Interdisciplinary Capstones for All Students

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Abstract

Every student at Elon University completes an interdisciplinary capstone with a capstone project as the culminating experience of the Elon Core Curriculum. These courses are opportunities for students to integrate and apply what they have learned during the college experience. The capstone also challenges students to consider larger themes of the Core Curriculum – ethical reasoning and personal and social responsibility within local and global communities. This paper offers examples of interdisciplinary capstones across higher education, an overview of Elon’s program, and assessment data showing the perceived learning experience in interdisciplinary capstones to be rated higher than in disciplinary courses.

Keywords: capstone; integration; interdisciplinary, general education; core curriculum

Introduction

Capstone experiences create an opportunity for students to integrate their prior learning in college. They have been defined as “culminating experiences (that) require students nearing the end of their college years to create a project of some sort that integrates and applies what they’ve learned” and are endorsed as a high-impact educational practice by the Association of American Colleges and Universities (AAC&U) (Kuh, 2008, p. 11). Similarly, the Boyer Commission (1998) recommended that every undergraduate program should culminate with a capstone experience, including a capstone project.

Levine (1998) identified four purposes to senior capstone courses: integration of college experiences, breadth beyond the major, application of student learning to produce a substantive product, and transition to the world beyond college. Ideally, a capstone also provides students with the opportunity to demonstrate higher-order skills such as integration, reflection, synthesis, and interpretation. As Boyer said, “As students see how the content of one course relates to that of others, they begin to make connections, and in
so doing gain not only a more integrated view of knowledge, but also a more authentic view of life” (Boyer, 1992, p. 92).

Capstones are most commonly disciplinary in nature and built to serve majors. However, some institutions have interdisciplinary capstones to provide better alignment with the mission and goals of general education. As Henscheid (2000) reported, the most common purpose of interdisciplinary capstones in a survey of 707 institutions was “promoting the coherence and relevance of general education” (p. 95). Interdisciplinary capstones are also useful for assessing whether students have fulfilled the goals of a general education program and the university as a whole. Depending on the curricular design, interdisciplinary capstones may exist alongside or as an alternative to a disciplinary capstone.

The learning outcomes of interdisciplinary capstones often reflect the nature of the complex problems that students will encounter after college. For example, in a survey of American institutions, Padgett and Kilgo (2012) found that the most common learning outcomes of interdisciplinary capstones were “critical thinking and/or analytical or problem-solving skills” and “proficiency in written communication” (p. 14). Other transferable skills like collaboration, creativity, and innovation may also play important roles. All of these outcomes are among those highly valued by employers (Hart Research Associates, 2013). Despite their national recognition as a high-impact practice and their lofty goals, interdisciplinary capstones have received very little research attention (Kinzie, 2013). As Padgett and Kilgo (2012) observed, “few studies have examined the impact of various types of seminars or capstones on student learning and development” (p. 29).

**Interdisciplinary Capstones in Higher Education**

Currently, only a small percentage of college students in the United States take an interdisciplinary capstone course. At institutions participating in the 2007 NSSE, only 6% of students had a capstone outside the major (NSSE, 2007). Similarly, only 13% of institutions indicate that interdisciplinary courses are their primary form of capstone (Padgett & Kilgo, 2012), and only 15-16% of all capstone experiences take place outside the major (NSSE, 2009; Kinzie, 2013). According to the National Survey of Senior Capstone Experiences, only 33% of four-year institutions even offer interdisciplinary capstones, only some of which are required courses and only some of which include a capstone project (Keup, 2013).

Interdisciplinary capstone courses were once more prevalent, though with a different title and approach than modern models. Throughout the 18th and 19th centuries, courses in “moral philosophy” often served as a capstone, attempting to integrate curricula into a practical ethical framework. Such courses largely ended with the rise of disciplines and more focus on specialized knowledge (Beuttler, 2012). In the early 20th century, other models arose to reestablish capstones. For example, Reed College introduced senior seminars for students in order to integrate skills acquired across the undergraduate experience and Antioch College developed a program to provide integration between student learning and work experience (Levine, 2000). Nevertheless, such attempts at integration and coherence were relatively uncommon during the last century (Boning, 2007).
Over the last twenty years, as organizations such as AAC&U have advocated for capstones that support general education outcomes, there has been a resurgence of interest in interdisciplinary capstones. Several models have been developed that make these capstones accessible to all students through a general education curriculum. For example, California State Polytechnic University at Pomona utilized an interdisciplinary capstone course “to use reflection and research to integrate, deepen, and extend general education learning” (Fernandez, 2006, p. 24). All sections shared readings that prompted thought on the purpose of higher education and larger life questions, and all culminated with a 15-page research paper on a topic of student interest (Fernandez, 2006).

