

Transformative Learning for Senior-Level Students in the Agricultural and Food Systems Interdisciplinary Program at Washington State University^{1,2}

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Abstract

Washington State University has consolidated some of its former agriculture department-based undergraduate programs and restructured them into multi-departmental interdisciplinary degree programs. One such degree program is called Agricultural and Food Systems (AFS, afs.wsu.edu). This successful degree program currently has 200 students enrolled. At the end of their degree program, AFS students take AFS 401 "Advanced Systems Analysis and Design in Agricultural and Food Systems", a senior-level, culminating capstone course. Semester-long student team projects with an industry partner (e.g., co-op or private company) were designed to provide transformative learning experiences, address emerging issues or problems and provide research-based recommendations. Students met regularly with industry partner mentors to develop a project management plan, establish research priorities, and collect research data. At the end of the semester, teams provided both a comprehensive written report and an oral presentation with recommendations both to their peers and to industry partners. Through survey and focus group activities, students indicated this course provided a transformative learning experience that extremely or moderately evolved their ability to solve problems and work as a team. Following industry partner de-brief conversations, partners indicated that student team research added value to their enterprise. Several partners indicated student's professionalism, teamwork skills and receptivity to feedback exceeded their expectations. Most indicated that if they had an open position, they would hire one or several student team members.

Keywords: transformative learning, industry partnership, professional skills

Introduction

A report by Hart Research Associates (2015) includes an online survey of 400 company executives and over 600 graduating college students. Of particular interest in this report is the fact that employers and students have considerable gaps in how they rate student preparedness for the workforce. Of six particular student skills that were assessed in the survey (locating, organizing and evaluating information; oral communication; written communication; critical/analytical thinking; analyzing/solving complex problems; applying knowledge/skills to the real world), on average, 60% or more of the students thought they were "well prepared" while only 20-30% of employers thought the students they hired and who were working for them were "well prepared". If this is a national trend for college graduates entering the workforce, clearly, there is great room for improvement in how we design and execute our academic programs to provide the very best relevant education and related transformative learning experiences possible to prepare our students.

Over the last decade in the College of Agriculture, Human and Natural Resource Sciences (CAHNRS) at Washington State University (WSU), considerable efforts have been made to create transformative student learning experiences that enhance student preparedness for the workforce (Cerny et al., 2007). One of the significant steps taken was to create two interdisciplinary undergraduate degree programs. One

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of these, the Agricultural and Food Systems (AFS) interdisciplinary degree program, involves eight aligned disciplines that contribute to agriculture and food production: Crop Science, Soil Science, Horticulture, Entomology, Plant Pathology, Economics, Food Science and Animal Sciences. Besides the traditional discipline-based courses, students also take courses that are interdisciplinary by design.

Another significant effort of the college was the creation of the "Student Experience Advisory Council" (SEAC). The membership of this council includes faculty, staff, student representatives, interested alumni and industry partners. The council meets twice a year to share about programs, discuss ideas, identify needs and explore opportunities for transformative student learning experiences. The industry partners provide valuable input to faculty on what employers are looking for in future employees. In particular, they are interested in professional or 'soft' skills, the ability to solve problems and work effectively in teams. Industry partners often serve as student summer intern advisors or they may contribute time and/or resources to support student professional development. In some cases, they may directly participate in some of the interdisciplinary courses such as AFS 401. Further, they participate in job fairs and they often hire many of our graduating students. In many cases, industry partners are alumni from our programs. Their loyalty to the college and their desire and willingness to help us create an outstanding transformative student learning experience is making a difference. Many of our senior-level students have one or more solid industry job offers before they graduate.

The purpose of this manuscript is to focus on student transformational learning through participating in a senior-level, culminating, interdisciplinary capstone course that provides substantial and intentional interaction between students and partners from industry dealing with a real-world scenario. The course is AFS 401 "Advanced Systems Analysis and Design in Agricultural and Food Systems" (AFS Capstone). Well-designed and executed research-based undergraduate capstone courses can provide many positive and meaningful outcomes to students (Hauhart and Grahe, 2014; McKinney and Day, 2012). In particular, McKinney and Day (2012) noted that students in their study reported learning valuable research skills that enhanced their professional and academic development. Further, capstone courses can also provide a positive means to assess the success of the student learning experience (Sum and Light, 2010). They observed that by aligning institutional and programmatic goals, incorporating various forms of assessment in the class, they were able to achieve an end result of greater student and faculty buy-in and the ability to more effectively impact and assess student learning.

