



An Informal Learning Program as a Replicable Model for Student-Led, Industry-Supported Experiential Learning

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Julia Armstrong is the Director of the OHI/O Informal Learning Program at the Ohio State University (OSU). She combines engineering (BS ECE), public teaching of gifted education (M.Ed.) and industry experience (PMP, CSM) to grow the offerings and strength of the program and build rapport with the industry partners. She uses her diverse interests and skills to bridge the gap between curricular education and skills of the working professional. In 2018, Armstrong was part of a multi-disciplinary team from Ohio State to receive a 3-year NSF award for Advancing Informal STEM Learning.

In her three years at Ohio State, Armstrong designed and partnered on a wide variety of educational events for students to explore through active learning experiences. She focuses on current trends and connecting students to industry representatives, emphasizing open-ended problem-based learning, encouraging students to continue exploration of topics and challenges of interest. Armstrong has grown the OHI/O Informal Learning Program from a few events to two dozen, now serving over 1,500 students annually, including several K12 outreach events.

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Abstract

This research paper details the growth of an informal experiential learning program around hackathons and makeathons and presents the evolution of the program as a model of a successful co-curricular approach in engineering education. After six years of growing an informal learning program from a single hackathon event of 100 attendees to a complete experiential learning platform (OHI/O) consisting of over twelve events, sustained industry engagement, scholarships, and building a successful and stable team of student leaders, the authors will share and gather feedback on the development and evolution of the program.

Introduction

Hackathons and makeathons, rapid-prototyping contests, focus on software or hardware development. They provide participants a hands-on experience to create a workable product in a short time frame. Hackathons and makeathons have been used in an industry setting for many years. Articles have been written about hackathons and other informal learning events used in the classroom [1] - [4], engaging with the public [5], [6] and about research around the events themselves [7] - [9]. In recent years, interdisciplinary collaboration has become a growing component of OHI/O's program and that is echoed in the literature which focuses on bridging engineering with business [10], entrepreneurship [11], [12], and health and wellness [13]. While outputs of hackathons often have mixed results for continued development, Kitsios and Kamariotou summarize 70 articles related to hackathons, open data, and ongoing entrepreneurial success rates and propose a model for successful entrepreneurial development as an outcome for events [14].

Rationale for involvement in hackathons has been detailed from a participant perspective [7], [8], [15], [21] but not as widely for those planning the events, such as this paper investigates. Many hackathons held by companies, libraries [16], or museums [17] focus on the output of products, apps, or ideas that streamline services or resources as a key motivator in running a successful hackathon. Libraries, in particular, have focused on the benefits of civic engagement, life-long learning, and critical engagement with information as key drivers in hosting hacking, making, and coding-related events in library spaces [18], [19]. For those that focus on learning rather than just competing, some hackathons, makeathons, and other coding contests prioritize peer-to-peer learning or skill improvement as outcomes rather than the competitive aspects [18], [20], [21]. Kos details that individuals attending hackathons have four motivations for event attendance: competition, exploration, dabbling, and observing. [21] While there are several handbooks on how to organize hackathons or other time-bound events [22], [23], to date there have not been similar programs built into an informal experiential learning program focused around technology, time-bound events.

By emphasizing informal and diverse learning opportunities for students regardless of experience or background, the OHI/O program fosters a tech culture on campus brought about by the student leaders most effected by the change in culture. With these opportunities outside of the traditional classroom, the program connects students to real-world problems and opportunities by engaging

with the community, alumni, and industry partners. This research paper investigates the rationale and benefit perceived by student planners in the development and success of creating and sustaining an informal learning platform outside the traditional classroom. This research paper details the history of the program, the evolution of the student-led co-curricular group that plans and executes the events, examples of sustained industry engagement, feedback from student leaders, and a plan for scaling this model to other schools.

Background of the Program

OHI/O (<https://hack.osu.edu/about.html>) is the informal learning platform at The Ohio State University that connects students to real world problems and opportunities by engaging with the community and industry partners. Since the inaugural event in 2013, OHI/O's annual hackathon has grown from 100 students in the library basement to over 750 students in the campus's union. In 2014, a hardware focused makeathon was added as a satellite program. However, it takes more than a couple of events for a program to develop. Student planners proposed a showcasing event, ShowOHI/O in 2016, to encourage students to continue working on their event-specific projects and invited local technology leaders to recruit summer interns or fund promising projects.

