



# Experience Report: International Curriculum Development as a Capstone Experience

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This paper describes an ongoing collaboration between Harvey Mudd College in Claremont, CA, USA, and Musizi University in Kampala, Uganda. Novel aspects of the collaboration, from an undergraduate capstone perspective, include the long-standing international collaboration and the focus on student-led curriculum development. In this experience report, we reflect on the challenges and opportunities of this unique capstone structure.

Keywords: international collaboration; curriculum development

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## Introduction

In this paper, we describe an ongoing collaboration between Harvey Mudd College (HMC), an established STEM-focused liberal arts college in Claremont, CA, and Musizi University (MU), in Kampala, Uganda that is now in its third year. MU is Uganda's first private liberal arts university, welcoming its first cohort of students in fall 2026. MU aims to demonstrate how a purpose-driven, Africa-centered education can be a powerful engine for sustainable development and global progress. To reach that goal, MU plans to include computing as part of its general education curriculum. Since HMC has included gen-ed computing in its curriculum for many years,<sup>8</sup> MU's founders approached HMC in 2023 about a potential collaboration. By positioning that collaboration within HMC's existing undergraduate capstone program, we have integrated students and faculty from both institutions, fostering a peer-to-peer knowledge exchange that transcends traditional faculty-led curriculum development. The resulting course materials are carefully designed to meet the unique academic and infrastructural requirements of a developing institution in East Africa.

This service-learning capstone model has clear promise for HMC students. The benefits of service-learning projects for undergraduates are well understood: they can be particularly effective for students who are motivated by social good<sup>1,2</sup>, and can help to develop self-efficacy and communication skills that are beneficial to students' career readiness<sup>3,4</sup>. Similarly,

participating in international collaborations can develop students' intercultural competence.<sup>5</sup>

The vast majority of computer science capstone experiences focus on large software development projects,<sup>2,6</sup> though, and issues like ongoing maintenance costs can make those projects less beneficial to partner organizations.<sup>1</sup> The benefits of global collaborations can be maximized through long-term collaborations.<sup>7</sup>

Developing a curriculum for Ugandan university students has required HMC students to understand differences in secondary school exposure to computing,<sup>9</sup> which may lead to differences in curricular priorities.<sup>10</sup> Additionally, students have had to learn about curriculum design, course development, and educational assessment as part of their capstone experience.

## Capstone Context

All engineering and computer science majors at HMC are required to participate in a Clinic project as their capstone experience. Clinic is a two-semester team-based course. Projects are defined by external sponsors; those sponsors pay a fee to the college and provide a technical liaison to work with the team for approximately two hours per week. Each team is guided by a faculty advisor who serves as a coach, but students manage the projects, the work plan and the sponsor relationship.

In 2005, HMC introduced a Global Clinic Program to prepare students to become innovative engineers and scientists in a global context. Projects have run

successfully in several countries, including Iceland, India, Israel, Ireland, Japan, Kenya, Mexico, Uganda and Singapore. Site visits with sponsors are a key component of Clinic projects, and Global Clinic teams travel internationally when their projects would benefit from expanded Global Clinic's reach to partnerships with NGOs.

Since 2023, three teams of HMC students have collaborated with MU on Global Clinic projects. The student teams have developed materials for 11 courses that will be part of MU's curriculum, including a mix of gen-ed computing courses and upper-level courses for MU's Software Engineering undergraduate degree program.

### ***Capstone Highlight: International Site Visit***

While in-person collaboration is not possible every year, the HMC faculty advisor traveled with a five-student Clinic team to visit Musizi University in Kampala in January 2025. That experience offered specific logistical challenges, along with substantial benefits and lessons learned for future site visits.

#### **Preparations and Planning**

To minimize the impact on other school activities, the trip took place during the final week of HMC's winter break. Travel took approximately 36 hours in each direction, and the team was in Uganda for just under 7 days.

Planning for the trip required collaboration with multiple divisions at HMC. The Assistant Dean for Study-Aboard provided valuable guidance on planning, vaccination requirements, and travel insurance. The Business Affairs Office assisted with risk assessment, cash advances, and other logistical details. The student health center provided necessary vaccines to support travel. The Office of Sponsored Projects coordinated paperwork, reservations, and communication with other offices on campus.