The AFS Capstone is designed to encourage students with integrating and applying all of the skills they have acquired in previous AFS program course work to analyze current challenges and opportunities in agricul-

ture. Students are provided with the opportunity to apply scientific inquiry, critical thinking, and problem-solving skills in a team setting to analyze agribusiness challenges and to develop original research related to issues in agricultural and food production. By emphasizing collaborative interdisciplinary teamwork, this course replicates challenges students will face in the professional work environment. Pfaff and Huddelson (2003) noted that positive teamwork experiences in the undergraduate educational program can enhance student preparedness for future roles and responsibilities in a later professional career. In the AFS 401 course, by using effective scientific inquiry and communication skills, students create an original strategy for addressing the concern or initiative that is presented to a panel of stakeholders and peers in a formal oral presentation, as well as in a written report. In order to consciously improve their ability to use scientific information to address an issue, to convey scientific information to others in an effective manner and to be a valuable teammate, students are regularly provided with constructive feedback on their scientific writing, public speaking and teamwork skills.

Methods

Course Evaluation

To ensure that a capstone course continues to meet its student learning outcomes it is advisable to regularly assess it by appropriate methods. Student feedback may be gathered from online course evaluations, exit surveys and student exit interviews (Gizerian, 2014). Unfortunately, since student feedback from these methods is not compulsory, participation rate may be inadequate to draw representative conclusions upon which to base future decisions regarding programmatic change. This may be due, in part, to "survey fatigue" and the sense by students that their opinions really do not matter or that they will not result in any substantive change (Porter et al., 2004). As senior-level students near the end of the semester with final project presentations/submissions looming, preparing for final examinations, taking job interviews, requests for online course evaluations and participation in various online surveys, etc., time-challenged students may simply be overwhelmed and opt not to participate in anything that they deem trivial. Porter et al. (2004) noted that response rates suffer under such conditions. Alternatively, Ward et al. (1991) observed that the use of facilitator-guided focus groups provides similar results to surveys and that they provide an added benefit of getting additional details. The focus group method to receive student feedback gives students the benefit of being heard concerning their perceptions and experiences by a neutral facilitator (Gizerian, 2014). Since the focus group participates in a guided conversation, student participants hear each other's answers and may be drawn to elaborate more freely about how they really feel or what their actual perceptions are to a particular issue (Gizerian, 2014). If focus groups are conducted

Figure 1. Student self-assessment of skill set evolution during their AFS degree program.

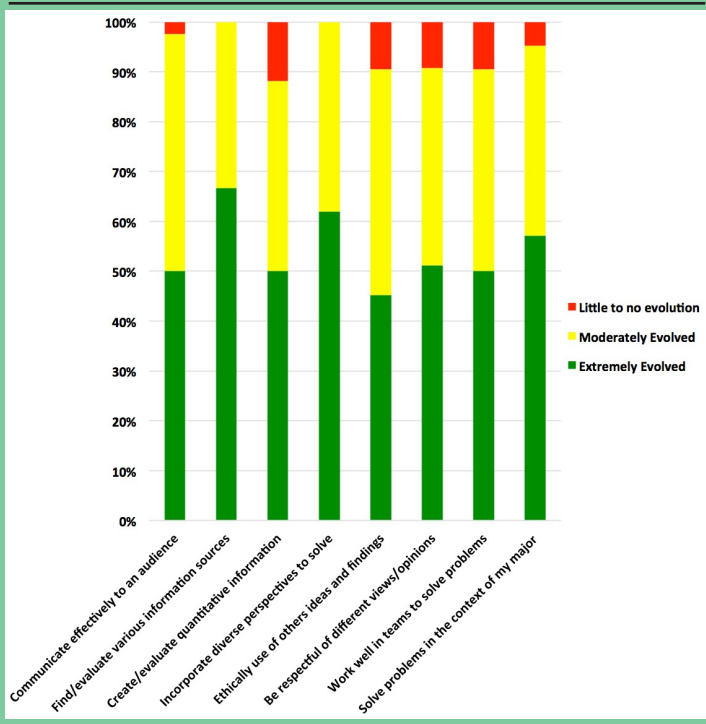
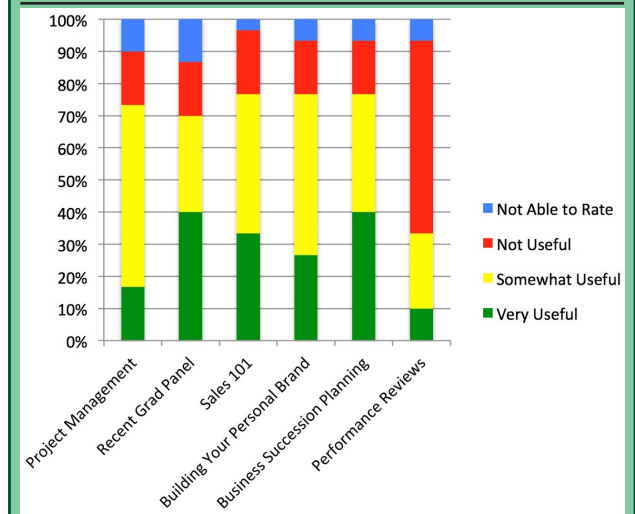


