

Taking Stock of Capstones and Integrative Learning

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Culminating experiences provide graduating seniors a course, program, or activity designed to cap off the integration of educational experiences, and foster transition to work or further education beyond the bachelor's degree experience. Founded in the early 1900s as courses taught at the end of a program to integrate philosophy and religion, senior capstones are generally considered mastery experiences, the final opportunity to instill the values, knowledge, and skills expected of graduates; they are, ultimately, a rite of passage (Gardner, Van der Veer, and Associates 1998; Hunter, Keup, Kinzie, and Maietta 2012). Recently recognized as a transformative learning experience because of their positive contributions to desired learning outcomes, capstones are considered a "high-impact practice" (Kuh 2008). Capstones have grown in scope and importance in undergraduate education, yet we know little about the nature and value of the experience for student learning, and in particular the extent to which they contribute to one of their central purposes: fostering integrative learning.

The culminating experience is considered the final opportunity to bring a holistic understanding to students' educational journeys. However, as Brownell and Swaner (2010) concluded, research on capstone experiences is largely descriptive, and while there is some evidence that capstones foster students' abilities to apply and integrate knowledge in the major, such outcomes-based research is limited. This article highlights extant research on culminating experiences, relying primarily on results from multiple years of the National Survey of Student Engagement (NSSE), supplemented by findings from institutional surveys of senior capstone experiences, and independent studies of culminating experiences. The article closes with a discussion of capstones and integrative learning, and suggests further research on the outcomes of capstones.

CAPSTONES: NATURE AND SCOPE

Culminating experiences take many forms, including senior seminars, capstone courses, field-based experiences and internships, senior projects, and comprehensive exams. Since 2000, the National Survey of Student Engagement (NSSE), an annual assessment of students' exposure to educationally purposeful activities, has measured students' experiences in culminating experiences. Although response options were altered in 2004 to clarify the state of students' experience (indicating completion, in process, expectation, or no plans to do a capstone experience), the proportion of students reporting senior culminating experiences across more than 1,500 NSSE participating colleges and universities is remarkably consistent (Kuh, O'Donnell, and Reed 2013; NSSE 2011). About one in three seniors report having completed such an experience. Among the high-impact practices measured on NSSE, culminating experiences rank third in terms of participation, behind the more frequently experienced internships and service learning.

Participation in capstones varies across institutional type, with students attending baccalaureate liberal arts and private institutions much more likely to have such experiences. Findings from the 2011 National Survey of Senior Capstone Experiences (Padgett and Kilgo 2012) mirror NSSE results about institutional type, and also show that capstones are more likely to be found at institutions with senior enrollments less than 1,000 students. It also shows that most capstones (85 percent) are discipline-based courses. Unlike several of the other high-impact practices, such as study abroad and research with a faculty member, in which participation differs significantly by student characteristics such as first-generation status and race-ethnicity, NSSE results show that culminating experiences are fairly evenly distributed across student characteristics. Some differences across majors exist—students majoring in arts and humanities, communications, and engineering are more likely to have a culminating experience, while education majors



were the least likely. Equity across student characteristics and small differences by major field is explainable, in that senior culminating experiences are typically built into the curriculum. In fact, dissimilar from elective experiences like study abroad, culminating experiences are educational opportunities that can be made available to all students.

To examine more closely the nature and impact of senior culminating experiences, in 2007 and again in 2009, NSSE appended a series of questions to the core survey. These items reflect responses from seniors at institutions who had completed a culminating experience or capstone. Results from the 2007 item set show that the most common form of culminating experience was a major paper, project, or thesis, and that most students had the experience in the context of their major. Three quarters (77 percent) of respondents indicated that their culminating experience was required for graduation. Students reported that senior projects required a varying amount of time, with a third of seniors reporting five hours or less per week, and nearly another third reporting between six and ten hours per week. Faculty members were essential to senior projects, with more than 60 percent of seniors reporting frequent meetings with faculty supervising their work.

Most senior culminating experiences aim to address specific educational outcomes. Padgett and Kilgo (2012) identified the three most important goals for the capstone course: development of critical thinking, analytical, or problem-solving skills. Other objectives—including the ability to conduct scholarly research, career preparation, professional development, and proficiency in written communication—were identified as important, but far less than the aforementioned higher-order learning skills.

The most frequently reported teaching practice implemented in capstone was integrated learning (60 percent), followed closely by communication of high expectations (57 percent), and academic challenge (55 percent). These findings suggest that institutions

are incorporating vetted effective teaching practices within the capstone.

CAPSTONES: EDUCATIONAL GAINS AND OUTCOMES

Capstones are designed to address a range of important educational processes and outcomes including integration and closure, application, reflection, and transition (Gardner et al. 1998). While the evidence indicates that capstones are educationally beneficial, most of the research is lacking in terms of scale and the specification and use of robust measures of valued outcomes such as integrative learning.

