



BROWN

**CRAFTING MEANINGFUL CULMINATING EXPERIENCES:
BEST PRACTICES FOR CAPSTONES IN THE CONCENTRATION**
A Report on Capstones for the College Curriculum Council

March 6, 2018

Executive Summary

This report on capstones at Brown was reviewed and approved by the College Curriculum Council (CCC) in February 2018. The report provides an overview of research findings about the typical forms and educational benefits of capstones; a review of capstone requirements across 100 concentration options (70 A.B. degrees and 30 Sc.B degrees); and a set of recommendations about what the College can do to increase the academic rigor and learning potential of its capstone practices.

The key findings of the report are that:

- The majority of concentrations (69%, $n = 69$) require a capstone. However, 31% ($n = 31$) of concentrations lack a capstone requirement.
- The capstone requirement is most often fulfilled through an independent study or research project (42), an upper-level course (32), or a senior seminar (19).
- In a small number of concentrations the capstone requirement can be met through a research internship (5) or a portfolio project and/or a public performance or presentation (10).
- 32 concentrations identify 2 or more ways to satisfy the capstone requirement.
- Some concentrations that do not require a capstone nevertheless encourage capstone work (and/or independent research).

The CCC endorsed the following recommendations for how departments and programs could strengthen their capstone requirements:

- 1) Concentrations should state explicitly what the academic purpose of the capstone requirement is and how and why students are required to undertake this work in their senior year.

2) Concentrations currently lacking a capstone requirement or with an optional capstone should explore ways to institute a required capstone experience for seniors that is responsive to the discipline and fits within the structure of the concentration.

3) Departments and programs should consider ways of using senior capstones to assess the alignment within concentrations between intended learning goals and achieved learning outcomes.

4) The DoC should continue to track research on capstones and pursue opportunities to conduct formal research on the educational effectiveness of Brown's capstone practices.

Supports to departments and programs to carry out these recommendations could include:

- DoC curriculum development grant funds to develop dedicated senior capstone courses and supporting tools and resources.
- Swearer Center curriculum development grant funds to develop community-engaged capstone courses.
- A Sheridan Center Brown Learning Collaborative course design institute focused on capstone course development.

Introduction

“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.” Jillian Kinzie, Taking Stock of Capstones and Integrative Learning

Senior-year capstones are widely recognized as a high-impact educational practice and have been variously instituted by many colleges and universities, including Brown.¹ While there is a need for more research about the specific learning outcomes associated with capstones (and with particular forms of capstones),² well-designed capstones hold significant promise for advancing student learning as well as for assessing the rigor and coherence of curricula at the college and departmental level.

This report to the College Curriculum Council provides a brief summary of research findings about the typical forms and educational benefits of capstones; a review of capstone requirements - or lack thereof - across concentrations at Brown; and a set of preliminary recommendations about what Brown can do to increase the academic rigor and learning potential of its capstone practices. (Note: this report focuses exclusively on capstone requirements independent of Honors work.³ Honors theses certainly qualify as capstones and most departments and programs have well-developed and “capstone consistent” guidelines for Honors work, even if they do not explicitly refer to them as capstones.)

What is a Capstone?

Senior capstones are high-impact educational practices that have been shown to foster deep learning, build significant relationships with faculty, and develop academic and professional skills.

The overarching goal of the capstone is to provide students with a culminating learning experience through which they demonstrate proficiency and facility with key learning objectives articulated at the level of the concentration as well as the broader general educational goals of their institution. As culminating learning experiences, capstones are integrative, reflective, and

¹ George D. Kuh, *High-impact educational practices: What they are, who has access to them, and why they matter* (Washington, DC: Association of American Colleges and Universities, 2008)

² D. G. Young, et al., *Introduction to 2016 National Survey of Senior Capstone Experiences - Expanding our Understanding of Culminating Experiences* (University of South Carolina, 2016). See also: J. E. Brownell and L.E. Swaner, *Outcomes of High-Impact Educational Practices: A Literature Review* (Washington, DC: Association of American Colleges and Universities, 2009).

