



## CHAPTER ONE

# OVERVIEW OF THE CAPSTONE COURSE

In this chapter, we briefly review the introduction of the capstone to the American university curriculum and its subsequent development into a central feature of American higher education. We devote special emphasis to the centrality of the capstone course across a broad range of disciplines and an introduction of the goals often sought by educators in their capstone course. Our review focuses special attention on the nature of the senior capstone experience in the new millennium and summarizes briefly some of the recent capstone studies that we rely on throughout this book. This review supports two important points: (1) capstone courses are now offered or required at two-thirds to three-fourths of US baccalaureate institutions and (2) the disciplinary-based capstone course is far and away the most common format across these institutions. We also comment in this overview on the benefits that can be obtained by studying the negative case of the unsuccessful capstone course or practice and discuss the differences inherent in the discipline-based capstone as compared to the interdisciplinary, or general-education-based, capstone.

## The History of the Capstone Course in the College Curriculum

Although the capstone course is embedded in academic disciplines that range across the entire curriculum in most US undergraduate institutions, the contemporary emergence of the senior capstone as a common academic offering did not occur until the late 1980s and early 1990s. According to some sources, capstone courses emerged first in the United States in the late eighteenth century. At that time and for many years following, it was not uncommon for college presidents to teach courses on philosophy and religion to advanced students approaching the termination of their formal undergraduate studies. These courses were broadly conceived rather than discipline specific and sought to span the liberal arts curricula of that day and time. President Mark Hopkins of Williams College in Massachusetts led such a course in the 1850s that influenced his student, James A. Garfield, who later became the twentieth president of the United States (Henscheid & Barnicoat, 2003). For the better part of the late nineteenth and early twentieth centuries, capstone courses remained idiosyncratic and occasional rather than common. New capstone courses appeared in curricula whenever a faculty member or college president wished to sponsor one, and existing capstone courses languished and disappeared whenever the sponsor lost interest. There is scant record of capstones reported from the period during the twentieth century's great wars and the worldwide depression of the 1930s.

The courses apparently began to reemerge as a feature of American higher education in the early 1970s. Still, they were far from common. In the 1970s, for example, only 3 percent of American institutions reported offering capstone courses (Levine and Carnegie Council on Policy Studies in Higher Education, 1978). In the 1980s and 1990s, the number of senior capstone courses in American higher education dramatically increased. The capstone became more widely dispersed across the curriculum as well. Scholarship regarding the course coincided with its increasing popularity. Many of the research and scholarly articles that we will discuss as foundational are from this era. Completing the historical arc, the capstone course became widely popular only toward the end of the millennium (Levine, 1998; Lucas, 2006; Thelin, 2011). In sum, the senior seminar or capstone course became a prominent feature in formal higher education in the United States only within the past few decades. Thirty years after these courses made a notable reappearance in the 1970s, over half of the institutions of higher learning in the United States offered them in one or more disciplines (Henscheid, Breitmeyer, & Mercer, 2000).

Since 2000, more frequent pedagogical studies of capstone courses have attempted to track the growth in their popularity. However, recent estimates of the prevalence of senior capstones within US higher education vary, and sometimes widely. Researchers have estimated the presence of capstones in American colleges and universities at from 40 to 98 percent. If we were to combine all the distinct samples that have estimated the proportion of institutions that offered capstones, we could reasonably conclude that approximately three-fourths of four-year higher education institutions offer capstone courses in the United States. When considering the entire history of American higher education, one is disposed to ask why capstone courses emerged across the broad range of American colleges and universities only recently. Moreover, one is inspired to wonder whether the recent trend can sustain itself or whether the capstone's popularity will wane in the future, as predicted by the authors of the "Capstone" entry in the *Higher Education Encyclopedia* (Henscheid & Barnicoat, 2003).