As a high-impact practice, capstones provide students a host of opportunities to be engaged in educationally purposeful practice. In fact, participation in a culminating experience is positively associated with the extent to which students interact with faculty, collaborate with peers on academic matters, and experience higher-order learning and perceive their environment as supportive of their learning. Quite simply, seniors who reported a culminating experience were more engaged in educationally purposeful activities than their nonparticipating peers (Kuh 2008; NSSE 2009).

Career preparation is often an objective of capstones. As a result, it's not surprising that seniors who participated in a senior culminating experience were more likely to report gains in job- or work-related knowledge and skills than their peers who did not participate (NSSE 2011). However, an examination of the relationship between seniors who participated in any of the high-impact practices and perceptions of gains in job- or work-related knowledge and skills revealed that seniors who participated in internships and service-learning projects perceived greater gains in work-related knowledge than students who participated in capstone experiences.

Educational gains associated with culminating experiences vary by capstone emphasis. NSSE's in-depth examination of capstone experiences revealed that cap-

stones characterized as a field placement or experience were associated with the greatest number of educational gains (fourteen of fifteen common gains), including working effectively with others, acquiring job- or work-related skills, solving complex, real-world problems, applying theory, and synthesizing and organizing ideas. In comparison, students whose capstone experience was a comprehensive exam, a thesis, or presentation were associated with only about half of the specified gains, and these gains were in the expected areas of writing, thinking imaginatively, and synthesizing (NSSE 2007). Similarly, Rhodes and Agre-Kippenhan (2004) found that the community-based experience in Portland State University's capstones were associated with significant educational gains, including leadership ability, tolerance of others with different beliefs, knowledge of people from different races or cultures, and the understanding of social issues, among others.

The extent to which faculty and students interact in the culminating experience matters. The more students reported meeting with their supervising faculty member, receiving clearly explicated expectations, and receiving helpful feedback, the greater the gains (NSSE 2007). Finally, there is value to capstones that place significant demands on students' time. The more time and effort demanded of students, the greater their perception of educational gains.

The experience of deep learning—or sophisticated cognitive tasks rather than rote memorization, aligning with employer demands for creativity and problem-solving skills—is a desired outcome of substantive educational practices like culminating experiences. Deep learning requires the acquisition of knowledge, skills, and competencies across a variety of academic and social activities, and integration of these diverse experiences into a meaningful whole. NSSE's deep learning measure includes scales of higher-order and reflective and integrative learning, including such activities as incorporating ideas from

various sources into a paper, including diverse perspectives in class discussions or writing projects, putting together ideas and concepts from different courses, and trying to better understand someone else's views by imagining how an issue looks from another person's perspective. Seniors who reported a capstone experienced greater gains in NSSE measures of reflective and integrative learning than their nonparticipating peers (Kuh 2008; NSSE 2007).

An in-depth investigation of capstone experiences at four liberal arts institutions revealed detailed information about the benefits and practices associated with effective capstone experiences (Schermer and Gray 2012). Although the capstones across these four institutions differed in terms of purpose, the experiences shared a common emphasis on a culminating, sustained, independent act of research or inquiry, centered in the students' major, with a focus on critical thinking and communication skills, and a thesis or paper. Results of a pre-post capstone survey design revealed increases on eight educational scales (exhibition of scholarly skills, need for cognition, project management, academic ability self-rating, collaborative skills, independent voice, strive to achieve, and research orientation). However, no change was found in civic orientation, status career orientation, and satisfaction with instruction, and declines resulted on the following scales: higher-order cognition, satisfaction with support services, and use of multiple perspectives. The increase in the scales, particularly the substantial effect on scholarly skills and research orientation, suggest that the capstone is an effective educational practice, with students performing at a higher level on critical thinking, research, and communication skills. Yet, while the capstone is a culminating experience that is intended to bring together an array of liberal arts outcomes, the largest gains were associated with the skills needed to successfully complete a narrow project within a discipline. This finding suggests that capstones that involve

very focused questions in the discipline may not contribute to desired outcomes including integration across disciplines and ideas, use of multiple perspectives, or synthesizing and applying learning to a wider context.

One of the most prized objectives of culminating experiences is their role in bringing coherence to students' educational journey through the integration of academic experiences and ideas. Although NSSE results demonstrate positive associations between culminating experiences and integrative learning, Schermer and Gray's (2012) investigation raises questions about the potential for capstones, particularly those within the major, to foster the level of integration many envision.

FOSTERING INTEGRATIVE LEARNING

Believing that the undergraduate experience is fragmented and not preparing students for the world's complexities, educators across campuses are investing in integrative learning to help students put the pieces together. Borrowing from the AAC&U VALUE rubric, integrative learning is defined as understanding and a disposition that students build across the curriculum and cocurriculum, from making simple connections among ideas and experiences to synthesizing and transferring learning to new, complex situations within and beyond the campus (Rhodes 2010). Well-designed educational experiences such as learning communities or linked courses, integrated assignments, and interdisciplinary curricula can help students achieve integration by connecting their learning across fields and linking coursework with experiences in larger campus and community contexts (Huber, Hutchings, and Gale 2005). Integrative learning demands intentional effort by the student and deliberate pedagogical and curricular moves by educators.