³ The College Curriculum Council endorsed a series of guidelines for Honors Programs following a similar review in spring 2013, available at <http://brown.edu/go/honors>.

transitional.⁴ They are integrative in that they require students to synthesize across discipline-specific content and research methods, apply knowledge to novel problems and contexts, and often experiment with different forms of scholarly and public presentation. They are reflective in that they prompt students to think about and account for the developmental trajectory of their learning within the concentration and discipline. They are transitional in that they frame, with varying degrees of explicitness, opportunities and pathways in post-college life: graduate school, professional career, public service, etc.

Capstones take many forms (see Table 1 below). They can be course-based and be disciplinary or interdisciplinary in focus. They can be project-based and range from applied learning or design projects to independent research projects, including theses. Capstone projects may be short-term or extend over one or more semesters. They can be interdisciplinary and involve students working on team-based projects. They can involve experiential learning opportunities centered around internships, teaching experiences, or community-based projects. And importantly, they can be articulated as culminating learning experiences relative to the overarching learning goals of the institution (e.g., *Liberal Learning at Brown*) or, as the current practice and primary self-understanding at Brown, as requirements of the concentration or major. While the latter option is not exclusive of the former, it defines the capstone at least in significant part in relation to disciplinarily-defined knowledge and competencies.

Table 1: Typology of Capstone Experiences in NSSCE 2016⁵

Category of Capstone	Frequency
Capstone course	Department or discipline-based course
	General education-focused course (campuswide capstones)
	Other capstone course
Exam	Comprehensive exam
	Exam leading to certification or professional licensure
Arts performance or exhibition	Exhibition of performing, musical, or visual arts
Project	Senior integrative portfolio
	Senior integrative or applied learning project

⁴ Cuseo's widely-used definition describes three overarching goals for capstones: "(1) offer an opportunity for integrative reflection, (2) make meaning of the college experience, (3) assist with transition to post-college life" (p. 22). Joseph B. Cuseo. "Objectives and Benefits of Senior Year Programs", ed. J.N. Gardner and G. Van der Veer, *The Senior Year Experience. Facilitating Integration, Reflection, Closure, and Transition* (San Francisco: Jossey-Bass Publishers, 1998).

⁵ Reproduced from Young, et al, [2016 National Survey of Senior Capstone Experiences](#), 14.

	Senior thesis or independent research paper
Experiential learning	Service-learning or community-based learning project
	Internship
	Student teaching
	Other supervised practice

Educational Benefits of Capstones

The literature on capstones indicates clearly that certain types of capstone structures yield more significant learning experiences for the student and more meaningful assessment data for the faculty, academic department, and university. As a scaffold for multiple types of activities and assignments, capstones often incorporate other high impact educational practices (research experiences, applied design projects, community-based learning, collaborative assignments, internships), which themselves are associated with multiple learning outcomes.⁶ Not surprisingly, capstones involving more intensive faculty supervision and feedback - e.g., research projects - are correlated with greater educational gains for students.⁷

1. **Dedicated senior capstone seminars** (which at Brown are found in Africana Studies, Contemplative Studies, Ethnic Studies, Public Health, and Sociology, for example) provide more focused opportunities for integrative learning and summative reflection on disciplinary concepts. By contrast, capstones satisfied through upper-level courses have been found to be less effective in “understanding key concepts in the major” (NSSE 2007, p. 20). Through refinements to department-level definitions of and expectations for capstones and modifications to assignments in upper-level capstone electives, it might be possible to approach the intentionality of the dedicated senior capstone seminar.
2. **Portfolio-based capstones** (American Studies, Hispanic Literatures and Culture, and Visual Art), which require students to collect and curate work produced across their undergraduate career and reflect on challenges and progress, are powerful tools for integrative and reflective learning.
3. **Team- and project-based capstones** (Business, Entrepreneurship and Organizations (BEO), Biomedical Engineering) build collaborative and problem-solving skills that are valuable for and transferable to future careers.