## Sources of Modern Influence

The story of the development of the capstone in the 1980s and 1990s suggests that the emphasis was an outgrowth of a number of reports regarding higher education at that time. Moreover, there is a general history of American higher education curricular development driven by committee and foundation reports. In the 1950s, for example, the Dartmouth College political science department was stimulated to develop its capstone course as a result of a college wide report on curricular change and an earlier American Political Science Association report (Garfinkel & Tierney, 1957; American Political Science Association, 1951). These reports inspired the formation of a committee on the integration of the political science major, and that committee recommended a new "coordinating course" as a culminating experience for political science majors at Dartmouth (Garfinkel & Tierney, 1957). The surge in capstone courses during the 1980s and 1990s perhaps simply reflected the number and prestige of the several reports that supported and encouraged capstone course adoption. This influence is also easily observable within American sociology during this period. In chapter 2, we use that experience to illustrate the process of disciplinary curricular change that led to more widespread adoption of the capstone experience across many academic departments.

In 1985 the Association of American Colleges (AAC) produced an influential report, *Integrity in the College Curriculum: A Report to the Academic*

*Community*. The report identified a number of intellectual qualities and learning experiences that the authors believed to be missing from the higher education climate on many college campuses. These included, among others, critical analysis, writing, values, and study in depth—that is, a number of the learning objectives that could be embraced and fostered through adoption of a capstone course (Wagenaar, 1993). Wagenaar's own review of the state of the capstone in sociology at the time of his writing led him to conclude that many sociology faculty members misunderstood the nature of the capstone. He called for developing a sociology capstone that was synthetic, holistic, interdisciplinary, and required, citing the educational goals identified in the AAC's report.

Dickinson (1993), also noting the influence of national commission studies of higher education, observed that the emphasis on capstones within sociology in the early 1990s was driven in part by subsequent reports from the Association of American Colleges (1991) and the American Sociological Association (1991). Both reports emphasized the importance of critical reflection, connectedness, and diversity through a capstone that encourages students to integrate the range of coursework in the major in a focused, summative conception that provides a coherent conclusion to the undergraduate curricula. The impetus of the AAC in influencing curricular review can be found in the annals of many disciplines during the 1980s and 1990s. The biological sciences, like American sociology, undertook such a review and focused substantial attention on the capstone course as well as the undergraduate research experience generally (Carter, Heppner, Saigo, Twitty, & Walker, 1990). A few years later, Wagenaar (1993) described the emergence of the capstone course within American sociology and called for even greater adoption of the approach. The Boyer Commission report (1998) also recommended the capstone course as a critical addition to the higher education curriculum, thereby fostering the trend within sociology and other disciplines. That same year, Gardner and Van der Veer (1998) published a highly influential book on the senior experience that further focused attention on capstones within the contemporary undergraduate curriculum.

In a more recent recollection of the development of the capstone course in the history major, Jones, Barrow, Stephens, and O'Hara (2012) similarly recalled the importance of the Boyer Commission report (1998) as a reason for the renewed contemporary interest in the course. They point to this report as producing an emphasis on "liberal idealism" that led to "provid[ing] all undergraduates opportunities to 'do' real history" (p. 1096). They also note two other factors that are consistent

with other reports prepared by historians: a practical motive of “outcomes assessment” and “administrative attention to undergraduate research opportunities.” The capstone course provides ideal avenues to introduce both of these practical, rather than idealistic, motives because students are encouraged to complete research during the course, and research projects can be assessed in a more straightforward manner.

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## Where Things Stand: The Capstone Course in the New Millennium

Our short synopsis of the historical development of the modern capstone course reaches its curricular apogee today. Over the past dozen or so years, a series of foundational studies have been published that now constitute the baseline data for analysis and discussion regarding the senior capstone experience. We rely often on this group of research reports in the following chapters. These studies differ from earlier examinations of capstone courses primarily due to their more sophisticated methods and multi-institutional focus. Thus, they permit a broader comparative approach than most of the earlier anecdotal summaries of capstone courses that appeared in print. Since the data and conclusions offered by research are only as good as the methodology in place, we address the methods in each study so readers may judge for themselves the quality of the observations reported.