Around this time the event planners began rethinking event specific planning and started addressing fundraising, alumni engagement, and student planning efforts with a full program approach in an annual cadence. The program is built around workshops and experiential learning, community involvement, educational research, seed grants, scholarships, and promotion of other similar events. In recent years, the program has blossomed to include the largest hackathon in the state (HackOHI/O), a hardware focused event (MakeOHI/O), an outreach spin-off event that takes the hackathon model into the community and provides opportunities for students from grades 9-12 to build a workable product (High School I/O), a two-day event for middle school students to learn about hardware and software while designing and building a responsive animal robot (Robo I/O), the showcase event (ShowOHI/O), scholarships and support for student leaders, and in 2019-2020 several events related to cybersecurity were added, including a hands-on workshop series. Figure 1 shows growth of program participation over time.

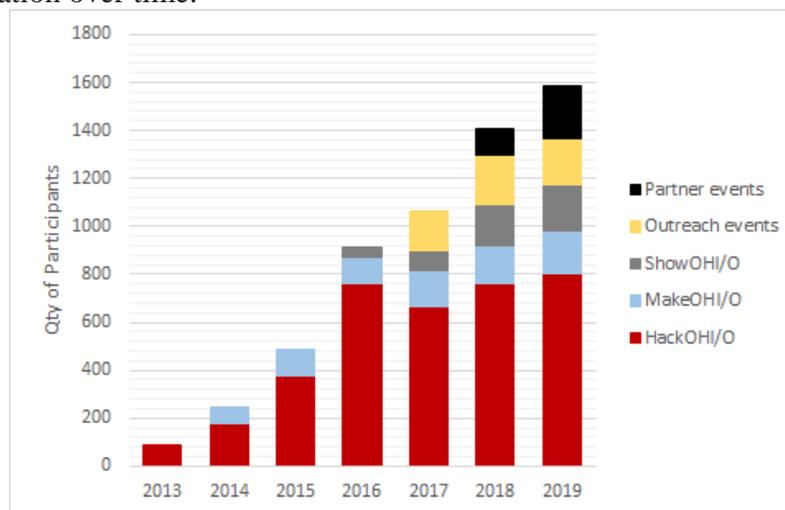


Figure 1: Growth of OHI/O program events over time

Forming a student-led group

OHI/O organizers are driven by a belief in the power of creation and are dedicated to helping students develop skills such as technical ability, communication, creativity, and critical thinking for both the planners and participants. The first planning team in 2013 consisted mostly of volunteers of staff and faculty and one student to get the event up and running. In 2014, it grew to a group of four undergraduate students who took over many of details involved with the hackathon event, even renaming it to OHI/O (with a play on both the state and input/output, common in computer science.) By 2015, a group of eight students divided responsibilities of the hackathon event into sub-teams and many of those team leaders helped plan the spring makeathon as well. In order to keep everyone connected, the teams would use Slack as well as Google Docs to communicate and track shared documents. The individual sub-teams made decisions together and reported those to the executive team, which also served as a check and balance to ensure that no one group was going too far afield. Staff and faculty volunteers would clear the roadblocks, provide advice, and curb enthusiasm as needed. Staff would help navigate university politics, plug students into university pathways such as marketing and communications, and “be the adult in the room” when negotiating with space rentals.

By 2017, with the continued growth, it was apparent there was a need for a full-time staff member dedicated to the program to help unify the communication from around campus, give a single point of contact to the students, and strategize about the sustainability of the funding model. Once hired, the Program Director turned over more ownership to the student leaders so that they proposed additional events to add to the program. Similarly, at this time, the larger team served in as-needed or advisory roles. In 2019, the team of student leaders had a planning retreat to strategize about future years, anticipate student leader succession plans, and brainstorm how to improve the events themselves.

Like many student organizations on a college campus, recruitment and training of new leaders is always a focus to keep the program sustained year to year. The role of the Program Director helps confirm everything gets done, and to help guide the students to reduce critical problems. After a few years of this new model where student leaders took a more active role in shaping the program’s direction, the authors decided to survey current and past student leaders to gather feedback on the program’s growth to date.