⁶ George D. Kuh and Ken O’Donnell, with Case Studies by Sally Reed, *Ensuring Quality & Taking High-Impact Practices to Scale* (Washington, DC: AAC&U, 2013).

⁷ National Survey of Student Engagement, *Experiences That Matter: Enhancing Student Learning and Success*, Annual Report 2007 (Bloomington, IN: Indiana University Center for Postsecondary Research, 2007), 20.

4. **Capstones involving field experiences and/or internships** (Health and Human Biology, Public Policy) **or collaborative partnerships** with non-university stakeholders (BEO, Engaged Scholars Program) have been shown to have a particularly rich set of educational gains related to integrative learning, applied skills, leadership, social justice orientation, and cultural understanding.⁸ Importantly, however, recent research has documented negative outcomes for students in historically underrepresented groups in cases where community-based learning projects assume a paternalistic or “othering” stance toward community partners.⁹ This points to the importance of asset-based and truly collaborative models of community engagement.

The four types of capstones described above are not mutually exclusive. It is possible to combine one or more of these types of capstone experiences and to deepen potential learning outcomes accordingly.

Many of the learning outcomes and competencies most highly valued by potential employers are correlated with the types of capstones described above. A recent survey commissioned by the American Association of Colleges and Universities (AACU) found that employers place the greatest priority on five knowledge areas and skill sets (out of 17 types): oral and written communications (85% and 82%), teamwork skills (83%), ethical decision-making (82%), critical thinking and analytical reasoning (81%), and applying knowledge and skills in real-world settings (80%).¹⁰

Capstones and Assessment

⁸ “Educational gains associated with culminating experiences vary by capstone emphasis. NSSE’s in-depth examination of capstone experiences revealed that capstones 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.” J. Kinzie, *Taking Stock of Capstones and Integrative Learning* (Peer Review, Fall 2013, Vol. 15, No. 4).

⁹ As Brownell and Swaner (2009) state: “Studies show that service learning has a positive impact on academic and civic outcomes, such as sense of social responsibility, development of a social justice orientation, commitment to a service-oriented career, gains in moral reasoning, and greater tolerance of difference. These positive outcomes apply to both majority students and underserved students. However, the research has identified an additional negative outcome for underserved students. If the service-learning experience treats community partners as “other,” students who identify with those communities can experience conflict and a sense of isolation. More research is needed in this area, but these findings show that program design is essential to ensuring positive outcomes for all students.”

¹⁰ Hart Research Associates, *Falling Short? College Learning and Career Success* (Washington, DC: Association of American Colleges and Universities, 2105), 4.

Clear capstone guidelines and consistent practices of advising and supporting capstone work at the level of the concentration have multiple benefits for students and faculty, including for purposes of assessment. Assessment can be understood at the level of the individual student and the concentration as a whole.

With the individual student, capstone work provides an opportunity to assess how successfully the student has developed proficiency around learning objectives and core competencies that the faculty have identified as fundamental to the concentration. At the concentration level, the capstone work of seniors provides faculty with a ready means of assessing the adequacy of its curriculum to the learning objectives it articulates for the concentration.