These studies collectively provide evidence that supports two important points. First, the data show that capstones are widely offered across many disciplines and that in most cases, those capstones are offered to students in their major fields of study and not as interdisciplinary or general education capstones. Second, these studies suggest that disciplinary capstones are most commonly research project capstones. The studies further suggest that students who participate in research-based capstones have positive experiences and develop cognitive and practical skills that students who do not engage in a research experience do not develop. These outcomes, in sum, provide persuasive evidence in our view that the capstone course makes important contributions to undergraduate education and that the research capstone, in particular, offers students the best opportunity for in-depth study leading to positive learning results. The more important studies include the following.

During summer 1999, the National Resource Center for the Study of the First Year Experience and Students in Transition at the University

of South Carolina conducted a survey of capstone courses offered at American colleges and universities. Led by Jean Henscheid, with John Breitmeyer and Jessica L. Mercer, the researchers collected survey responses from 707 institutions; 549 of the responding institutions reported offering at least one capstone course. (Some respondents reported offering more than one capstone course across their curriculum.) Among the major findings, the authors reported that the courses were primarily designed and delivered by individual academic disciplines. The researchers also concluded that (1) among the least likely components of the courses were formats that took students out of the classroom; (2) capstone courses were commonly taught and administered by single instructors on behalf of academic departments; and (3) most of the courses were not at that time part of a comprehensive assessment process (Henscheid, Breitmeyer, & Mercer, 2000).

During spring 1998, Bauer and Bennett began an investigation of alumni perceptions of participation in undergraduate research as one measure of the value added by a research experience. The researchers mailed a survey to 2,444 alumni of the University of Delaware, a midsized research university with an undergraduate research program in place since 1980. The sample consisted of 865 graduates who had participated in the formal Undergraduate Research Program (URP), each matched with two alumni who shared the same major, year of graduation, and grade point average but were not recorded in the URP database. The researchers attained a response rate of 42 percent. All respondents who reported undergraduate research experience reported high satisfaction and improved skills relating to that experience. Those who participated in the formal UR program, as compared to other research experiences, reported even greater ability to conduct research and registered more improvement in eight cognitive skills (Bauer & Bennett, 2003). This study lends support for undergraduate research both before and during the senior capstone course.

In summer 2000, researchers conducted seventy-six first-round student interviews with undergraduate students completing natural science-based capstones at one of four participating liberal arts colleges: Grinnell, Harvey Mudd, Hope, and Wellesley. In the interview, students were presented with a checklist of possible benefits derived from the literature and invited to comment. Students could also add benefits they discerned that were not on the list. Student response was overwhelmingly favorable: 91 percent of all student statements were positive. Generally, positive statements fell within one of seven areas with personal/professional (28 percent),

thinking and working like a scientist (28 percent), and improved skills (19 percent) the most commonly expressed (Seymour, Hunter, Laursen, & DeAntoni, 2007).

In 2011 the National Resource Center for the First-Year Experience and Students in Transition at the University of South Carolina conducted a second national survey of senior capstone experiences. The 2011 sample yielded 276 responding institutions; 268 (97.1 percent) reported offering one or more senior capstones. Among the more important findings reported were that discipline-based courses led by a single instructor continued to be the dominant form of the capstone experience, although many institutions offered multiple types of capstones across campus. Public institutions were more likely to rely on a discipline-based traditional course, whereas private institutions were more likely to rely on a senior thesis or undergraduate research paper. Moreover, by 2011, more than half the respondents reported that capstone courses were part of the university's assessment program and that these respondents had formally evaluated the senior experience within the last three years (Padgett & Kilgo, 2012).

In November 2000, researchers studied four liberal arts colleges (Allegheny College, Augustana College, Washington College, and College of Wooster) that require each graduating senior to complete an intensive, mentored capstone experience. Data from surveys of the colleges' administrative structures, along with student and faculty mentor surveys, constituted the bulk of the first-phase data. In a second phase, data were collected from focus groups of students, faculty, and others. Survey data compiled from responses of 108 departments roughly split among the four colleges showed that two-thirds of departments have a course specifically designed to prepare students for the senior capstone experience, and 86.6 percent of departments reported "production of a senior thesis or substantial paper" as the specific course outcome sought by the department's capstone. With respect to student-faculty surveys, generally both students and mentors rated the senior capstone highly along a series of specific dimensions (Schermer & Gray, 2012).