Survey design

For this study, the researchers surveyed current and past OHI/O student leaders for three purposes: (1) to determine why the students took on a leadership role within the program; (2) to understand whether being involved with the program shaped their college experience, helped them secure employment, or provided them with useful career skills; and (3) to test the hypothesis that participation in the leadership of the program led to transferable skills in the workplace. This study qualified and was approved as Institutional Review Board (IRB)-exempt research.

The research team invited fifty current and past student leaders to participate in the online survey; eighteen (twelve alumni and six current students) completed at least a portion of the survey, a 36% response rate. Each participating subject filled out the survey and received questions based on whether they were current students or alumni. The survey (Appendix A) centered on why students participated in the planning of events, the impact their participation as a student leader had on their college experience, and how their involvement opened opportunities after graduation. It covered such issues as how they determined success measures, what skills they acquired as a student leader, and whether their participation in the student planning team led to job opportunities. The survey results fell into several themed areas and provided valuable insights into the research questions.

Findings

While participants in OHI/O events are comprised of diverse majors (Figure 2); student leaders for OHI/O came from a relatively few majors (Electrical Engineering, Electrical and Computer Engineering, Computer Science Engineering, Computer and Information Science, and Physics/Computer & Information Science). The amount of time individuals participated as part of the planning teams varied (Figure 3)