Capstones at Brown

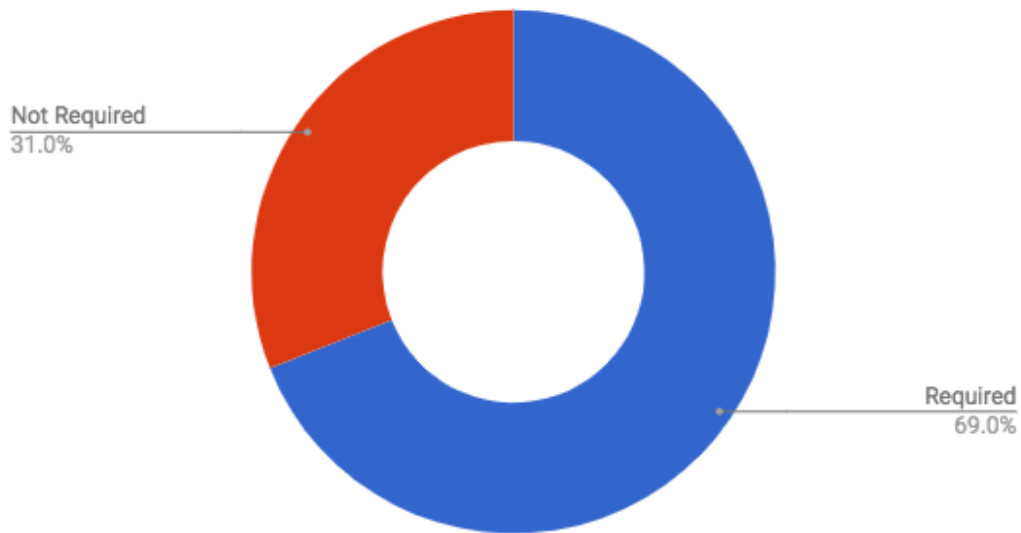
The analysis that follows is not based on a comprehensive assessment of each and every capstone requirement across the undergraduate curriculum at Brown. However, some general conclusions can be drawn from even a limited scan and content analysis of descriptions of concentration requirements on departmental and program websites as well as of courses listed in Courses@Brown as satisfying a concentration capstone requirement.

Senior-year capstones are a common but not universal requirement across undergraduate concentrations at Brown. There are currently 81 concentrations at Brown (including Independent Concentrations) with 70 A.B. degrees and 30 Sc.B degrees. An analysis of these 100 concentration options - excluding variations created by tracks within concentrations - shows that:

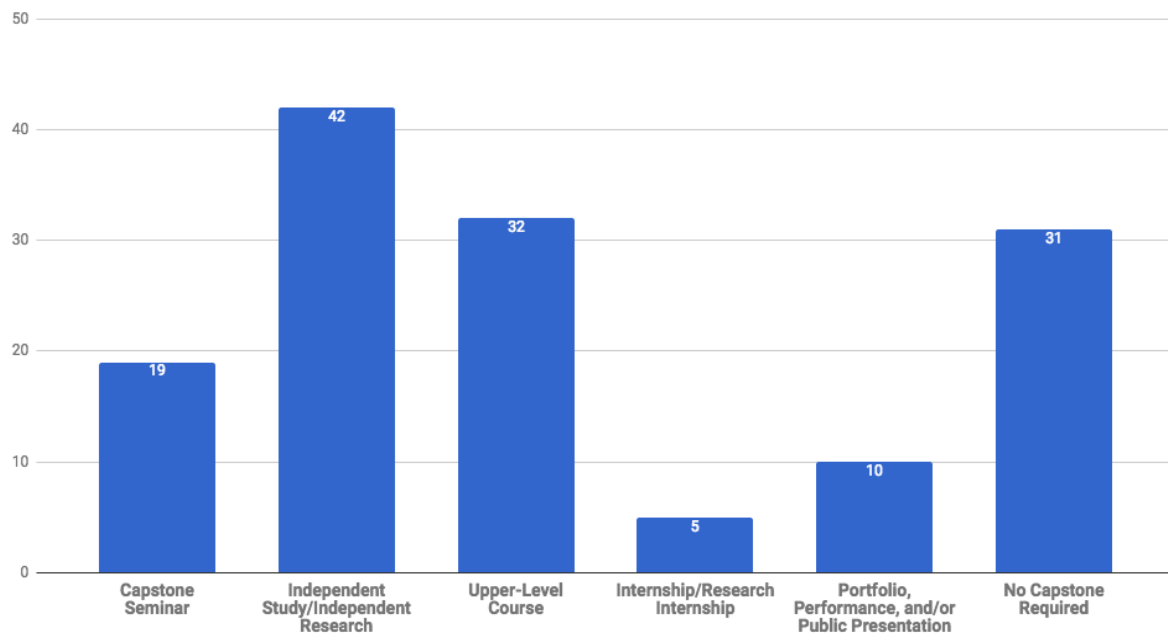
- The majority of concentrations (69%, n = 69) require a capstone.¹¹
- 31% (n = 31) of concentrations lack a capstone requirement.
- The capstone requirement is most often fulfilled through an independent study or research project (42), an upper-level course (32), or a senior seminar (19).
- In a small number of concentrations the capstone requirement can be met through a research internship (5) or a portfolio project, public performance, and/or public presentation (10).
- 32 concentrations identify 2 or more ways to satisfy the capstone requirement.
- Some concentrations that do not require a capstone nevertheless encourage capstone work, often through an independent research project.

