

# Across the stage and into the world

## Capstone courses create a bridge for college students

The journey through college begins and ends with students in transition. Freshmen get a glimpse of college during orientation classes, and many seniors take capstone courses as they prepare to cross the Gallagher-Iba Arena stage and find paths leading in new directions.

Though defining senior-level capstone courses often encourages discussion among academic affiliates, many at Oklahoma State University agree: Capstone courses add value to educational experiences, career-seeking students and collegiate programs.

"Capstone courses give students an opportunity to summarize, synthesize and apply the skills they have learned while studying a variety of subjects within their undergraduate program," said Ed Miller, College of Agricultural Sciences and Natural Resources associate dean.

Through capstone courses students work on a scenario similar to what they may do in a job while still having the comfort of a class environment and the knowledge that a professor is available to direct and guide the work if needed.

If this description sounds like an internship more than a capstone, consider these points of contrast: Capstone courses involve working with peers while internships may not; in a capstone course students work on a level of equality with fellow students and professionals to accomplish a goal, whereas an intern works with a boss and co-workers in a situation of hierarchical cooperation.

Miller said capstone courses and internships are alike in that students "work on real problems and issues for real people in the real world."

Capstone courses that complete degree programs for technical majors, such as landscape architecture and agricultural engineering, are required and defined by the organizations that accredit these programs, he said.

These pre-defined courses do not require participation in professional projects; yet many capstone professors search for professionals to collaborate with students.

"We have many individuals, businesses and agencies interested in our academic programs providing interesting projects for our capstone courses," said Miller. "That's one of the reasons why our capstones are particularly good."

Miller said faculty in departments supporting non-accredited programs have a choice of whether to include a capstone as a required course. Neither OSU nor CASNR make a mandate on the subject, but both promote the philosophy that capstone courses are valuable where they are feasible.

"We expose students to career opportunities and try to get them in a position where they can present themselves well, whether they are looking toward graduate school or finding a job," said James Stiegler, plant and soil sciences professor and department head.

Stiegler teaches PLNT 4571 Senior Seminar, in which students are required to research and discuss senior-level current topics in addition to completing professional development activities.

Although these are elements of a capstone course, Stiegler does not consider his course a capstone because it does not review all the information students have learned throughout their degree program and apply parts of it to an activity or project.

According to many of the professors in CASNR and across campus, there was a push about 10 years ago to make it mandatory that every university department include a capstone course in its senior curriculum.

Each department began researching, creating committees and planning how they would structure such a course for each discipline, said David Buchanan, animal science professor. But before the process was completed, the idea was retracted.

The reason capstone courses were not made mandatory came down to economics for many departments, said Richard Berberet, entomology and plant pathology professor. The funding and human resources would have cost too much for the university to afford such a mandate, he said.

In other departments the challenge was creating a course that adhered to the strict definition of a capstone course the university was promoting at that time.

"The capstone was to be a summation experience for students where they would use all the information they had been gathering and obtaining," Berberet said.

Many departments reported it was too difficult to cover this breadth of material within one course.

Berberet said since the decision to have mandatory capstone classes was abandoned, some capstone courses returned to their original titles and formats. This is one of the reasons some capstone courses do not include the word "capstone" in the title.

Academic departments throughout CASNR have continued to redevelop and improve capstone courses.



Steven Fowler, biosystems and agricultural engineering senior, prepares for a life far away from campus, football games, tests and quizzes where he will use his knowledge and experience as a professional. (Photos by Sarah Fultz Prater)

"Students face big challenges when they graduate from college," said Miller. "Some may doubt how much they have learned and how well they will perform in a work setting."

Miller said a capstone experience for most students gives them a tremendous boost of self-confidence. They begin to realize how much they have changed throughout their college years, acknowledging the skills and abilities they have developed.

Candi Johnson, biosystems and agricultural engineering senior focusing in biomechanical engineering, said participating in the capstone course for her major, BAE 4012 and BAE 4022 Senior

Design, is much the same as working on a design team for an engineering company.

She and four other students are working on a multi-faceted project directed by the Environmental Protection Agency to redesign silt fences used to contain soil erosion within construction areas.

"We learn to do a project proposal, take it to management and get an approval—all the different phases we would go through in industry," Johnson said.

The biosystems and agricultural engineering capstone is unique because it is stretched throughout two semesters instead of one. Students begin the year brainstorming about project possibilities and forming groups depending on their interests.

During the first semester, they research their project and devise a plan. The second semester is spent creating their design and working out implementation difficulties.

"It's good because none of our other classes have included working with a machine shop. In a lot of classes we draw something in a computer program and then we're done; with this one we actually have to build it," Johnson said.