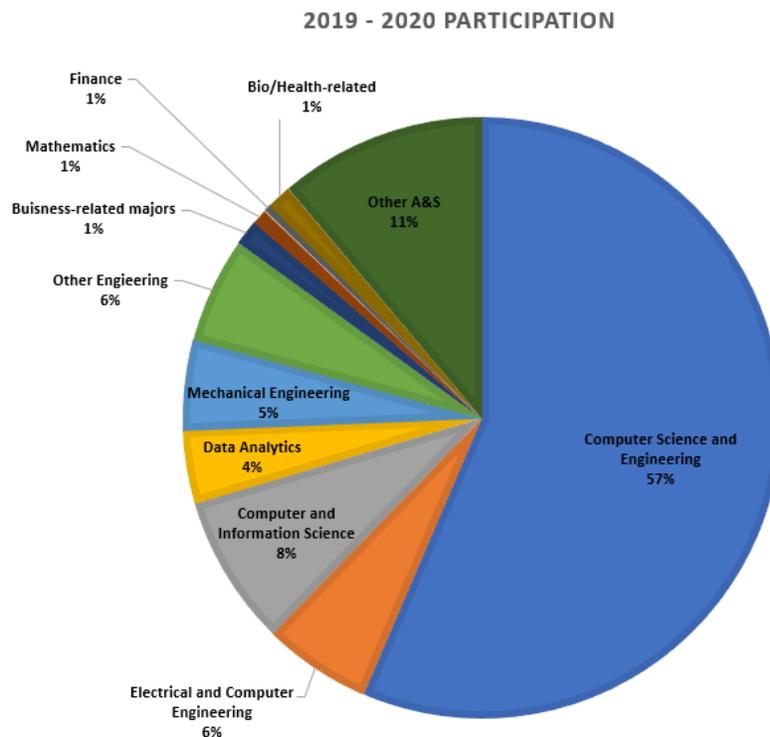


Figure 2: OHI/O participants of events by major

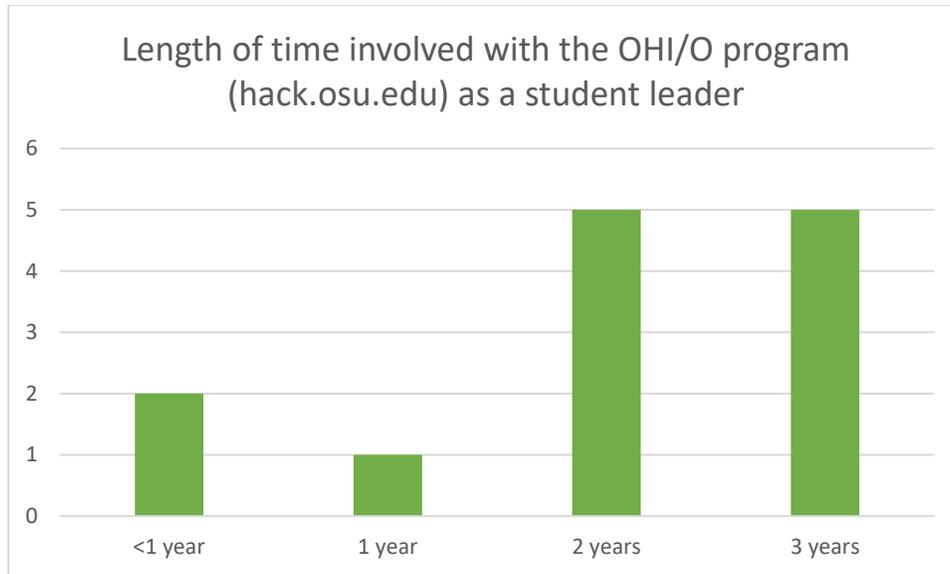


Figure 3: Student reported length of involvement as student leaders

After reviewing the responses, the three research questions will be examined in greater detail. The rationale for involvement in the planning process as a student leader varied. Some indicated they would like to make an impact or create new events; others were driven by participating in planning larger campus-wide events. One respondent noted that, “I chose to be involved with OHI/O because I had attended hackathons at various other universities and wanted to help bring more of the innovative and creative spirits from those events to campus.” A list of rationale by survey respondents is listed in Table 1.

Tech club involvement without need of coding skills	Student org was recommended by a friend or lots of friends were already leaders
Interested in spearheading specific events (makeathon, high school event, hackathon)	Wanted to bring a tech culture to campus
New to major and wanted to be involved in extracurriculars	Wanted to do meaningful work and encourage other students
Leverage skill set for job search	Impact lots of students on campus
Wanted to collaborate with peers more	Student-led board was appealing

Students mentioned that the program shaped their college experience by giving them a community, giving them a taste of what might be expected in the workplace, adding to their friend network and providing contacts for their first job after college. One student noted that “It made me feel like I actually helped make the university a better place.” Others mentioned that it created a network of like-minded peers, advisors and industry connections. Another student remarked that, “OHI/O has helped me learned how to network, navigate through difficult situations and build leadership skills.” A current student noted that participation allowed her to influence change on campus and impact the community. She noted, “I’m really proud that I get to put on events like HackOHI/O for our campus and community.” Another alum shared a similar

sentiment, “OHI/O was a home to me on campus. Sometimes I also felt like I was creating all of this value for other students, especially since I was not actually able to participate in the hackathon.” Several students noted that OHI/O was one of the top highlights of their college career. Students mentioned pride in the work that they did through the program and that they were happy that the events continue to draw attention and remain popular.

For the alumni, being involved in the student group led to a greater understanding of large organization and the bureaucracies involved, which certainly carried over into the workplace. A complete list of skills reported by respondents is listed in Table 2.

Table 2. Skills reported by student leaders as gained through OHI/O participation	
Communication	Multi-directional communication
Email communication	Leading without authority
Delegation of tasks	Organization
Teamwork	Team-building
Community building	Leadership
Web development	Budgeting
Fundraising/talking with sponsors	Time management
Event planning	Hacking/technology skills
Problem solving	Project management

One student wisely noted that “planning OHI/O events was always more about the soft skills for engineers than the technical skills which is ironic since the [event] participants are working on their technical skills.” Another mentioned that the impact was long-lasting, “A lot of the skills I learned through my involvement are directly relevant to my current position as a product manager. For example - working in teams, leading without official authority, prioritizing and making decisions across many different stakeholder needs, building empathy for our "users" (attendees, sponsors, etc). Working on the OHI/O sponsorship team also helped me make connections to many companies and industry professionals.” Several indicated that they developed more confidence due to their participation in the program as a student leader. One even started a hackathon at her current company.