¹¹ This report does not provide an assessment of the relative strength and rigor of those requirements. This is a matter for further research.

Percent of Concentrations Requiring Capstone



Types and Frequency of Capstone Requirement



The strongest and clearest statements about capstone purposes and structure are typically found in the descriptions of dedicated senior capstone seminars. Whether in a one-semester course such as AFRI 1360¹² or PHP 1910¹³ or a two-semester sequence such as BEO 1930/40¹⁴ or BME

¹² AFRI 1360 - Africana Studies: Knowledge, Texts and Methodology. "This course will explore the issues of Africana Studies as a discipline by engaging in a series of critical readings of the central texts, which

1930L/31L,¹⁵ the explicit designation and the structure of the senior seminar together pave the way for course design in line with capstone best practices.

Capstone requirements fulfilled through independent studies or by upper-level courses tend to be more vaguely articulated. In the case of independent studies, this vagueness (and variability) arises due to the high degree of discretion that instructors have in the design and assessment of departmental independent studies. This is exacerbated if the concentration lacks clear guidelines of the goals and desired learning outcomes for the capstone work. Concentrations with a capstone requirement that can be fulfilled through an upper-level course face a similar problem unless the department or program provides clear guidelines about what kinds of learning objectives and assignments ought to be incorporated into such a course in order to qualify as a capstone. Such goals and guidelines are especially important given the breadth of course options that can, in many cases, be used to satisfy the capstone requirement and the variability of instructors - regular faculty, visiting faculty, graduate students - from year to year and from course to course.

One important exception to this claim about the vagueness of capstone requirements fulfilled through independent studies is the case of ScB concentrations requiring directed research. ScB degrees in Biology, Biophysics, Computational Biology, Geology, Geology-Biology, Geology-Chemistry, Geology-Physics-Math, and Neurobiology all require one or two semesters of directed research with a faculty sponsor. While in some cases this work is not described as a

laid the protocols of the discipline. The course will also raise issues of knowledge production and methodologies. This course is a senior capstone seminar. Open to all senior Africana Studies concentrators; others by instructor permission only.” See AFRI 1360 on Courses at Brown.

¹³ PHP 1910 - Public Health Senior Seminar. “The course provides an overarching capstone experience to Public Health seniors. It is designed to weave together 3 threads, specifically: (1) Capstone final written project based on Public Health concentration goals, including a systematic review or data analysis; (2) Formalizing and presenting career plans; (3) Learning and practicing key principles of effective workplace skills. The course provides opportunities to synthesize and reflect on the knowledge gained during the undergraduate program, provide support for solidifying effective next career steps, and provide important soft skills for excelling in the workplace.” See PHP 1910 on Courses at Brown.