Figure 2. Student usefulness rating of invited guest speakers based on topic.



during regularly scheduled class time, participation rates will be high. When the course instructors are not present, the students are assured anonymity and the trained facilitators encourage active group participation, more open and honest expressions of student feelings and perceptions can be elicited and recorded. Ward et al. (1991) noted that when considering issues related to program development, the data obtained from focus groups could be used as a stand-alone methodology.

In this study, we utilized several methods to gain insights from students and industry partners on the AFS Capstone experience and how we might improve it in the future. For students, this was accomplished near the end of the semester by an online and paper survey and two facilitator-led focus group sessions. For the industry partners, this was accomplished by telephone de-brief interviews the semester after the course was completed. These were typically 30-60-minute conversations where the industry partner responded to a standard set of formal questions. At the end of the interview, the industry partner was given freedom to express any additional thoughts, concerns or suggestions that they had for the benefit of both the instructor and the future class.

1. Online Exit Survey: As part of a college standard best management practice, a voluntary, anonymous online exit survey for graduating senior students is distributed late in the spring

semester prior to graduation. Student responses and survey data are not available to instructors until after student final grades have been submitted. Survey data is used as part of our annual programmatic assessment, as a means to share feedback with instructors, and to provide feedback that can lead us toward programmatic adjustments to enhance student learning outcomes through transformational learning experiences. To ensure a high response rate for the AFS 401 graduating seniors, students were given the opportunity to complete the survey in class as an “extra credit” opportunity. It was still anonymous, and we did not have access to the data until the following semester. Average responses of the 36 AFS 401 students to questions related to their perceived professional skill set evolution over the course of their degree program are summarized in Figure 1.

Table 1. Selected Student Focus Group Questions and Comments

| Question | Student Comments |
|---|--|
| What were some of the strengths of this course? | The opportunity to work with industry in a real-world setting; real-life projects and exploring outside industries and companies; building communication skills and using different modes with industry partner (face-to-face, e-mail, Zoom web video-conferencing); it was challenging which made it worthwhile; everyone had to contribute to succeed |
| What were the most valuable skills that you learned or practiced? | Knowing that our professors and industry partner had high expectations of us pushed us to get our reports done early and listening to and accepting feedback from our partner; being patient with others and practicing self-control in a group setting; the recent graduate panel was really helpful; practicing public speaking skills; learning how to better synthesize information; strengthening professional skills |
| What was the value in doing the industry project? | Working with industry professionals and having face-to-face interactions; the on-site visit to our partners place of business (should be required); working in a group setting even if you didn't get the project you wanted – sometimes you have to get things done that you don't like; having to coordinate with people over an entire semester is character building |
| What skills were required to successfully complete the project? | Coordinating meetings with our team and scheduling with our industry partner; critical thinking and using strengths of different members on the team; playing to all of our strengths; creativity – we had a very open-ended problem |
| Was it valuable to you to do original research? | Yes, we had to reach out to a lot of organizations in order to expand on different aspects of the project – we learned a lot; it was beneficial because they were all actual problems that the industry faces every day – it wasn't like homework that others have done; both the research and public speaking were helpful; partners don't already know the answer so they are engaged and are interested in hearing our ideas |
| Did you prefer to self-assign or be instructor-assigned to teams for class activities? | Being assigned to groups was valuable; we had a diversity of majors on our team – this helped with the project quality; I got to be with people other than those that I would normally work with; it was awesome to be exposed to other experiences and perspectives through them |
| Were you pleased with the level of engagement with your industry partner? Share some specifics. | The communication with our industry partner was fantastic; we wanted more direction from our industry partner for the project management plan; we met with our industry partner every week; our industry partner was honest and told us when it was a really busy time and they could not meet with us; it was a little hard to get connected in the beginning but after our first face-to-face meeting we could see that our partner was interested in helping us |
| Where do you see room for improvement in this course? | It would be great to have more in-class time to work with our team on the industry project; felt we were being “micromanaged” with all of the industry partner check-in activities; the assignments could have been spaced out more; needed a more concrete example for the project management plan |