At Portland State University, community-based learning formed the basis of a 6-credit capstone course that sought to apply “scholarly theory to the real-world problems of business and community organizations” (Rhodes & Agre-Kippenhan, 2004, p. 4). Students perceived the community projects of these courses to be the most important learning experiences, contributing to interpersonal skills, knowledge of people from different backgrounds, public speaking ability, and so forth (Rhodes & Agre-Kippenhan, 2004).

The interdisciplinary capstone at Millikan University was designed around two interrelated components, reflection (“the inner work of students examining themselves”) and contribution (“the outer work of contributing to others”). The former was addressed through a personal development plan, while the latter was addressed through student-designed multi-disciplinary team projects. Millikan students rated the interdisciplinary capstone as more effective than disciplinary courses at developing students’ ability to communicate, work collaboratively, lead others, respect human differences, recognize and reconcile moral dilemmas, and clarify personal values. On the other hand, disciplinary courses were more effective at developing students’ ability to achieve depth in a discipline, think critically, use models, and use technology (Brooks, Benton-Kupper, & Slayton, 2004).

Other universities have capstones for all students that are offered through disciplines, but which have some degree of interdisciplinarity as the result of community-based projects (McGill, 2012), internships (Fernald & Goldstein, 2013), or collaborative research projects (Firstenberg & Dowdy, 2014). It has also been proposed that using one discipline to draw content connections with other disciplines could be used for a general education capstone (Williams, McCarley, & Kraft, 2013). By contrast, the vast majority of capstones are disciplinary experiences, focused on the scholarship and/or professional practice of a student’s major (Schmer & Gray, 2012; Ahlawat, Miller, & Shahid, 2012; Lord, 2009; Dunlap, 2005; Sill, Harward, & Cooper, 2009) or closely related fields (Bajada, 2013; Souders, 1993). As a natural result, the vast majority of what we know about the impacts of capstone experiences also comes from information on disciplinary capstones.

For example, students who report participating in “senior culminating experiences” (defined on the NSSE as capstone courses, senior projects or theses, or comprehensive exams) have higher scores on NSSE’s measures of effective educational practice, deep approaches to learning, and self-reported gains in learning and development (NSSE, 2009). Seniors commonly reported that capstone courses contributed to growth in critical thinking, effectively learning on their own, developing intellectual curiosity, and making judgments on their own. However, the 2007 NSSE
Annual Report found that senior capstones in the major were less associated with positive learning gains than other high-impact practices in the senior year. Although capstones in the major were associated with “understanding key concepts in the major,” no association was found in the 2007 study with working effectively with others, complex problem-solving, communication skills, and a dozen other outcomes (NSSE, 2007).

As part of the Wabash National Study of Liberal Arts Education (WNS), Kilgo, Sheets, and Pascarella (2014) used NSSE data and pre-test/post-test surveys at more than 60 institutions to analyze the impacts of capstones and other high-impact practices. They found the impacts of these capstones to include the “need for cognition,” a positive attitude toward literacy, and intercultural effectiveness. However, capstones had a negative association with critical thinking and had no impact on numerous other possible outcomes, leading to the conclusion that the impacts of capstones were mixed and dependent on their administration and facilitation.

It is unknown to what extent the NSSE and WNS studies might reflect outcomes of interdisciplinary capstones, specifically, though it seems logical that capstones offered through disciplines would inevitably serve the interests of majors more strongly than general education. Overall, research focused on interdisciplinary capstones is very sparse, coming down to only a handful of studies at select institutions. We are aware of no published description or assessment of an interdisciplinary capstone program like the model at Elon University.

**The Elon Core Curriculum Capstone**

Elon University’s Core Curriculum extends across the multi-year undergraduate experience, in parallel with the major. It consists of three “first-year foundations” courses (an interdisciplinary seminar, writing, and statistics), world languages, a two-unit experiential learning requirement, and ten courses across the arts and sciences. The Core Curriculum culminates with an interdisciplinary capstone in the third or fourth year of study. The Elon interdisciplinary capstone is an opportunity for students to integrate and apply what they have learned during their college experience. It consists of a 4-credit seminar course that includes a substantial capstone project. There are five distinguishing features of the Elon capstone model:

*Student choice / course diversity:* Students may select from over sixty interdisciplinary courses in a given year, each with a different topic and capstone project. This allows students to choose the framework through which they integrate their learning and encourages agency over the process. Professors from every academic department propose course topics, which are rigorously vetted by an interdisciplinary curriculum committee, the Core Curriculum Council.