In a study we began in 2007, we distributed an invitation to participate in an online survey to the chairperson of every department of sociology on the member list of the Pacific Sociological Association and the chairperson of every department of psychology on the member list of the Western Psychological Association. Two follow-up e-mails were sent to increase the response rate to the survey to 28 percent. We found that the overwhelming majority (75 percent) of four-year schools responding offered capstone



courses, as did a slight majority (56 percent) of schools offering terminal master's degrees. PhD-granting institutions constituted the only group that did not offer an appreciable percentage of capstones (22 percent).

As a number of these studies have also found, a primary goal of the senior capstone experience within sociology and psychology programs is directed at helping students integrate material across a discipline. We also reported, as have a number of other studies, that the primary course outcome sought typically consisted of a major project leading to a field or library research paper (Hauhart & Grahe, 2010).

Another multi-institutional study within sociology (McKinney & Busher, 2011) confirmed the major findings of our regional survey. These researchers also found that the primary goal of these capstone courses was for students to engage in a major research project within sociology that would integrate their learning across the discipline and produce a final research paper. A discussion of factors in supporting, and student limitations in completing, successful capstone outcomes is also presented.

In a subsequent study, we replicated and extended our initial 2007 regional online survey by developing a national random sample of colleges and universities from the Carnegie Foundation for the Advancement of Learning institutional list and surveying the departments of sociology and psychology at those schools. From the total of 1,856 bachelor's-level or higher institutions on the Carnegie list, we selected a one-third sample from each of nine geographical regions and achieved a response rate of 25.44 percent. Like our previous regional survey and many other comparable efforts, we again found that the overwhelming majority of colleges and universities with sociology and psychology programs supported a senior capstone course—as high as 80 percent overall. Our national survey results confirmed that within sociology and psychology, and apparently like most other academic disciplines, the capstone course offered requires completion of a major project that entails research, a literature review, and an extended paper or senior thesis. Later we discuss the many other detailed findings our national survey revealed with respect to the most common practices and features of sociology and psychology capstone courses (Grahe & Hauhart, 2013; Hauhart & Grahe, 2012).

Finally, a study population of 597 undergraduate students from a single major public comprehensive university with enrollment in excess of thirty thousand was invited to complete the Undergraduate Research Questionnaire. The questionnaire consisted of thirty-two scaled items regarding the benefits derived from the undergraduate research experience: faculty support for undergraduate research methods and skills,



academic benefits received, and experiences of peer support. Major findings suggested that (1) benefits derived from research participation depended on the extent of research involvement (i.e., number of hours engaged in research related activity), (2) faculty mentors play a significant role in student satisfaction and the perception that research engagement is valuable, and (3) students with high grade point averages generally invested more time in research-related activity and rated their experience more highly than those with lower averages (Taraban & Logue, 2012).

Collectively these studies map the general terrain and nature of contemporary capstone courses in US colleges and universities. The results they report form the foundation for our examination of the purposes sought by contemporary capstone courses, the form of those courses, and the structural design of capstone experiences that offer the best learning environment for students. It is apparent to us, however, that educators will continue to study and report on the evolution of the contemporary senior experience. Even as this book goes to press, the Centre for Collaborative Learning and Teaching at Victoria University in Melbourne, Australia, is engaged in organizing a network of scholars to extend capstone studies. (Interested readers may access the Capstone Curriculum Across Disciplines website at [www.capstonecurriculum.com.au](http://www.capstonecurriculum.com.au).) Thus, while we have gathered the best data, analyses, and recommendations regarding capstone practices currently available in the literature, we expect more extensive and refined research efforts will continue to appear. We invite readers to join us in documenting future research by visiting our website (<https://osf.io/tg6fa/>) and contributing to our collection of capstone materials.

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## The Importance of Examining the Negative Case

As we suggested very briefly in the Preface, not all reviews of the senior capstone experience reflect a positive assessment. Moreover, negative reviews are not limited to students. Upson-Saia (2013) recently reported that various pressures, including well-intentioned goals, created capstone course experiences that could not sustain the learning goals and department objectives that were added as the capstone course became the location for integration, application, and assessment. In our view, reports of negative experiences based on poor design or delivery of capstone experiences are an important starting point for analysis, reform, and revision. Therefore, we will often invite readers to join us in listening carefully to these negative assessments.