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2. Student Focus Groups: In order to facilitate an environment where students could openly and honestly express their feelings and perceptions about the AFS Capstone, focus groups were conducted during a regularly scheduled 75-minute class period. The AFS Capstone class was divided into two equal-sized groups. Half of the students were moved to a separate classroom for the focus group activity so that the sizes of the two groups were not too large (less than 20 students per group). The focus groups were facilitated separately by a pair each of an Assessment Specialist and note taker from the Office of Assessment of Teaching and Learning (ATL) at WSU. Course instructors were not present during the focus groups and students were informed that their candid responses were encouraged and that their input would be anonymous. Individual students first responded to a short-written paper survey of questions. Student responses to part of the paper survey are summarized in Figure 2.

After completing the individual paper survey, students responded orally as a group to a series of questions posed by the facilitator. Both the questions for the individual paper survey and the group oral session were previously prepared and vetted by the course instructors, assessment specialist and members of the AFS program assessment committee. Critical questions and representative student comment themes are noted in Table 1.

3. Industry Partner Team Projects: Five different industry organizations partnered with our class to offer a total of seven different student team projects (Table 2). Student team composition for the industry partner projects was determined by the course instructors based on three criteria: i.

The student's respective major in the interdisciplinary degree program; ii. The student's cumulative grade point average (GPA); and iii. The student's preferred industry project topic. Students had an opportunity to hear presentations about projects from the industry partners in class and they were allowed to rank their project preferences. In every case, we were able to match students with either their #1 or #2 project choice preference. This method of determining team composition enabled us to ensure that teams were sufficiently diverse both in terms of academic major and scholastic performance. Further,

Table 2. Semester-long student team project industry partner, industry problem posed to the student team and solutions offered by the team to the industry partner.

| Industry Partner | Problem Posed ^a | Solutions Offered ^d |
|--|--|---|
| CHSPrimeland^a (http://www.chsprimeland.com) | Determine location for new satellite plant | Three locations suggested and prioritized based on proximity to the new Port of Wilma plant and the strategic opportunity that each represent: 1. South of Colfax, WA; 2. North of Colfax, WA; and 3. Pomeroy, WA. |
| Darigold^a (http://darigold.com/) | Expand current operations to include organic milk? | 1. Offer full product line of organic fluid milk and cheese products; 2. Consider adding new, value-added specialty products (e.g., protein bars, dairy-based cosmetics) |
| Moscow Food Co-op^a (http://www.moscowfood.coop/) | How to grow demand for mid-level shoppers | 1. Add Snapchat to social media toolbox; 2. Develop educational and promotional videos; 3. Develop new advertising flyer and promote through local businesses |
| NWFCS^{b,c} – Team 1 (https://www.northwestfcs.com/) | Employee succession planning and customer relations | 1. Transition new employees into existing lender/borrower relationships; 2. Providing financial incentive for retiring employee to mentor new employee; 3. Extend and expand new employee training program to include assigning a mentor at the conclusion of the program |
| NWFCS – Team 2 | Expanding public awareness of agriculture in urban western WA | Invest time, funding, and expertise to partner with existing Whatcom county and Washington State Farm-to-School programs; 2. Partner with others to create a new Adopt-A-Farmer program for western WA |
| NWFCS – Team 3 | Relationship lending – changing technology with the times | 1. Ensure that banking app in development is as user-friendly as possible; 2. Utilize web-conferencing with tech. savvy customers (e.g., Skype); 3. Use Twitter for short updates; 4. Use Snapchat for borrowers to share time-sensitive farm information with lender that can be archived into an electronic journal; 5. Develop a new customer survey |
| Wilbur-Ellis^a (http://www.wilburellis.com/) | Custom chemical application in the Inland Empire area – risks and benefits | 1. Lease rather than buy equipment; 2. Establish a 5% markup on custom application practices; 3. Conduct market research on consumer trends and competitor offerings; 4. Use excellent applicator training programs to reduce liability risk and increase customer satisfaction. |

