.

The work ethic at each institution did not match up. We refer to this generally as a difference in campus culture. One example was the difficulty in arranging for a time for team members to have a conference call. On nearly every occasion, some members could not or would not make themselves available to meet at the agreed-upon time. Excuses varied, including the opportunity to party instead of meeting.

One team member responded to a request to meet briefly on a Thursday evening by saying: “... and also we NEED to meet. I think we really should meet another time besides Thursday. This is going to sound dumb, but Thursday is a big night to go out here. Yes, it can be held off, but I know no one is going to want to put the time in that we need on Thursday. We really need to try to meet at a time when we can work on this for a good block of time. . . .”

The team member from the other school responded: “... I know Thursday is a big bar/party night—it's the same here, but everyone is going to have to realize that to get this project done and done WELL, we have to sacrifice some time. . . .”

Student learning

The results of the multiple choice tests on FPIM facts are presented in Table 2. The two groups were: (1) the SJU class taking the product development course as a lecture-based course (the Control group), and (2) the combined PSU/SJU class that followed a largely problem-based approach (the Experimental group). The Experimental group was further subdivided into the full problem-based course (PSU group—Experimental) as compared to the problem-based group with some lecturing (SJU group—Experimental).

There were no statistical differences in the mean scoring between any two groups. That is, the pretest mean scores were not

<table>
<thead>
<tr>
<th>Team A</th>
<th>First round</th>
<th>Second round</th>
<th>Third round</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSU student</td>
<td>0.70</td>
<td>0.82</td>
<td>0.89</td>
</tr>
<tr>
<td>SJU *</td>
<td>1.00</td>
<td>1.02</td>
<td>1.02</td>
</tr>
<tr>
<td>SJU</td>
<td>0.92</td>
<td>0.97</td>
<td>0.98</td>
</tr>
<tr>
<td>SJU *</td>
<td>1.04</td>
<td>1.01</td>
<td>1.01</td>
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<tr>
<td>SJU *</td>
<td>0.80</td>
<td>1.03</td>
<td>0.98</td>
</tr>
<tr>
<td>Mean</td>
<td>0.892</td>
<td>0.955</td>
<td>0.974</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.141</td>
<td>0.093</td>
<td>0.049</td>
</tr>
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<td>Coefficient of variation</td>
<td>15.8%</td>
<td>9.69%</td>
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<table>
<thead>
<tr>
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</tr>
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<tbody>
<tr>
<td>PSU student</td>
<td>0.95</td>
<td>0.74</td>
<td>0.72</td>
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<td>PSU</td>
<td>0.92</td>
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<td>SJU *</td>
<td>0.71</td>
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<td>SJU *</td>
<td>0.64</td>
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<tr>
<td>SJU</td>
<td>1.06</td>
<td>1.12</td>
<td>1.01</td>
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<tr>
<td>Mean</td>
<td>0.856</td>
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<td>Standard deviation</td>
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<td>Coefficient of variation</td>
<td>20.45%</td>
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</thead>
<tbody>
<tr>
<td>PSU student</td>
<td>0.98</td>
<td>1.03</td>
<td>1.01</td>
</tr>
<tr>
<td>PSU</td>
<td>0.96</td>
<td>0.99</td>
<td>1.00</td>
</tr>
<tr>
<td>SJU *</td>
<td>1.17</td>
<td>0.94</td>
<td>0.93</td>
</tr>
<tr>
<td>SJU</td>
<td>0.86</td>
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<td>SJU</td>
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<td>0.95</td>
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<td>Coefficient of variation</td>
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<table>
<thead>
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<th>Second round</th>
<th>Third round</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSU student</td>
<td>1.06</td>
<td>0.99</td>
<td>1.02</td>
</tr>
<tr>
<td>PSU</td>
<td>1.00</td>
<td>0.99</td>
<td>1.00</td>
</tr>
<tr>
<td>SJU *</td>
<td>1.07</td>
<td>0.99</td>
<td>1.00</td>
</tr>
<tr>
<td>SJU</td>
<td>1.07</td>
<td>0.99</td>
<td>1.00</td>
</tr>
<tr>
<td>SJU</td>
<td>0.50</td>
<td>0.98</td>
<td>0.81</td>
</tr>
<tr>
<td>Mean</td>
<td>0.940</td>
<td>0.988</td>
<td>0.966</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.248</td>
<td>0.004</td>
<td>0.088</td>
</tr>
<tr>
<td>Coefficient of variation</td>
<td>26.35%</td>
<td>0.45%</td>
<td>9.07%</td>
</tr>
</tbody>
</table>

