

## Capstone Experiences Best Practices and Resources

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### Office of Undergraduate Experiences

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HIP Best-Practices Guidelines

CAPSTONE COURSES AND PROJECTS

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## 1. Definition and Overview

According to the Association of American Colleges and Universities (AAC&U), “Whether they’re called ‘senior capstones’ or some other name, these culminating experiences require students nearing the end of their college years to create a project of some sort that integrates and applies what they’ve learned. The project might be a research paper, a performance, a portfolio of ‘best work,’ or an exhibit of artwork” (<https://www.aacu.org/leap/hips>).

As defined by the University of Colorado Denver for the purposes of its High Impact Practices (HIP) initiative, a **Capstone Course** is a culminating, integrated experience that results in the completion of a major project. A capstone creates opportunities for students to integrate, reflect on, and apply what they have learned in their academic programs, and is demonstrated in the form of a project such as a presentation, performance, portfolio, exhibit, research paper, or a combination of these experiences.

## 2. Best-Practices Guidelines

The minimum standard features of a Capstone course, based upon national best-practices, are as follows:

- **Culminating Project:** In a course that is taken in or close to the final semester or year, students complete a major project, as defined within their discipline(s) or field(s), that draws upon and ideally synthesizes what they have learned throughout their academic program(s).
  
- **Integration of Knowledge and Skills:** Students integrate the knowledge and skills

scaffolded/taught throughout the program, as well as from courses outside their discipline or field and through their co-curricular experiences.

- **Reflection on Learning:** Students engage in significant reflection through written work and/or performance on what they have learned in their programs and through their projects.

### 3. Learning Outcomes

National best practices recommend that Capstone courses should deliver the learning summarized by the following AAC&U [Essential Learning Outcome](#) (ELO), **Integrative and Applied Learning**.

According to the AAC&U, “Integrative learning is an understanding and a disposition that a student builds 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.”

Capstone course syllabi ideally should reference and use the [VALUE rubric](#) for the **Integrative and Applied Learning** ELO and integrate this general learning outcome into the discipline-specific learning outcomes for the course. The ELO should be expressed in the terms of that discipline or profession and serve the delivery of disciplinary knowledge and skills.

In addition, individual faculty may choose whether or not to incorporate one or more of the other ELOs, as appropriate to the discipline, and integrated into the disciplinary or professional content or used as vehicle for that content. Other ELOs that may be especially appropriate to Capstone courses include: **Creative Thinking, Critical Thinking, and Oral Communication**.

This concludes the abbreviated Capstone Best-Practices Guidelines. The complete version additionally includes a Suggested Resources or references section and a Sample Courses section.

## 4. Suggested Resources

Below are a sample of related articles, capstone tools, and resources from the Degree Qualifications Profile (DPQ) (<http://degreeprofile.org/resource-kit/capstones>).

### RELATED ARTICLES AND BOOKS

**Brownell, J. E., & Swaner, L. E. (2010). Five high-impact practices: Research on learning outcomes, completion, and quality. Washington DC: Association of American Colleges and Universities.**

Examines research on five educational practices: first-year seminars, learning communities, service learning, undergraduate research, and capstone experiences. The authors explore questions such as: What is the impact on students who participate in these practices? Is the impact the same for both traditional students and those who come from historically underserved student populations?

**Hauhart, R. C. & Grahe, J. E. (2012). A national survey of American higher education capstone practices in sociology and psychology. *Teaching Sociology*, 40(3), 227-241.**

Previous research on capstones in sociology and psychology has suggested that there is a typical capstone experience required by three quarters of all four-year colleges and universities in the United States. This article reports results from a national survey that confirm that sociology and psychology capstone courses conform generally to a common format. The findings further indicate that factors related to student limits and time limits predominate with respect to those variables that produce less successful course outcomes.

**Murray, M., Perez, J., & Guimaraes, M. (2008). A model for using a capstone experience as one method of assessment of an information systems degree program. *Journal of Information Systems Education*, 19(2), 197-208.**

A well-defined capstone experience is comprehensive in nature allowing for the assessment of a wide range of abilities. A capstone based assessment method includes mapping project deliverables and other artifacts to specified learning outcomes, establishing a scoring rubric that defines performance criteria, collecting and analyzing data and reporting results. Through this type of analysis, program strengths are revealed and program weaknesses are identified. Subsequently program improvement plans can be developed and ultimately increases in student learning can be realized.

**Sum, P. & Light, S. A. (2010). Assessing student learning outcomes and documenting success through a capstone course. *PS: Political Science and Politics*, 43(3), 523-531.**

A capstone course is an increasingly common method to measure student learning and assess programmatic and institutional success. We provide concrete suggestions to design a capstone course and assess student learning outcomes. After describing the structure of the course and four innovative assignments, we present the results of assessment conducted through the capstone. We further the conversation on the development of best practices and how political science departments can align institutional and programmatic goals and lead the way in university assessment.