*Interdisciplinary:* Each capstone course supports the integration and application of knowledge to address problems larger in scope than a single discipline can handle. Every course must draw from a range of disciplines, encourage students to view issues from multiple perspectives, and be able to attract students from across the university. Faculty members are encouraged to seek collaborations and guidance from faculty in other areas.
Capstone project: Each course requires a substantial interdisciplinary project that integrates and applies what students have experienced through their studies at Elon, from first-year courses to the capstone. Each syllabus refers to the project as the “Capstone Project of the Elon Core Curriculum.” Likewise, each capstone project engages Core Curriculum learning goals, as well as larger themes of the Core Curriculum such as ethical reasoning and personal and social responsibility within local and global communities. At the same time, there is not a prescribed project format across all course sections. Instead, individual faculty create a project framework that will work within the context of a particular topic, and then students further choose their direction within that framework. This allows for flexibility, creativity, and choice by both students and faculty. Examples include reflective portfolios, integrative research, fellowship/grant proposals, research-based multimedia projects, creation of a conference or other major event, and many other formats.

Advanced critical thinking: In its own way, each course emphasizes the integration and application of knowledge to address complex problems in local and global contexts. Authentic problems are messy. Thus, pedagogical strategies are promoted that create cognitive dissonance for students and promote a rational response to questions that cannot be answered definitively. Clear, high-level course objectives are set that move beyond mere comprehension and analysis to synthesis and evaluation. Student participation and engagement is expected in the pursuit of inquiry, innovation, and creativity.

Emphasis on writing: High-level writing experiences and instruction are expected that cultivate a mature writing process. The courses use both plentiful writing and a variety of writing types to enable students to make meaning and think critically. Both writing to learn and learning to write pedagogies are encouraged.

Rather than being a one-size-fits-all approach, the Elon model sets general parameters for signature work to happen and then allows student and faculty innovation to flourish. The resulting capstone courses take a wide range of forms: student-designed projects and poster presentations analyzing research on study away to reflect on “coming home”, using poverty studies to design a feasible social change project, employing “futures thinking” to use the past and present to predict and create the future, writing and producing a theatrical production, and so forth. Notably, Elon University also has capstones in the majors (often referred to as senior seminars). Thus, Elon students complete two capstone experiences: one disciplinary capstone that integrates the major and one interdisciplinary capstone that integrates general education and the overall college experience.

Models for Interdisciplinary Capstone Projects

Elon’s interdisciplinary capstone program is distinguished by an entrepreneurial vibe. Because students (and faculty) are given significant freedom, capstone projects reflect a wide diversity of topics and innovative approaches. Providing student choice of the capstone was a key recommendation of the Higher Education Academy, which noted that although choice “increases the probability that more students will experience
transformational learning” compared to a one-size-fits-all approach, it is “a major challenge for higher education” (Healey et al., 2013, p. 75). Student agency and independence was also the first key criterion for signature work recommended by Peden (2015).

Five generalized models for how to facilitate interdisciplinary capstone projects have arisen organically across Elon’s program. Each of the five models facilitates the integration of knowledge and skills across the college experience.

First, the “liberal arts in action model” involves students applying what they have learned during college to address some community or workplace issue. For example, in the “Entrepreneurship and the Arts” course, student teams plan an entrepreneurial venture related to the arts, bringing liberal arts learning together with professional application. Projects include the development of business, marketing, and project plans for carrying the venture through to completion, as well as project presentations. Likewise, in the “Diversity and Social Justice” course, students create an educational guide or training manual related to a diversity/social justice issue for some campus or community organization. Students use scholarship and their previous courses as a framework to improve cross-cultural communication and cultural competency in their target audience. This model bears some resemblance to capstone courses at Portland State, which are focused around community engagement (Rhodes & Agre-Kippenhan, 2004; Peden, 2015).

Second, the “scholarly inquiry model” involves students developing research projects to investigate an interdisciplinary topic. For example, students in the “Rome” course complete a scholarly capstone project using Rome as a focal point to integrate students’ broader college studies. Projects include a textual component, visual support, a historicizing component, and a connection to the contemporary world. Similarly, students in the “Coming Home” course organize a conference on the impact of study abroad and present their own papers and posters as part of their capstone project. The scholarly inquiry model is a common pedagogy for capstone projects across higher education, though it is typically employed within disciplines (Healey et al., 2013).

Third, the “personal reflection model” involves students creating a life story that reflects upon past learning in order to consider meaning, purpose, and future advancement. In the “Authentic Leadership” course, students assess their own life stories, focusing on critical incidents (both bad and good) that have shaped their orientation about life, their values and goals, and their underpinnings in general regarding authentic leadership. In other courses, students build a reflective portfolio exploring how their learning in college connects with themes of the Elon Core Curriculum, and how the interconnected whole relates to a student’s life in the past, present, and future. These examples are similar to the reflective portion of capstones utilized at Millikan University (Brooks, Benton-Kupper, & Slayton, 2004).