In her review of capstone courses offered in religion departments, Upson-Saia (2013) reports the overwhelming frustration she heard from her colleagues as they described their experience.<sup>1</sup> They noted limitations that echo other researchers, including poor motivation from students, limited faculty time, and insufficient faculty expertise. However, Upson-Saia attributed the problems to the course, not the students or the resources directly. This conclusion supports our contention that designing an effective capstone course is as, or perhaps more, important than simply “teaching” one.

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### Supporting the Disciplinary versus the Interdisciplinary Capstone

A capstone in architectural terms is, by definition, the coping stone that forms the top of a wall or the final stone placed in the center of an arch that will hold the entire, otherwise unstable, construction together. Thus, it is the crowning experience—within both architecture and an educational program—that is placed last and on top of the structure beneath it. In the academic setting, it is the course that integrates or knits together all the earlier educational experiences. It is the culminating experience for students.

The fact that we use the term *capstone* to refer to this final phase of an education suggests that there must be a coherent program to “cap,” and this is a significant factor in developing the capstone. The fact is that a prerequisite to designing and executing a good capstone is a credible, sustained, coherent program on which the capstone may rest. In architectural terms, the “legs” of the arch or the base of the wall must be conceived well and solidly built before either will be able to support the capstone properly. With respect to a disciplinary capstone, this means the academic major must offer a solid, coherent core. The capstone course will then constitute the culminating experience that tops off the program’s basic foundational courses.

The interdisciplinary or general education–related capstone presents a slightly different integrating challenge. By definition, an interdisciplinary program attempts to unite two or more orientations that may (or may not) share any substantial overlap in terms of substantive and theoretical concerns. Likewise, a capstone course that requires students to embrace broadly both their academic major and the academic values embedded in a liberal arts general education program must span many separate intellectual divisions in an effort to achieve an overarching goal. Here the architectural metaphor is less applicable since the diversity of

a contemporary general education program nearly precludes finding an essential core shared by undergraduate students across an entire institution. Arguably, these differences make the interdisciplinary or general education–related capstone course even more challenging for both students and faculty than a capstone course within an academic major. This could explain why the interdisciplinary version of the capstone course has consistently been offered by a smaller number of institutions (Henscheid et al. 2000; Padgett & Kilgo, 2012).

Beyond these initial distinctions, capstones can embrace a number of different educational experiences, and throughout the subsequent chapters we remind readers of these variations at appropriate junctures. Padgett and Kilgo (2012) note, for example, senior capstones that encompass undergraduate research, a nonresearch-based thesis, a comprehensive examination, an internship experience, and a course leading to certification by an external professional body. Each of these variations on the senior capstone experience likely requires a different undergraduate preparation, envisions a different motivational script, and anticipates a different learning experience and course outcome. Schermer and Gray (2012) observe that each of the four institutions they studied has its own name for the culminating senior experience, and although each senior experience is different, they chose to subsume the four under the term *capstone* because of the several qualities that they believe all senior culminating courses share.

In short, the definition of the capstone must arise from the stated mission for a program or a specifically delineated goal or set of goals, be shaped in a way to help achieve those goals, and ultimately be judged by a set of outcomes specifically tailored to meet the objectives of the program. A capstone is therefore a creature of its context and must symbiotically respond to the educational environment in which it is enveloped in order to be considered successful. In subsequent chapters, we often emphasize the embedded nature of the capstone course in our discussions.