Footnotes: ^a = cooperative; ^b = commercial business; ^c = Northwest Farm Credit Services; ^d = problem posed and solution offered is abbreviated and simplified for purpose of table.

Table 3. Selected questions and comments from industry partner de-brief interviews

| Question | Industry Partner Comments |
|---|---|
| How did your participation in this course provide value to your company? | Great to get a student perspective on our problem; this project helped us address one of our strategic goals of educating the community; being on campus, interacting with students, telling our story is a great avenue for recruiting; wish I would have had this kind of opportunity when I was in college; get to see where students are in terms of their actual capabilities and soft skills; a longer term period to observe them than could occur in an interview; get to see how they solve problems and work in a real-world team setting |
| Were the recommendations that the students provided to you something that you will implement in the future? | Yes, they did a good job in analyzing the situation; It mirrored what we did in our strategic planning; not a slam-dunk, our business is very conservative and moves slowly; Yes; their efforts will not die with me; Yes, provided relevant feedback that will be part of our culture and business practices in the future; Yes, we have already developed a SnapChat account and are using it and are planning new videos |
| What did students seem to struggle with the most in their project? | They struggled a bit with wrapping their heads around our business model – probably should have provided them with more background sooner; our team was great, struggling to find something to criticize; there was no “answer key” to our problem, there was no formula or preconceived outcome; difficulty in finding peer-reviewed research to support their problem; because it was an open question it was a challenge to narrow the topic down |
| In what areas did they exceed your expectations? | Professionalism, conduct and receptivity to feedback; teamwork, organization and professionalism; organization, leadership and collaboration – very professional; open-mindedness and inquisitiveness; they responded very well to some tough questions during their final presentation; their final report was A+ quality – they went above my expectations |
| Did you meet with the student team at your site? How was this valuable? | Yes – it helped the team understand what we were doing; Yes – face-to-face cannot be replicated digitally; company HR person chided us for not including her in the site visit (for recruiting purposes); Yes – valuable to meet our staff, see our facilities, ask questions, etc. |
| Would you consider hiring any of the students on the team you mentored? | Yes – one is working for us now; most definitely; absolutely – very professional, good base knowledge and desire to learn/understand; would consider hiring 4 out of the 5 team members; we would have hired two but one took a job with a competitor |
| If you were to mentor a team in the future, what would you do differently? | I would be on campus for the first meeting and it would be outside of class so not as time limited to get the team off to a good start; would provide more in-depth company information earlier; need to keep the project ideas fresh and relevant; I would push for the in-person field visit to occur earlier in the semester; I would supervise the team more closely and help them to better set the scope and milestones (basic project management stuff) |
| Would you be willing to mentor a team in 2017? | All – a resounding Yes; already talking with colleagues about ideas for projects; great experience; a great opportunity for our organization. |

it helped to ensure that students would be working on a project topic for which their interest was genuine. After the course was completed, the instructor interviewed each industry team project partner by telephone (30-45 min. each). Each partner was asked a standard set of questions about the course, in general, the team project and their interactions with the team, in particular. Some of the representative questions and common industry partner responses are noted in Table 3.

Results

1. Online Exit Survey: For AFS 401 graduating seniors, based on their own self-assessment in the online survey, they reported that their skill set in eight specific areas either extremely or moderately evolved (Figure 1). Those skills that they identified with the greatest total evolution were the ability to find and evaluate various (scientific) information sources, incorporating diverse perspectives to solve problems and solving problems in the context of their major. An important factor identified that our SEAC members noted was the need for students to have stronger teamwork skills. Based on their self-assessment by the survey, 90% of the students indicated either that they extremely evolved (50%) or moderately evolved (40%) in their ability to work well in teams to solve problems.