From their inception at the beginning of the twentieth century, capstones were intended to foster integration. Yet, this purpose is not always well-specified in today's

capstone experiences. To achieve greater integration, capstones must explicitly declare integrative learning outcomes and then require students to draw on learning from earlier courses to explore a new topic or solve a problem, involve students in substantive experiences that combine academic and community-based work, and demand reflection on the meaning that students are making towards integration.

The predominance of capstone courses as the final course to cap off the major, and extent to which projects frequently require narrow explorations within students' major field, limit the likelihood that students will be challenged to connect ideas across their coursework and transfer learning to wider contexts. The fact that most culminating experiences are rooted in the discipline may simply preclude opportunities for integrative learning. The design of *interdisciplinary* capstone courses or projects is an obvious way to expand connections. Instructional and curricular scaffolding are essential to the promotion of deeper levels of learning. The intention of scaffolding is to provide extensive structure and graduated support to assist students in accomplishing complex tasks. The complexity of integrative learning, combined with the intensity and importance of culminating experiences, makes it crucial to scaffold learning experiences to help students experience integrative learning early in their academic program, and to participate in simple capstone preparation experiences that will help them make deeper connections later when they actually begin their culminating experience. For example, learning communities that link courses around interdisciplinary themes are opportunities to help students connect concepts across courses. When experiences like these occur in the first year, students can develop habits of connection-making that can be cultivated and refined in subsequent years. Integrative learning is too complex to only address in the senior capstone. Rather, integrative experiences and connections to the culminating experience



should be introduced to students as early as the first college year, and be intentionally reinforced throughout the curriculum.

Another way to increase integration in the capstone is to develop meaningful opportunities for students to connect curricular, cocurricular, and experiential education. Outside-the-classroom activity in which students are confronted with new perspectives and challenged to integrate insights from different perspectives, and experiences that connect course content with applied contexts and demand that students tack back and forth between the classroom and the outside world, represent critical steps toward intentional, integrative learning.

Integrative learning and reflection go hand in hand. Whether called reflection or metacognition, the idea of making students more intentional, self-aware, and purposeful about integrative learning is powerful. Reflection assignments that invite students to consider how capstone experiences have prompted them to reevaluate their views and take on new perspectives, as well as classic reflection activities that ask students to deepen their understanding of what and how they are learning, are vital. Strategic prompts or assignments guide students through a systematic reflection process that can weave potentially fragmented learning experiences into a clearer and more meaningful tapestry. Culminating experiences that incorporate portfolios as a formal vehicle for students to document, connect, and reflect upon their integrative learning experiences, and rubrics for self-assessment such as the AAC&U integrative learning VALUE rubric (Rhodes 2010), can serve integrative purposes in capstones by making students more self-aware. Whatever the approach, culminating experiences should have a mechanism to encourage students to reflect on and make meaning of the many facets of their collegiate experience.

Finally, the capstone can be a rich source of information on the quality of undergraduate instruction and students' achieve-

ment levels in both skills and knowledge. It is an excellent and frequently employed site for student learning outcomes assessment (Berheide 2007). In addition, the evaluation of capstones for educational effectiveness and specifically for their contribution to outcomes like integrative learning must be enacted. Assessment of integrative learning—via pre-post designs, surveys of students experiences, application of AAC&Us integrative learning rubric to senior projects and presentations, and alumni surveys of career preparation—can help inform capstone practice and guide program improvement.

CONCLUSION

The critique that undergraduate education must be more than a collection of separate, disconnected experiences suggests that we must enhance opportunities to connect, deepen, and generalize learning beyond the immediate setting where it occurs. The increase in the number of institutions that offer culminating experiences and the press for greater institutional investment in integrative learning and experiences that bring coherence to undergraduate education makes it incumbent to be more intentional about ensuring the integrative potential of capstones. Yet, while the scant research on capstones shows positive outcomes for students who participate, there is more to learn about the quality of these experiences and their contribution to integrative learning.

Opportunities to integrate, synthesize, and apply knowledge are essential to ensuring deep, meaningful learning experiences. The senior culminating experience provides an opportunity to cap off the undergraduate years and prepare students to take ownership of the diverse strands of their educational journey and transition to the next phase in life. Institutions need to better understand the extent to which students experience integrative learning and the aspects of the culminating experience that make this happen. Research findings on culminating experiences, combined with institutional assess-

ments, could help institutions maximize the potential for culminating experiences to function as the definitive site for integrative learning and educational coherence. ■

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