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## Conclusion

There is, as we hope to demonstrate in the balance of this book, a great deal of accumulating evidence that a properly organized capstone course can be a transformative educational experience for students and faculty alike. It is one of the high-impact practices that educators believe provide the best learning opportunities for students (Kinzie, 2012). We agree and believe that the culminating capstone experience unites faculty and students in an

important shared venture that has the best opportunity to support intellectual challenge, dedication to undergraduate research, and an appreciation for scholarly activity. We do not think the capstone experience can be duplicated or achieved by any other single format currently recognized. We hope that the following chapters offer a lucid introduction to the many reasons and empirical studies that support this view. Still, we recognize that the senior capstone experience is not a self-activating one that can be installed, cookbook style, into an administrative unit of the modern academic division of labor. Sill, Harward, and Cooper (2009), in an evocative essay on the senior experience, offer an apt illustration of the slight differences that can separate the transformative educational experience from the ordinary, or mildly disappointing, one.

In the early 1990s, the senior assignment for studio art majors at Southern Illinois University's (SIU) Edwardsville campus asked seniors at year's end to collect a sample of their work that represented the skills they had acquired within various genres and mediums. Seniors were asked also to draft a short artistic statement describing their process and reflecting on the work they had accomplished. Faculty members then evaluated the miniportfolios and statements displayed, assessing both individual efforts and program success. The studio art majors did as they were instructed and installed their works throughout the art department building, and faculty dutifully reviewed all the works and rendered their judgment. Yet the results of this disciplinary effort were disappointing. Students, not fully appreciating the fact that the exercise was intended to be an integrative and reflective one, merely carried out what they viewed as their final assignment. Art faculty, facing a building full of mounted art on a Friday night late in the term, struggled to review and assess the work in a meaningful way and offer a collective evaluation. Neither the students nor the faculty experienced the deep immersion in learning and growth that a culminating experience should entail because the effort was episodic and individualized, not sustained and collectively experienced. It was, in short, not thoughtfully designed or programmatic in its execution but rather offhand, throwaway, and, in the end, alienating rather than affirming (Sill et al., 2009).

The revealing, and redemptive, lesson from Sill et al.'s (2009) account of the art studio capstone experience, however, is that the initial failed plan turned out not to be the end but rather the beginning of the art department's capstone program. Stung by the flat and disengaged nature of the student response to the assignment and equally disenchanted with the tediously uninspired demand to assess that experience, faculty

collectively reorganized an existing course into a true senior culminating experience: Art 405. Rather than an experience tacked on to the senior year, Art 405 became a required, shared senior-year experience: a semester-long preparation of a representative portfolio of each student's work enlivened by a coherent program of classes devoted to integrating the senior year with earlier courses and work. Thus, a disappointing initiative was used to create a transformative educational experience for senior studio art majors and their faculty.

At our own institutions, like SIU-Edwardsville's Art Department, the onset of capstone courses also took place in the 1990s. The capstone experience became part of the expected culture for our graduating seniors. We conclude that this curricular trend was driven by the strong arguments presented by the American Association of Colleges and Universities and others who championed the traditional capstone course as a model for better-educated students. However, at some level, these changes also reflect the social normative nature of our educational system. We must recognize that the capstone course has become as integral to the curriculum of many disciplines as introductory courses. We believe, based on examining the many reports and studies we review in this book, that the senior capstone course is here to stay within American higher education for the immediately foreseeable future. Whether it will remain that way in the future is an open question.

Michael Stolloff and colleagues (2010), prominent researchers studying the scholarship of teaching psychology, may well be correct that we will see a decline in the prevalence of the capstone course. Stolloff et al. expressed their concerns regarding the sustainability of capstone programs after a noticeable difference between their sample estimate of the number of psychology departments offering capstones (40 percent) and earlier research estimates (60 percent). Contrary to Stolloff and colleagues, we find little evidence of any likely decline in interest in the capstone in our research to date. Rather, our research has confirmed that an increasing number of disciplines and institutions offer or require a senior capstone experience (Hauhart & Grahe, 2010, 2012; Grahe & Hauhart, 2013). Moreover, more professional peer-reviewed studies and publications regarding capstones are appearing, and an increasing number of educational bodies continue to call for more emphasis on the senior capstone rather than less emphasis. Ultimately only time and evidence will tell us whether there is an eventual decline in the offering of capstone courses within specific disciplines or more broadly across the liberal arts curriculum. In the meantime, we focus this book on how to best design and teach this course that is so prevalent across the majority of American four-year institutions today.