Fourth, the “creative synthesis model” involves students creating an artistic product. For example, students in “Theatres of the Mind” create a theatrical production that seeks to make sense of the human condition. A “Religion and Art in Asia” course invites the creation of a mandala that symbolizes the themes of the Core Curriculum. A few other schools such as the College of Wooster allow creative products as capstone projects (Peden, 2015), though they are typically not framed as interdisciplinary or a synthesis of general education.
Fifth, many capstone courses employ mixed models that facilitate student choice of any of the project types described above. For example, a course called “Good Death” invites students to use an interdisciplinary lens to take a position on an issue related to what it means to have a “good death” (and thus a good life). The capstone project combines a major intellectual work with personal reflection directed to a specific audience of a student’s choice. Projects include a proposal, an annotated bibliography, graded drafts, personal reflections, a presentation, and a final product that might take a wide variety of forms (fiction, poetry, a public service announcement, integrative research, research-based multimedia projects, artistic presentations, etc.). In the Elon environment, it has been advantageous to allow and even actively encourage different models for facilitating interdisciplinary capstone projects. The faculty members routinely explore new ways to guide capstone projects, share ideas with other faculty at periodic events, and spread successes through collaboration. Thus, the pedagogy maintains an organic quality that evolves through experimentation and assessment.

Students share capstone projects with each other through presentations within classes, community poster sessions, and informal conversations. In the process, students in capstone courses have the opportunity to learn from the different ways of integrating and through the probing questions of others. Recent efforts include providing opportunities for first and second year students to interact with students who are presenting capstone projects. Observing and asking questions helps the less experienced students to better frame, plan, and integrate their own general education experiences.

Outcomes

The highest curricular purpose of Elon’s interdisciplinary capstone is integrative learning across the Core Curriculum and the university, as a whole. Students should integrate prior learning in college, and demonstrate the ability to integrate and apply knowledge to address complex problems. To assess student perceptions of the learning that took place through Elon’s interdisciplinary capstone program, an online survey was administered. The survey was sent via email to 200 randomly selected graduating seniors (every 10th student on a graduation list) two weeks before the end of students’ final semester of college. Eighty-five responded for a response rate of 43%.

Overall, 92% of students rated their learning experience in the interdisciplinary capstone as either a 4 or 5 on a Likert-scale from 1 (poor) to 5 (excellent). The average response was 4.3 (s=0.84, n=72), which was slightly higher than a similar question asked about disciplinary capstones (M=4.1, s=1.07, n=60). Likewise, half of students thought the interdisciplinary capstone was better (32%) or much better (17%) than disciplinary courses taken to satisfy general education requirements, while only a few thought it was worse (8%) or much worse (1%).

Other questions explored the degree to which students found the interdisciplinary capstone to integrate previous experiences. The average response was 4.0 for both of the following questions on a scale of 1 (very little) to 5 (very much):

- To what extent did the course provide the opportunity for you to integrate prior learning in college?
- To what extent did your COR capstone course meet the call in the university mission statement to “integrate learning across the disciplines and put knowledge
into practice, thus preparing students to be global citizens and informed leaders motivated by concern for the common good”?

Student comments about interdisciplinary capstone courses were similarly positive and provided more evidence of integration. Representative student comments include the following:

- “Capstone experiences gave me the confidence to work in a dynamic environment with people who think differently than me toward a common goal. This is why I am proud to be an Elon graduate.”
- “It required research skills I had acquired in prior coursework.”
- “We were encouraged to draw upon the material from past classes for the papers throughout the capstone course.”
- “It combined many of the classes I have taken before and encouraged critical thinking.”
- “The nature of my capstone work allowed me to work at my pace and take complete responsibility for my work and time management.”
- “The capstone class outside my major was awesome. It wasn't easy and it was definitely outside my field of study, but I really enjoyed it and learned a lot.”

Some students reflected simultaneously on the interdisciplinary capstone and the disciplinary capstone from their major:

- “I loved them both! They were both relevant to my major, field of work, and my life in general. The COR course required critical thinking and applying topics to our everyday lives!”
- “Definitely two of my most rewarding and enjoyable classes at Elon. Even though they both required a lot of work, I was always interested in what I was learning about and researching. I also think that fact that I had so much freedom in picking my research topics really contributed to how much I enjoyed these classes.”

**Conclusion**

There has been much national conversation about high-impact educational practices, including capstone courses and experiences such as those described here. However, providing capstone opportunities that integrate learning from across the college experience is a substantial challenge at every institution. Interdisciplinary capstones can be highly effective for facilitating the transfer of learning from across a college curriculum into the complex, interdisciplinary environments that dominate life after college. Although it seems unlikely that one model will work on all campuses, the Elon model does offer a successful and sustainable example for how to provide interdisciplinary capstones for all students.

**References**


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