The MU members of our team built on their established network in Kampala to fill the week with valuable experiences for the HMC students. To find spaces where HMC students could pilot their curriculum and receive meaningful feedback, they leveraged their Musizi WINGS college bridge program in collaboration with 7 local schools. Over the course of a day-long workshop, HMC students were able to interact with real potential learners of the curriculum they developed, while the 37 participants in their pilot lesson got to meet the HMC students, get feedback on their college application essays, and learn about software engineering career opportunities.

The MU team's extensive professional networks

allowed them to arrange interviews with software engineering professionals in Uganda. These interviews helped the HMC team more thoroughly understand the priorities of the kinds of employers who are likely to hire new MU graduates in the future.

Because MU has worked with more than 20 US interns over the last 4 years, they were also able to efficiently organize the logistics of the Mudd team's stay, such as housing, in-country transportation, meals, safety, and tourist activities.

#### **Benefits and Challenges**

Despite the logistical challenges, the benefits of this week-long site visit would be hard to overstate. The HMC students began their spring semester with a strong team bond, strengthened by their shared experience, and a clear motivation driven by their familiarity with the students who might learn from the curriculum they were developing. Overall, the experience provided a boost at a point in the academic year when project momentum can often lag.

For both the MU and the HMC members of our team, in-person collaboration provided a welcome relief from the time zone challenges of the rest of the year. Having the Claremont team visit Uganda provided an opportunity for informal cultural exchange, enabled deeper conversations about pedagogy, and gave the undergraduate students a clear understanding of the context where their work would be deployed.

While the visit was overwhelmingly positive, we did learn some important lessons that will inform planning for future visits. HMC will send future teams with at least two faculty or staff members. Having staff backup will ensure that, if there is a medical or other emergency requiring the team to split up, one staff member can stay with each part of the group.

#### ***Discussion***

Through analysis of written reflections from HMC students and faculty, Musizi liaisons, and over 120 Ugandan students, based on our work over the past three years, this section offers a discussion of common themes and impacts that the collaboration has had on its participants.

**Takeaway #1: Curriculum-Development Requires Adjustments to Capstone Structure** - HMC's Clinic program is well-structured for scaffolding software engineering projects. Advisors have extensive experience guiding students through the process of specifying project goals, identifying milestones, and tracking progress. HMC's Clinic directors are similarly experienced in specifying the appropriate scope of a one-year, student-driven project.

The college has much less experience scoping curricular projects by students, however. Further, most HMC students have no formal training in curriculum development or teaching, though the college does have a strong culture of undergraduate TA opportunities. It has taken some trial and error, and flexibility on all sides, to develop an intuition for the number of courses and level of curricular detail that are reasonable to expect from a capstone team.

We have come to appreciate iterative development cycles that include frequent check-ins, rapid prototypes, demo class sessions, and small improvements that prioritize the course materials Musizi lecturers will find most useful in the initial offerings of each course. As part of their capstone work, students learn about strategies such as backward course design and writing concrete learning objectives. Opportunities to present pilot classes to high school and first-year college students locally have been effective ways for students to gain experience in front of a class, which helps them develop and pace effective lesson plans

**Takeaway #2: Student Empowerment** - Consistent with prior literature, recent graduates who participated in this collaboration as undergraduate students report that they were highly motivated by the potential impact of their work. Former students say that during their capstone experience, the work felt like it was “higher stakes” than their previous classroom work, and that they appreciated the real-world impact offered by the opportunity to have a lot of influence over the direction of a project that would affect the experiences of MU students.

Depending on whether the USA is observing daylight saving time, the time difference between Claremont and Kampala is 10 or 11 hours. Meetings need to be scheduled for early mornings or late evenings to accommodate team members in both locations. We view students’ willingness to accommodate these logistical constraints as a sign of their commitment to the project. Another clear indicator of the success of this structure as a student experience is the tendency for project team members to stay connected to (and continue to identify with) the project, even after graduation. In other words, HMC capstone students see themselves as part of the MU team, well beyond the boundaries of their coursework.

**Takeaway #3: Potential of Learner-Driven Instructional Design** - All team members share an appreciation for how the undergraduate students bring their own experience as learners into the curriculum design process. HMC students appreciate being able to consider their own experiences as they shaped the experiences of future MU students. MU liaisons value the way that HMC students are motivated by an

opportunity to create courses they wish they’d taken, and how they respond to that opportunity with an empathetic approach to course design.