2. Student Focus Groups: Based on the individual paper survey, there was agreement (>70%) that nearly all of the guest lectures by industry professionals in the AFS 401 course were very or somewhat useful (Figure 2). The project management lecture, in particular, was directly related to the industry partner team project. The two industry interactive sessions that had the highest very useful rating by students were the panel of recent graduates and the father-son team that talked about succession planning at their family fruit farm. Building your personal brand and Sales 101 lectures were well received by the majority of students. The students found guest lectures much more useful where the speaker directly engaged them in discussion.

Student focus groups noted that the opportunity to work on real-life industry problems in a real-world setting was a primary strength of the course (Table 1). They appreciated the emphasis on strengthening their professional skills. They identified the value in on-site, face-to-face interaction with their industry partners. They valued having a diverse team (representatives of each of the majors in the AFS program) and playing to each other's strengths. Since most of the industry-posed problems did not have easy answers, students felt challenged to provide interested partners with their ideas. Most teams were very pleased with the communication they had with their partners and valued their input and critique. They noted that they would have appreciated if more in-class time had been allotted for team project work because it was difficult to find times when everyone on the team could get together for a meeting outside of class. For a list of industry partners, the problems that the students were asked to solve and an abbreviated summary of the solutions they offered, please see Table 2.

3. Industry Partner Team Projects: The industry partners overwhelmingly found this to be a very valuable experience for their co-op or company (Table 3). Highlights for them included getting a student's perspective to their unique question, the opportunity to "preview" students, so-to-speak, who they might want to recruit for jobs, and seeing students evolve in their professional skills over time. Depending on the project

and team recommendations, some partners had already begun to utilize the recommendations while others were weighing the need for additional input and data. Students seemed to struggle initially with problems that had no easy answer, however, once they had a face-to-face meeting with their partner and got more information, they were able to make good progress. Student professionalism, organization, willingness to respond to critique and collaborative ability exceeded many partners' expectations. All partners indicated that if they had an open position, they would have considered hiring at least one member of each team. In some cases, they said that they would hire all of the team members. Partners indicated that it would be ideal to have their first face-to-face meeting with student teams earlier in the semester. All of the industry partners committed enthusiastically to partnering with the class again in the following academic year.

Discussion and Conclusions

Contrary to the findings of Hart Research Associates (2015) as evidenced by both indirect (online exit survey and student focus groups) and direct measures of student achievement (industry partner de-brief), students in the AFS Capstone were well prepared for the workforce as represented by the partners who evaluated them. For nearly all students, the AFS Capstone occurs in their final semester before graduation. It represents the culmination of at least four years of learning and growing towards completing this interdisciplinary degree. The AFS degree program is punctuated with other interdisciplinary courses, team projects, extracurricular activities and transformational learning experiences such as industry-funded internships and other professional development opportunities. As noted by others, the capstone course model can provide positive and meaningful student outcomes and a positive means to assess their success (Hauhart and Grahe, 2014; McKinney and Day, 2012; Sum and Light, 2010). Overall, this course provided significant benefits to both students and their industry partners. The connection between students and industry partners was transformative in helping them learn how industry issues are faced and addressed in the real world. Industry partners valued the student's fresh perspective regarding their problem, their ability to provide research-based recommendations and the opportunity to recruit future employees.

Some student and industry partner suggestions for course improvement included ensuring that guest lecturers actually engaged the student audience, starting the team projects sooner in the semester and making sure that face-to-face meetings with industry partners occurred outside of class and sooner in the semester. Students and industry partners both indicated the significant value of having student teams visit their off-campus worksite for tours, meeting staff, learning more about the business, etc. Based on student feedback, some future course changes include providing more

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in-class time for teamwork, a reduced frequency of industry partner check-in activities, more evenly distributing graded student work throughout the semester and including peer-evaluation. In their study, Pfaff and Huddelson (2003) noted that the student teamwork experience could be improved when the workload was reasonable and when teams were given in-class time to work on their projects coupled with peer-evaluations. Industry partners who have agreed to mentor project teams in the future have already been challenged to come up with “fresh” new ideas for problems for students to explore. All indicated excitement about the possible solutions teams may come up with along with the potential to identify outstanding students to recruit to their business in the future.