**Erradi, A. (2012). EasyCapstone: A framework for managing and assessing capstone design projects. Paper presented at the ICCSE 2012 – Proceedings of 2012 7th International Conference on Computer Science and Education, 1345-1350.**

To enhance students learning and satisfy ABET requirements, the Department of Computer Science and Engineering at Qatar University undertook over the past few years significant enhancements to the senior design project course. This work has produced a framework for managing and assessing capstone design projects. Along with a web-based application named easy Capstone to ease the framework adoption by automating key workflows particularly for managing the project registration, the submission of deliverables, scheduling project presentations, assessing students work and providing timely personalized feedback to students.

**Goldberg, J.R. (2012). Active learning in capstone design courses. *IEEE Pulse*, 3(3), 54- 55, 57.**

This article discusses means by which to encourage active learning within capstone courses. Many schools are moving away from the sage on the stage to the guide on the side model where the instructor is a facilitator of learning. In this model, the emphasis is more on learning and less on teaching, and it requires instructors to incorporate more active and student-centered learning methods into their courses.

**Healey, M. (2014). From the international desk: Integrating undergraduate research into the curriculum: International perspectives on capstone and final-year projects. *CUR Quarterly*, 34(4), 26-32.**

This article provides various examples of what a capstone might look like; specifically in universities abroad. Through integrating numerous short case-studies from universities in the U.K., the Netherlands, Australia, and New Zealand, this article delves into the differing forms capstone projects can take, their main purpose, and common characteristics.

**Blicblau, A. S., & Dini, K. (2012). Creating an alternate reality: Critical, creative, and empathic thinking generated in the “global village playground” capstone experience. *Thinking Skills and Creativity*, 7(3), 153-164.**

The “Global Village Playground” (“GVP”) was a capstone learning experience designed to address institutional assessment needs while providing an integrated and authentic learning experience for students aimed at fostering critical and creative thinking. In the “GVP”, students work on simulated and real-world problems as a design team tasked with developing an alternate reality game that makes an impact on the United Nations Millennium Development Goals. Researchers employed a qualitative case study approach to evaluate participant reactions to the course, their perceptions of the instructional design methodology, what they learned in the course, and the challenges they experienced during the pilot implementation of this capstone design.

**Schermer, T. and Gray, S., (2012, July). *The senior capstone: Transformative experiences in the liberal arts* (The Teagle Foundation Final Report). New York, NY: The Teagle Foundation.**

The four private liberal arts colleges participating in this study—Allegheny College, Augustana College, Washington College, and The College of Wooster—are distinctive in that they require all seniors to engage in an intensive mentored experience (“capstone”) that is designed and executed by the student using the theories, methods, and tools of a discipline, resulting in a scholarly or creative work. While we have long believed the experience to be transformative, the evidence has been largely anecdotal. This report presents some concrete findings on the impact of capstones on student learning.

**Carey, S.J. (Ed.). (2013). *Capstones and Integrative Learning. Peer Review: Emerging Trends and Key Debates in Undergraduate Education*, 15(4).**

This periodical is dedicated towards understanding what effective capstone programs are for undergraduate students. In particular, the contributors address the nature of capstones as integrative learning, the need for fostering interdisciplinary projects, conducting formative and summative assessments of such programs and requiring faculty involvement. Some of the institutional examples provided includes Hampshire College’s Division III project for their fourth-year students and University of La Verne’s Flex program

and use of e-portfolios, among others. The periodical also includes a discussion about some practices that may hinder the success of capstone projects and programs, such as the lack of communication among students and faculty about the goals of capstone learning as an integrative experience and conducting capstones as solely a senior capstone experience, which limits the necessary reflective time needed for effective integrative learning.

**Finley, A., & McNair, T. 2013. *Assessing underserved students' engagement in high- impact practices*. Washington, DC: Association of American College and Universities.**

*Assessing Underserved Students' Engagement in High-Impact Practices* contributes to the national dialogue by building on Kuh's original findings from his work with the large datasets of the National Survey of Student Engagement (NSSE). Ashley Finley and Tia McNair's study asks a new set of questions related to "impact," employing an inquiry- based model to probe for answers about the cumulative effects of HIPs. Written for campus practitioners, the book makes a unique contribution by developing a methodology to support purposeful and intentional study as well as equitable implementation of high-impact practices on the ground. Perhaps the most valuable endings of the book concern equity—the "equity effects" that appear in students' reports of their learning as their success is boosted by HIPs; the equity-minded perspective that educators can nurture; the principles of inclusive excellence that can guide colleges and universities in providing a liberal education that offers not only equitable access to HIPs, but also equitable achievement of outcomes.

University of Hawaii at Manoa.