¹⁴ BEO 1930A - BEO Capstone I: Organizational Studies Track. “The first in a two-semester Capstone for BEO Organizational Studies track seniors, open to all BEO seniors. Capstone builds upon concepts covered in BEO courses, specifically concepts from SOC 1311 and 1315. Students will synthesize knowledge at several levels: across disciplines, across theoretical understanding and practical application, and across private and public sector experiences of entrepreneurship and innovation. Students will be organized into client-mentored teams for social entrepreneurship and social innovation projects. BEO 1930A (fall) required; 1940A (spring) strongly advised for all Organizational Studies track seniors. Application required to match students to projects. Project team meetings required outside scheduled lectures. WRIT.” See BEO 1930A on Courses at Brown.

¹⁵ ENGN 1930L - Biomedical Engineering Design, Research and Modeling. “This course is the culmination ‘Capstone’ of the biomedical engineering educational experience. The primary objective of this course is to recall and enhance design principles introduced through the engineering core curriculum and to apply this systematic set of engineering design skills to biomedical engineering projects. Students will form teams with their peers and a clinical advisor, identify and define a design project to meet a clinical need, and engage in the design process through the course of the semester. For seniors only. Non-engineering concentrators should register for ENGN 0930L.” See ENGN 1930L on Courses at Brown.

“capstone” (though it is, for example, in Computational Biology and Geological Sciences¹⁶), this type of intensive research experience is functionally equivalent to a capstone.

Three concentrations (American Studies, Hispanic Literatures and Culture, and Visual Art) have a portfolio-based capstone requirement; and at least three (Human Health and Biology, Public Policy, Social Analysis & Research) have capstone requirements that can be fulfilled via research internships coupled with written reflections. The History of Art and Architecture is noteworthy in its requirement that second semester seniors complete a self-assessment: “a final essay that takes the measure of what they have learned from the concentration, including their Capstone and other experiences relating to their study of history of art and architecture.” Concentrations with professional tracks (e.g., Computer Science and Economics) require the submission of a reflective essay upon completion of the student’s internship or research experience(s).

Students participating in the Engaged Scholars Program (currently in 16 concentrations) are required to complete a capstone involving significant community engagement. Typically this requirement is satisfied by modifying the concentration capstone requirement - whether that takes the form of an capstone seminar, an independent study, or a research internship - to involve a non-academic partner organization (in, for example, the formulation of the research question and/or the design and release of a report). Students in the program are also required to take SOC 310: Theory and Practice of Engaged Scholarship, which has a capstone planning module.

There are also a number of departments that have a well-developed capstone for their concentrators that is not required. Education Studies, for example, has a webpage dedicated to capstones with a laudably detailed description, application process, and timeline for projects.¹⁷ Economics encourages concentrators to complete a capstone project or experience before graduating and identifies multiple ways that such work might be completed, including through an independent study, a research paper, a teaching assistantship, or a non-credit internship

¹⁶ “GEOL1970 (‘Individual Study of Geologic Problems’) provides an opportunity for you to experience what research in our discipline actually entails: to learn how to ask a well-defined, significant, and answerable question; to learn appropriate methods and collect your own data; to interpret your results and address their broader implications. These goals are best fulfilled by hands-on experience; they cannot be learned passively in the classroom or by reading about other people’s research results. A second and related goal is for you to take primary responsibility for your learning, including the necessary planning and time management. This course provides an integrative ‘capstone’ experience, which will allow you to get to know some professors, staff and grad students better than possible in the usual academic course, help you to decide whether (or not) to consider grad school and a career involving research, and provide you with skills (and a finished project) useful for job seeking.”