Capstone projects vary from creating real-world solutions for businesses and firms to researching specific topics and giving presentations. Though some capstone assignments are similar in structure to those given in prerequisite courses, capstone students experience a higher level of expectation, as well as more stringent requirements.

Team work is the most important capstone lesson for Crystal Smith, animal science senior. She said group work in the required course, ANSI 4863 Capstone for Animal Agriculture, was different from group projects she had completed in the past where the task could be accomplished by delegating separate parts to each member and merging the parts before handing in the assignment.

"We had to learn how to work together and not just how to put things together," Smith said.

The course involves assimilating information and applying it to issues facing animal agriculture and the food industry, Buchanan said.

"Students are exposed to guest speakers and concepts of research and learn independently, choosing their own topics and learning about those topics," said Buchanan.

"Then each student presents to the class what he or she has found along with the conclusions drawn from research."

He said students specializing in live-stock-oriented degree options also take one or more courses which represent another type of capstone course.

"In these courses, the students apply previously obtained knowledge to the study of production systems pertaining to a specific type of livestock," Buchanan said.

While students are the focal point of capstone courses, the businesses that engage with students and the degree programs from which they will graduate also benefit from being part of the capstone process.

Surveys taken by alumni and employers indicate where there may be gaps in graduates' knowledge or ability. This feedback enables faculty to adjust the curriculum and course design to ensure students are learning the information and skills they need to be successful in their careers.

Industry professionals gain fresh ideas from capstone projects and reports. They also shape what future graduates will know and get the chance to meet potential employees.

For many students, interacting with professionals can help them find a job, build a portfolio or résumé, and begin to develop a name for themselves, said Dan Tilley, agricultural economics professor.

Agricultural economics students can choose from five courses that contain capstone elements. In Tilley's class AGEC 4423 Agribusiness Management, students work in teams to complete two projects.

The first project involves a computerized game and teaches students about managing a production system through an agribusiness management simulation.

"The game emphasizes marketing production and all the decisions that are integral to maintaining a successful operation," said Tilley. "For the second project, students take on a business planning problem for a real firm."

Tilley said companies have a tendency to use some, if not all, of the ideas students develop. However, students' plans are never directly implemented without some changes being made first.

Solutions students create for business and industry in environmental science, landscape architecture, and biosystems and agricultural engineering capstone courses are often accepted and applied, depending on the restrictions of the discipline of the client's environment.

For example, a design for an engineering plant cannot be implemented outright

(continued on page 48)

## Students to professionals

(continued from page 19)

because law requires that a designer must be a licensed engineer before the plan is used, said Paul Weckler, biosystems and agricultural engineering professor.

In agricultural communications, agricultural education and other non-licensed disciplines, students' solutions can be directly adopted when professionals see fit. OSU students have contributed to a wide variety of professional endeavors directly and indirectly, said David Lewis, forestry professor and environmental science undergraduate program director.

"Among the current projects that exist because of the work initially done by students are the White Paper Recycling program at OSU and the Stillwater Creek Project," Lewis said.

Students also have made recommendations addressing issues including biomass emissions, composting at OSU's poultry facility, defining the feasibility of odor abatement relative to the Oklahoma Senate swine bill and identifying a volatile hydrocarbon contaminant in soil, said Lewis.

Agricultural education students convert their education into practice while fulfilling the requirements included in A GED 4103 Methods and Skills in Teaching and Management in Agricultural Education.

According to the OSU Department of Agricultural Education, Communications and 4-H Youth Development, agricultural education seniors must develop units of instruction and instructional teaching tools



Candi Johnson (left), Kody Rathe rston and Kent Evatt are completing their majors focused in biomechanical engineering and will work closely with Ditch Witch executives, Richard Sharp (second from right), research and development project manager, and Kevin Self, manager of research and development, in developing a real-world solution for installing silt fences efficiently to avoid erosion around construction areas.

before they leave campus to begin 12 weeks of student teaching.

From college freshmen to capstone seniors, OSU students overcome many challenges on their way from the Admissions Office to the other side of the Gallagher-Iba Arena stage, he said.

Some may return as industry professionals to add a real-world edge to future capstone experiences. Others could someday work as educators, creating their own courses that carry students through the transition from college to the working world.

Regardless of their backgrounds or future prospects, students benefit from the solid ground capstone courses can provide during a time when questions are abundant.

"Capstone courses help students focus on what they have accomplished academically and professionally while at OSU," said Miller. "Hopefully, the realization of the skills and capabilities they have developed helps bridge the gap between life as a student, the graduate's first job and ultimately a successful career." ♦ *By Sarah Fultz Prater, Stillwater, Okla.*