Retrieved 11/19/2017 from: <https://manoa.hawaii.edu/assessment/howto/capstone.htm>

## Capstone Experiences

### Definition

The capstone experience is a culminating set of experiences that "captivate, encapsulate, synthesize, and demonstrate learning." <sup>1</sup>

### Keys to the Capstone

1. The capstone should be a culminating set of personal, academic, and professional experiences.
2. In a capstone course, students synthesize, integrate, and/or apply their previous knowledge, rather than acquire new knowledge or skills. Students demonstrate mastery, not learn new knowledge/skills.
3. A capstone should occur near the end of the program. [Tip: schedule the capstone course before the student's last semester in case remediation is needed.]
4. Student ownership, responsibility, and engagement should be central to the capstone.
5. Rationale for the framework (see below) should be based on the specific needs of the program/discipline.
6. The products (e.g., written assignments) of the capstone should be designed to help assess the program's desired student learning outcomes.
7. Discussion, reflection, and/or demonstration of general education and/or institutional outcomes should be evident in the capstone. [Note: some general education outcomes may not be relevant, but a capstone experience can likely address these general education outcomes: effective written and oral communication, ethical decision making, information accessing and information processing, problem solving, inquiry and analysis methods.]
8. Satisfactory completion of the capstone experience should be required for graduation.
9. Full-time (tenured) faculty members should facilitate, mentor, and/or coordinate the capstone experience.

## Frameworks for a Capstone Experience

There are four common frameworks for capstones (see Rowles, et al.). Programs typically choose one as the primary framework based on their program's needs. If/when appropriate, the other frameworks may also be incorporated or acknowledged.

- **Mountaintop.** Students from two or more disciplines (or specializations) engage in interdisciplinary inquiry.  
For example: Geography majors and Biology majors enroll in their major's capstone courses and are paired with a student from the other discipline. Each GEOG-BIOL pair of students completes an interdisciplinary project such as a project that uses geographic information systems (GIS) to monitor fish migration patterns or habitat changes.
- **Magnet.** Students pull together their learning from multiple courses and/or experiences. For example, students gather their best work samples from four courses (can also include internship, practicum, service learning, etc.), choosing samples that directly address the program's learning outcomes.
- **Mandate.** Students document their learning in relation to external industry/professional standards or requirements. For example, civil engineering students gather evidence to demonstrate they have achieved the outcomes set forth by the American Society of Civil Engineers.
- **Mirror.** Students reflect on their experiences and metacognitive skills in relation to program goals and outcomes. For example, students write short reflective pieces that describe what they have learned and how their assignments and experiences have helped them achieve each program outcome.

## Options for Courses/Activities within the Capstone Experience

A capstone experience can consist of one or a combination of these:

- A course in the major
- An interdisciplinary course with a minimum of two distinctly different disciplines represented
- An out-of-class/co-curricular experience
- A service- and/or community-based learning experience
- An application/demonstration of knowledge (e.g., thesis, design project, portfolio development)
- A college-to-work/career transition experience (e.g., internship, informational interviewing)



## Pedagogic Practices for Capstone Experiences

Instructors typically use some of the following teaching strategies and methods in capstone experiences:

- Collaborative learning

"*Collaborative learning* is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. . . Most center on students' exploration or application of course material, not simply the teacher's presentation or explication of it. Collaborative learning represents a significant shift away from the typical teacher-centered or lecture-centered milieu in college classrooms." *Collaborative Learning: A Sourcebook for Higher Education* (1992) by Anne S. Goodsell, et al., National Center on Postsecondary Teaching. Available thru interlibrary loan from UH Hilo, LB1032.C65.1992.

- Self-directed learning

Faculty members give students choices about their learning as well as responsibility for the consequences associated with those choices. The faculty member (or internship supervisor, co-op employer, etc.) establishes the necessary structures to guide and support students while still leaving the students to do such things as establish goals, create timelines, monitor progress, develop products for evaluation, etc.

- Problem-based learning

Faculty members give students an ill-defined task to complete or an open-ended problem to solve. The faculty member acts as a mentor, coach, and/or facilitator. Often the task/problem mirrors an actual, discipline-based task/problem but it has been simplified or structured to match the level of the students.

- Learner centered (a focus on what the students are learning and doing, not on what the professor is delivering or doing)

Faculty members design assignments that promote critical thinking, integration, reflection, synthesis. They give students assignments and activities that encourage

students to "suspend judgment, maintain a healthy skepticism, and exercise an open mind"; professors design activities that call for the "active, persistent, and careful consideration of any belief in light of the ground that supports it." [Taken from: <http://www2.gsu.edu/~dschjb/wwwcrit.html>, whose source is John Dewey's *How We Think: A Restatement of the Relation of Reflective Thinking in the Educative Process* (1933).]

FOOTNOTE #1. Sources

"Toward a Model for Capstone Experiences: Mountaintops, Magnets, and Mandates" by C.J. Rowles, D.C. Koch, S.P. Hundley, & S.J. Hamilton. *Assessment Update*, Jan/Feb 2004, 16(1).

"Capstone Experiences and Their Uses in Learning and Assessment," workshop by S.P. Hundley, Assessment Institute (sponsored by IUPUI), October 2008.