*See Form 2 for method of calculation*
their designated responsibilities or were overly dominant in the
effectively deal with team members who were not carrying out
among groups, the contracts defined how team members would
consider in forming and preparing teams, each team developed
and individually signed a social contract. Although they differed
focus on marketing aspects of the new product launch process,
into two major areas: the multidisciplinary nature of the course,
and team-based learning. The sharing of resources among
more closely mimics real-world new product development.
The sharing of resources among universities via the Web
further complicates this approach.
are inefficient and lead to frustration and underperformance.
and job security will be when they are on the job in the food industry.
by the industry speakers helped to sensitize the students to the career
merits to our multi-institutional Web-based approach to the FPIM
process. The synergistic model we have refined over the last three
years clearly enables us to draw on one another's expertise and
industry contacts. Furthermore, it is an efficient use of human and
fiscal resources. We plan to continue this approach in future
years to expand it to include other universities. With the ex-
fessor. Frequent allusions to the importance of teamwork by the
industry. Frequent allusions to the importance of teamwork by the
grade motivation in the course was not as impactful as salary and
job security will be when they are on the job in the food industry.
were constantly reminded that the class teams were designed to simulate the types of teams they would be participating on in their future professional careers, they seemed to have difficulty grasping the analogy. This is probably because the grade motivation in the course was not as impactful as salary and job security will be when they are on the job in the food industry.

### Conclusions

University FPIM courses generally are housed in food science departments and taught from the perspective of food science and technology. There is relatively less emphasis on marketing issues such as opportunity analysis, market testing, and the sell-in and launch process. New product courses taught in business schools focus on marketing aspects of the new product launch process, but underemphasize both food science and technology and production issues. One of the most significant advantages of the joint PSU-SJU food product innovation course is the multidisciplinary nature of the course, which brings together food science, technology, production, and marketing expertise, all of which are absolutely necessary for food companies to successfully launch new products. Moreover, the use of cross-functional teams in the course more closely mimics real-world new product development. The sharing of resources among universities via the Web and compressed video conferencing is a dynamic and effective approach to enabling students to enhance their knowledge of the FPIM process.

Group or team work can enrich the student learning experience. Its successful incorporation into a problem-based learning course requires effective preparation and monitoring by faculty. We have taken multiple approaches to optimizing team function:

- In addition to the aforementioned parameters that were considered in forming and preparing teams, each team developed and individually signed a social contract. Although they differed among groups, the contracts defined how team members would communicate and relate to each other, when they would meet, how they would organize and structure their meetings and between-meeting activities, and how they would deal with adversity within the group.
- A major challenge for teams and the faculty mentors was to effectively deal with team members who were not carrying out their designated responsibilities or were overly dominant in the team decision-making and presentation processes. Peer assessment and feedback were helpful in this regard.
- Mentoring by faculty helped to facilitate effective team function as well as ensuring that the team stayed on task and schedule. Cross-institutional teams required greater faculty involvement to ensure that frequent and productive meetings occurred.
- The required periodic ad hoc class presentations, in addition to the more formal PowerPoint presentations, stimulated ongoing group interaction and responsibility.
- Although students were constantly reminded that the class teams were designed to simulate the types of teams they would be participating on in their future professional careers, they seemed to have difficulty grasping the analogy. This is probably because the grade motivation in the course was not as impactful as salary and job security will be when they are on the job in the food industry.

Multiple indicators suggest that cross-institutional teams contribute positively to student learning and skill development. In addition to gaining invaluable experience in the types of situations they are likely to encounter in their professional experiences, they learn from one another via synchronous and asynchronous interactions. Problem-solving skills, group leadership, and time management skills also are enhanced. In contrast, cross-institutional teams are inefficient and lead to frustration and underperformance by team members. They are difficult to facilitate and manage. Variations in the traditions and cultures between campuses further complicates this approach.

A challenge which has been difficult to resolve is maintaining student attention, motivation, and involvement when the presenter is at a remote site. Without the traditional accountability forms (tests, theme papers, and so forth), students tend to become disengaged.

In the final analysis, we have concluded that there are many merits to our multi-institutional Web-based approach to the FPIM process. The synergistic model we have refined over the last three years clearly enables us to draw on one another's expertise and industry contacts. Furthermore, it is an efficient use of human and fiscal resources. We plan to continue this approach in future years and to expand it to include other universities. With the exception of eliminating cross-institutional teams, there is little that we plan to change.

### References


### Table 2—Effect of lectures and problem-based learning approaches on student knowledge levels at the beginning and end of the course

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Pre- compared to post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N⁶</td>
<td>Mean SD⁷</td>
<td>CV (%) Mean SD CV (%)</td>
</tr>
<tr>
<td>Lectures only</td>
<td>20</td>
<td>10.15 2.033</td>
<td>20.0 12.55 1.669</td>
</tr>
<tr>
<td>(SJU)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Problem-based (PSU &amp; SJU)</td>
<td>21</td>
<td>10.24 2.047</td>
<td>20.0 11.67 2.198</td>
</tr>
<tr>
<td>(PSU)</td>
<td>7</td>
<td>8.86 3.532</td>
<td>39.9 12.43 1.397</td>
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<tr>
<td>(SJU)</td>
<td>14</td>
<td>10.21 2.486</td>
<td>24.3 11.29 2.463</td>
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</table>

aControl group 
bExperimental group 
cProblem-based only
dProblem-based with some lectures 
eNumber of students 
fStandard deviation 
gCoefficient of variation

The results imply that the traditional lecture format does not do a better job of imparting the facts of the product development process. Furthermore, they support recent results indicating that the PBL format does not place students at a learning and knowledge coverage disadvantage (Lieux 1996).
Web-based product development course...