One unexpected issue that came up in the industry partner project part of the course is worth noting for others who may choose to utilize a similar model. One of our industry partners had a situation arise early in the semester where they were unable to provide the time necessary to support their team adequately. This partner had recently hired one of our graduates as a new employee. The new employee had taken the AFS Capstone previously and knew many of the students who were on the current team. This new employee was asked by their supervisor to take the responsibility to lead the team in their absence. We recommend that industry partners should be sufficiently experienced in their job (at least five years post-graduation). This will help to ensure that student teams regard the partner not as a peer but as a senior professional to whom they owe the appropriate respect and courtesy. Another unexpected issue that came up had to do with a request for confidentiality by an industry partner related to intellectual property development that was part of the team project. In this case, the partner developed a non-disclosure agreement (NDA) that was reviewed and modified by our university legal counsel. Student team members and the university voluntarily signed the NDA. The expectation by the university was for the company to clearly identify any/all information as “confidential” to the students before it was shared with them.

As noted previously, it can be challenging to acquire representative feedback from students (Gazerian, 2014) and outside partners on which to base future programmatic change decisions. Porter et al. (2004) cited the problem of “survey fatigue”. Ward et al. (1991) observed that focus groups could be an efficient means to acquire reliable information comparable to that collected by surveys and that additional helpful details could be gleaned. In this study, we achieved good student participation in the online and paper surveys and the focus group meetings. We also received excellent feedback from the de-briefing interviews of all of our industry partners. We suggest that a combination of direct and indirect methods of program and course assessment will provide tremendous value to inform future decision-making. However, in situations of limited resources available to collect the data, Ward et al. (1991)

suggested that focus groups could be used as a stand-alone methodology.

It is important to realize that developing productive relationships with industry partners for the benefit of students takes time, a willingness to compromise, the development of trust and an understanding of how such relationships can provide transformational learning opportunities for all participants. Through the SEAC noted previously, we have an active group of critically influential, committed and involved outside partners with whom to work. Our desire is to provide these future employers with the best potential workforce possible and that they will actually recruit our graduates for positions in their companies. Fortunately, based on anecdotal information of graduating students, many have more than one job offer before they graduate. Perhaps as others utilize similar and even different approaches in the future, the discouraging results about workforce preparedness and employer satisfaction of student graduates noted by Hart Research Associates (2015) will begin to improve.

It is critically important that the instructor and industry partners roles, expectations, and desired outcomes are clearly communicated, understood and agreed upon before the course begins each year. Frequent communication between the instructor and partners during the semester can help student teams to stay “on track” and ensure that project deliverables arrive on time and that they have been properly vetted by the partner. Each year, it is encouraged to intentionally seek out strong, committed partners who have well thought out projects that are achievable by a student team within the timeframe of the course. We have found that to keep the course vibrant and fresh, we solicit new and different projects each year. Further, we try to identify and incorporate new partners as often as possible. There are some “tried and true” partners who are committed to the class and who want to participate on a recurring annual basis. Provided that they continue to bring new and pertinent projects and that they do a good job mentoring student teams, this is encouraged. However, there should always be the option to “take a year off” to get a rest and come up with some new ideas. It is also advisable to notify potential new industry partners beforehand of the typical time commitment necessary to successfully mentor a student team (e.g., 10-20 hours total for AFS 401). If they are interested in participating in the class but they have insufficient time to devote to the students, it would be better that they participate in a less time-consuming way (e.g., provide guest lecture, serve on industry panel, provide site tour, etc.). In some cases, the partner may find that they did not particularly enjoy the experience or that the demands of their regular job were such that they could not devote sufficient time to provide an excellent experience for the students. In such cases, we would advise graciously thanking the partner for participating and not asking them to participate again. To ensure the long-term success of a course such as this, it is necessary to both solicit and

act upon relevant feedback from both students and partners. Each year this course has been offered, informed adjustments such as these have subsequently helped to improve the class and enhanced our ability to meet the student learning outcomes and provide transformational student learning experiences.

Summary

The AFS 401 "Advanced Systems Analysis and Design in Agricultural and Food Systems" culminating capstone is featured as an example course providing transformational learning for senior-level students. Semester long, team-based projects with an industry mentor partner aim to help students learn how to solve real-world problems in a professional context. Successes and learning experiences of students, industry partners, and instructors are highlighted.

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