Meetings (over Zoom) with secondary school students in Uganda have been helpful for providing early cultural context, ensuring that the structure of the final courses is influenced by the interests and experiences of both HMC and MU students.

**Takeaway #4: Development of Student Interest in Teaching:** Starting in 2024, student teams have been encouraged to offer pilot courses to local students, giving them an opportunity to experience what it is like to be in front of a classroom. Since then, student presentations at the end of the academic year have often included comments indicating that students have a new appreciation for the work that goes into creating engaging classroom experiences, demonstrating an increase in appreciation for the work involved in teaching. Alumni of the HMC-MU collaboration report that participation in the project either introduced or reinforced an interest in teaching at some level. Former students note that their experience on a curriculum-focused capstone project will guide their future teaching efforts. One of the five students from our first cohort is currently enrolled in graduate school, and another is teaching in a K-12 school. Other recent graduates have expressed an interest in pursuing teaching in the future, and we intend to continue collecting longitudinal data about students’ pathways.

**Takeaway #5: Experienced Educators Learned from Students** - MU liaisons notice a change in their own teaching approach, as a result of their interactions with HMC students. They describe being used to a curriculum that is defined by what professors think students need to know, and a classroom structure where instructors copy notes from the textbook to the board, and then students copy the notes from the board to their notebook, with exams emphasizing memorization and reproduction of facts. They note that the established educational system in Uganda does an excellent job fostering discipline in students and emphasizing foundation skills, but doesn’t necessarily provide room for exploration or for practicing the application, creativity, and personal agency that is also needed to enable their students to realize their dreams of implementing expansive engineering solutions, building companies, and solving complex social problems.

MU liaisons appreciate that the courses developed by HMC students are engaging, hands-on, and project-based. This project-based learning will enable MU students to build confidence in their ability to work in teams on real projects. Through their interactions with HMC students, the MU members of our team have reframed their role as instructors from one of content

creators to one of strategic bridges that align students' ideas with national standards and the cultural realities of their region.

**Takeaway #6: Value of Transdisciplinary Collaboration** - Above all, all participants note an appreciation for the *experience* of collaborating with a team that crosses disciplinary, cultural, and career-stage boundaries. Students, faculty, and liaisons all agree that the collaboration has led to the creation of courses that are better than any single person or institution could have created independently.

HMC students enter the project each year with little to no familiarity with the structure of primary and secondary education in Uganda, or with the types of examples most likely to resonate with Ugandan undergraduates. MU mentorship ensures that the curriculum is not only academically robust but also culturally relevant, bridging the gap between what the students in America learn and the context in which the curriculum will be taught.

MU liaisons note the specialness of projects like the HMC student-generated Geographic Information Systems (GIS) project integrated into MU's Ubuntu Bulamu Philosophy course, as an example of the type of collaborative offering that combines technical soundness, a liberal arts approach to education, and a uniquely Ugandan perspective that is relevant to the students who will experience it. The resulting curriculum successfully merges critical thinking and the hands-on ethos of a liberal arts education with cultural strength and communal purpose of Ugandan context, resulting in a program that is both globally competitive and locally applicable.

### Conclusions

Our collaborative experience offers a model for a successful international, education-based capstone project. The project's success is anchored in our approach as true partners. The HMC team brings technical expertise and familiarity with pedagogical approaches grounded in a liberal arts philosophy. The Musizi team offers local context, with a deep understanding of the Ugandan educational landscape, their students' career aspirations, and the societal challenges their curriculum must address. By leveraging our respective strengths, we have been able to ensure maximum impact for students at both of our institutions. Together, we have created a curriculum that reflects the strengths of the liberal arts and STEM at HMC: technical skills along with thinking critically about the multi-faceted nature of technology and its potential impacts, tailored to the local context of MU students in Uganda.

Overall, our experience suggests that while software engineering projects remain the dominant form of capstone experiences for undergraduate computer science programs, there is promise in considering alternative formats for students to apply their learning. In particular, students may benefit from opportunities to create educational materials, particularly for an audience with different educational and cultural backgrounds than themselves.

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