¹⁷ Education Studies capstone description: “Capstones are voluntary, student-initiated projects or experiences outside the classroom that build on and contribute to students’ Education Studies concentration, and can take various forms, including a research project, website design, curriculum design, policy analysis, or scholarly paper. Capstones can be designed and executed your senior year, or can be based on a previous experience that you want to explore further in some way, such as an internship or teaching experience. While capstones do not confer departmental honors, students who complete capstones will be recognized at the department graduation ceremony and will have the opportunity to present at a conference in the spring of their senior year. Through capstones students have the opportunity to work closely with a faculty member in an area of their interest and are able to reflect on and extend their learning in the concentration.” See full description [here](#).

linked to concentration studies. Slavic Studies likewise encourages concentrators to pursue a capstone and provides clear guidelines outlining the pathways, purposes, and timeline for the capstone experience.¹⁸

Recommendations

According to the 2007 NSSE report, “four in five (81%) faculty members reported it is important for undergraduates to have a culminating senior experience” (21). At Brown, this general regard for culminating senior experiences is reflected in the almost uniformly clear rationale, criteria, and guidelines for pursuing Honors within concentrations. The academic rigor of Honors requirements is due, at least in some part, to the College Curriculum Council having taken up the issue of honors, reviewed the range of programs across the University, and proposed a series of [guidelines and best practices](#). When released, these recommendations prompted important departmental conversations and consequent tightening up of practices around Honors work.

We hope the same is true for capstones, which were among the goals recommended by the [Task Force on Undergraduate Education](#) a decade ago (p. 11). On the heels of that work, many departments and programs created "capstones" in name only, and there is now an opportunity to create more rigorous, well-defined, and robust capstone experiences.

What follows are recommendations for how departments and programs could strengthen their capstone requirements:

1) Students learn more and perform better when they understand the purpose of and expectations surrounding requirements and assignments. Concentrations should state explicitly what the academic purpose of the capstone requirement is and how and why students are required to undertake this work in their senior year. In alignment with general definitions and best practices, this articulation should refer to the integrative, reflective, and transitional nature of capstones and make reference to the learning goals of the concentration and of the College more generally. Some concentrations have developed useful worksheets or learning agreements that facilitate explicit communication about and planning for capstone experiences.

2) Concentrations currently lacking a capstone requirement or with an optional capstone should explore ways to institute a required capstone experience for seniors that is responsive to the discipline and fits within the structure of the concentration.¹⁹ While there may be some additional educational gains and evaluation benefits associated with credit bearing capstones, the most important factor for the capstone experience - be it credit bearing or not - is that it

¹⁸ “The objectives of the capstone experience are: to demonstrate one’s ability to interpret texts in one or more Slavic languages using a set of essential research tools, methodology, and a sound command of cultural knowledge; to cultivate clear and logical written expression in the context of an independent project; to serve as a bridge between the student’s academic work and his/her direction in the professional world. Ideally, the capstone experience will recapitulate a concentrator’s experience in Slavic Studies and help her/him identify and broaden their knowledge of a particular area of the Slavic world, which s/he would want to explore in the future or apply in their future profession.”

¹⁹ Smaller concentrations might explore the possibility of developing interdisciplinary capstones.

incorporates the goals and best practices described above. College-wide adoption of required capstones is particularly important in light of recent 2017 NSSE findings that first generation students lag behind their non-first generation peers in participation in high impact educational practices, including capstones.²⁰

3) Departments and programs should consider ways of using senior capstones to assess the alignment within concentrations between intended learning goals and actually achieved learning outcomes. Because capstone work requires students to synthesize and integrate their learning experiences over the course of their time as concentrators, it provides a ready-made opportunity for departments and programs to review the cumulative impact and effectiveness of their curricula and to present this information in CCC concentration reviews.

4) The DoC should continue to track research on capstones and pursue opportunities to conduct formal research on the educational effectiveness of Brown's capstone practices.

Supports to departments and programs to carry out these recommendations could include:

- DoC curriculum development grant funds to develop dedicated senior capstone courses and supporting tools and resources.
- Swearer Center curriculum development grant funds to develop community-engaged capstone courses.
- A Sheridan Center Brown Learning Collaborative course design institute focused on capstone course development.

²⁰ National Survey of Student Engagement, *Engagement Insights: Survey Findings on the Quality of Undergraduate Education – Annual Results 2017*, (Bloomington, IN: Indiana University Center for Postsecondary Research, 2017). 4.