When asked about success metrics for the events they planned, many participants indicated that they believed the events were successful. While official metrics were not defined by student leaders, event attendees, sponsorships, number of sponsors, and showcase attendees were tracked. A student involved in gathering participant satisfaction surveys noted, “Many of the participant surveys were positive and the sponsors were generally pleased.” The authors asked alumni surveyed if they would change the metrics of success for the events they were involved with now that they know how companies track metrics. One individual responded, “I would like to track long term impact and "retention" of our events. For example - number of projects that are still being worked on 1-month, 6-month, 1 year, after the event. Finally, I think it's important to set clear and quantifiable goals at the beginning of each planning cycle to keep the team focused, engaged, and excited.” A couple of respondents mentioned that it would be useful to track whether more people are getting jobs with companies that sponsor than they did before any OHI/O events occurred. The authors plan to take this feedback to the current student group for potential future implementation.

Overall, the survey respondents had several suggestions for ways to improve the student leader experience including more opportunities to network with sponsors, a stronger onboarding process for student leaders with more mentoring, and increasing social networking with student leaders. Survey responses indicate that the authors and program directors could do additional outreach with past student leaders as several of the suggestions have been implemented with the current student leaders, a change that may not be apparent for past student leaders.

Impact

With the growth of the OHI/O program, it has continued to draw industry attention as a place to build the talent pipeline. Industry representatives looking to hire interns and full-time employees after graduation find the large events a great pool of prospective hires. Sponsoring companies work closely with a couple of the student leaders to prepare for the events, leaning on the students for suggestions and instructions, building a strong rapport between a hiring manager or CEO and a couple of the undergraduate student leaders. In addition to the large OHI/O events, student leaders also work with company representatives to schedule and plan evening workshops to further investigate technologies.

With the entirety of the program financially possible due to corporate sponsorship dollars, an Industry Advisory Board (IAB) was formed to help steer decision making for future programming options. The IAB meets twice a year to discuss trending topics and decisions in programming. Student leaders take part in the IAB meetings and networking with large companies and their CIOs, VPs of Engineering and other top-level management.

There is a marked impact of alumni engagement on campus through the OHI/O Program. Whether they attended the university recently after the inception of OHI/O or whether they are older alumni who graduated prior to 2013, all are eager to volunteer time to mentor, teach or judge at the events. OHI/O offers a platform to expand the pool of alumni eager to give back time or talents to Ohio State. The OHI/O Program now benefits from over 200 alumni volunteering at least a few hours each year, past OHI/O student leaders amongst them.

Scalable Program Approach

The OHI/O program built on a strong student leadership group provides co-curricular opportunities for students to plan events, engage with industry partners, hone their leadership skills, and continue to build a student-led program that provides relevant technology skills to employers. This model of a student team, broken into sub-groups to plan events, with support offered by faculty and staff volunteers and a limited amount of paid staff (in this case <1.5) can provide a scalable model for other institutions. A key component is to find stakeholders from around campus with similar goals/motivations. Some examples could include career services, the libraries, other academic centers, and technology support units. Other areas of intersection include entrepreneurship, innovation, and topic-specific hackathons such as in the areas of data science, logistics, artificial intelligence and more. Once a few events have occurred, it may be time to create an advisory board of these key campus stakeholders to get feedback on the programmatic development and generate ideas for future endeavors.

OHI/O TIMELINE

A brief history of OHI/O

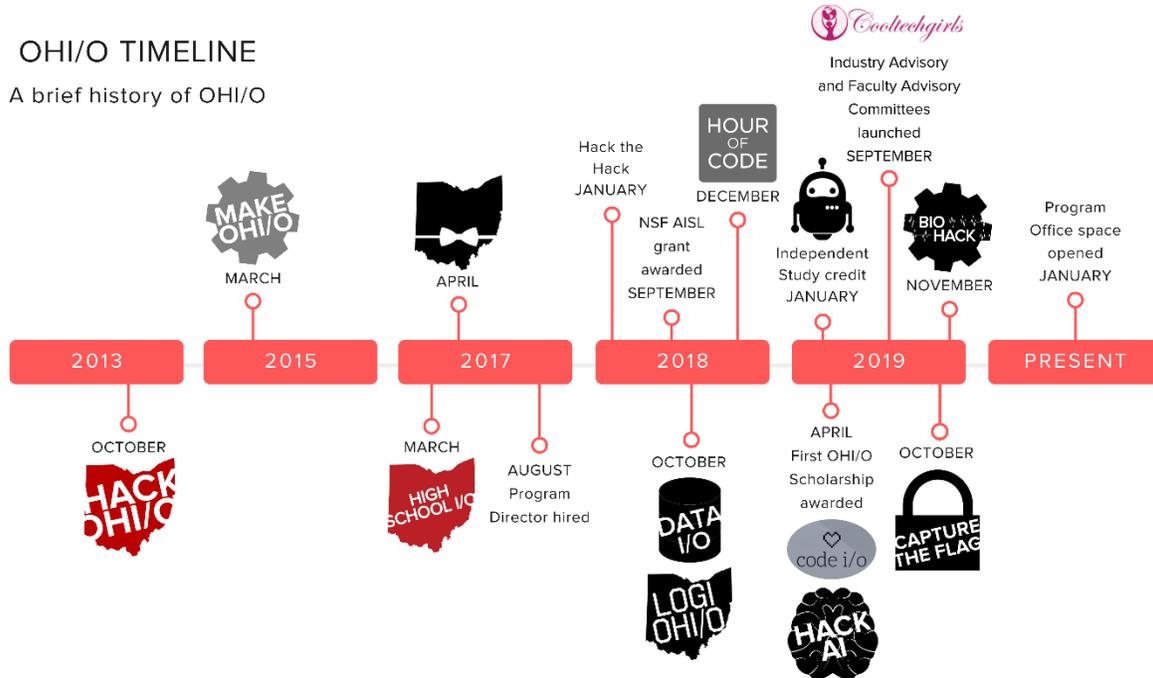


Figure 4: Timeline of OHI/O program development

For program development, be sure to work with curricular partners, such as departments of computer science, electrical engineering, physics, or data analytics, as well to find ways to integrate hackathon and makeathon products into semester-long capstone projects, independent studies, or other coursework. This process of building on event successes allows motivated students opportunities to continue to work on their projects beyond a weekend event. The student leaders have now increased their independent study credits by engaging on a project that may be too large for ‘hack the hack’ and still provides both a learning opportunity as well as a service to the program.

As the student leadership team reaches the maximum capacity for the program size, using the partnership model has continued to expand the opportunities for students. Other student organizations with a focus in a particular topical area provide the fresh leadership and energy needed to add an event to the program, and they are integrated into the student leaders’ annual events. The new student organization benefits from the experiences and processes of the larger body, while still expanding the array of experiential learning options for students on campus.

Another key area for planners is around growth: make a strategic plan for growth; create assessment measures for individual events and for the program and document them; and think through funding plans. Provide and support student leaders with retreats and planning times to discuss and set goals for being involved and ways to ensure goals are being met and students stay engaged. By planning early for these areas of programmatic expansion, it will help address both longer-term successes for the program and provide fodder for return-on-investment conversations with both university administrators and event sponsors.

Future Research and Conclusion

With this initial research, the authors acknowledge that there are many opportunities for future research including additional surveys or focus groups of student leaders as the programs grows and produces more graduates. The authors would also like to identify why the diversity of the leadership team is often an equal ratio of men and women, despite the disproportionate ratio within the computer science and engineering major. Finally, a longitudinal study of OHI/O student leaders should be added to capture data from student leaders several to many years after graduation to evaluate any changes in perspectives over time.

After six years and the growth of the program of rapid-prototyping events, feedback from student leaders matched the hypotheses of this study's authors. Namely, the student leaders indicated that involvement with the program led to valuable soft-skill development, allowed them to contribute ideas and make an impact on a student group specifically and campus more broadly, and led to the creation of a network on individuals with a shared ethos of innovation. This process of a scalable program from co-curricular events focused on technology is on that can be modeled at other institutions.

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Appendix A: Survey of student leaders

1. Please indicate your status:

Current student

Alumni

2. What is/was your major?

3. How long have you been involved with OHI/O?

<1 year ; 1 year; 2 years; 3 years; 4 years; 5+ years

4. What events have you planned/taken a leadership role with?

5. Was the event you were involved with successful? What were your measures of success? For alumni: knowing what you know about measures at your current workplace, would you measure the event success differently?

6. Why did you choose to be involved with OHI/O?

7. How has being involved with OHI/O shaped your college experience?

8. Has being involved with OHI/O helped you in getting a job? Why or why not?

9. What skills did you learn through OHI/O that helped you in life after college?

10. What would make OHI/O better?

11. Other feedback