

**2016-17 Annual Report on  
COMM ST 149: Computing Everywhere  
Computational Literacy Initiative**

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## Introduction

The goal of Computing Everywhere is to make computational literacy more broadly accessible, particularly to a non-technical audience. Building on our initial offering of one section in 2016, this year we offered 4 sections (2 sections per quarter in winter and spring 2017) of a zero-credit (graded S/U) course consisting of a series of 5 weekly 2-hour workshops about key components of computational literacy. While all sections of the course filled during registration, there were 26 students who completed the Winter series and 23 who completed the spring series. Fourteen graduate students and one postdoc in the School of Communication and related programs proposed workshop topics and served as paid instructors and peer mentors, with faculty coordination and mentoring by Jeremy Birnholtz. Support was provided by the School of Communication.



*Figure 1: Students working with Arduino hardware in Spring Workshop #1.*

Winter topics included: 1) sorting algorithms and algorithmic thinking, 2) fundamentals of coding in Python using the Earsketch package, 3) web page accessibility and HTML/CSS basics, 4) the structures of online networks and 5) the social implications of algorithms.

Spring topics included: 1) basic hardware programming using Arduino devices (see Figure 1), 2) building simple AI-powered chatbots, 3) web structure and HTML/CSS, 4) basic natural

language processing in Python, and 5) network structures and mechanisms behind Google's search algorithms.

Feedback was solicited from students each week via an anonymous questionnaire, and reflectively in person at a dinner before the final winter workshop. Overall response from students was enthusiastic, with encouragement that the course proceed. This document provides a summary of our experience and lessons learned.

## How It Worked

As in 2016, our goal was to create a lightweight, low-pressure, hands-on and low-risk environment in which students could experiment with technology and develop computational literacy. Again the course carried zero credits and was a self-contained (i.e., without homework or reading assignments) series of five weekly 2-hour workshops. This allowed us to present the course to the students as a low-risk, relatively low-effort endeavor (see feedback below) that would be completed in the first half of the quarter, before exam and project deadlines kicked in.

We offered two 20-student sections of the course in Winter and Spring quarters of 2017, with a separate slate of workshops for each quarter that were repeated for the two sections. That is, there were 5 winter workshops that were each offered twice and 5 spring workshops that were each offered twice. To avoid conflicts with other courses, both sections were in the evening: 7 - 9 pm on Tuesday and Wednesday.

Doctoral students and postdocs in Technology and Social Behavior, Media, Technology and Society, and some related areas (e.g., HCI-focused students in Learning Sciences and Computer Science) were invited in the fall to submit proposals (individually or in pairs) in fall quarter 2016 to develop a single two-hour workshop and teach it twice. Compensation of \$700 per instructor was provided (with the per-instructor amount the same whether there were 1 or 2 instructors).

A total of 11 proposals were submitted and received, all of which were evaluated by the course coordinator in terms of appropriateness, instructor experience and to achieve a suitable range of topics in each quarter. Ten proposals were ultimately selected. All applicants received detailed feedback on their proposals, and selected instructors were assigned to peer-mentoring pairs to provide feedback on each other's proposals and emerging lesson plans.

Once workshop proposals had been accepted, a schedule of workshops was proposed (and modified as necessary), and instructors were asked to begin work on lesson plans and meet with the course coordinator. For Winter Quarter workshops, mentoring meetings occurred in late fall. For Spring Quarter workshops, mentoring meetings occurred in late winter.

Each workshop consisted of a combination of hands-on exercises, experimentation with coding and design, and group discussion led by the instructors. Instructors were encouraged, through the proposal instructions, peer mentoring and 1-2 mentorship meetings, to keep their workshop tailored to the School of Communication student audience. That is, concepts were expressed in terms familiar to Communication students and using familiar examples and metaphors. Hands-on experimentation with technologies and code wherever possible were strongly encouraged.

All instructors received detailed instruction feedback from the course coordinator (or, in a few cases, from a trained observer affiliated with the Searle Center for Advancing Learning and Teaching), who attended one instance of each workshop. Students completed a brief evaluation questionnaire following each workshop.

To manage the logistics of the course, workshop instructors were assigned basic administrative roles such as collecting student feedback, handling enrollment/registration questions, preparing the syllabus and course launch, etc.

## Student Experience and Learning

In general student experience with the workshops was very positive. As Figure 2 shows, students generally felt they learned a lot and that the quality of instruction was good, and indicated that they wanted to learn more about the topics presented and felt all workshops should be offered again in the future. Qualitative comments indicated that students enjoyed the hands-on exercises, experimenting with different software tools and learning how computing systems work. In general, they were particularly enthusiastic about hands-on activities and challenges to solve problems on their own. This must, of course, be weighed against the fact that some students felt certain workshops got technical very quickly.

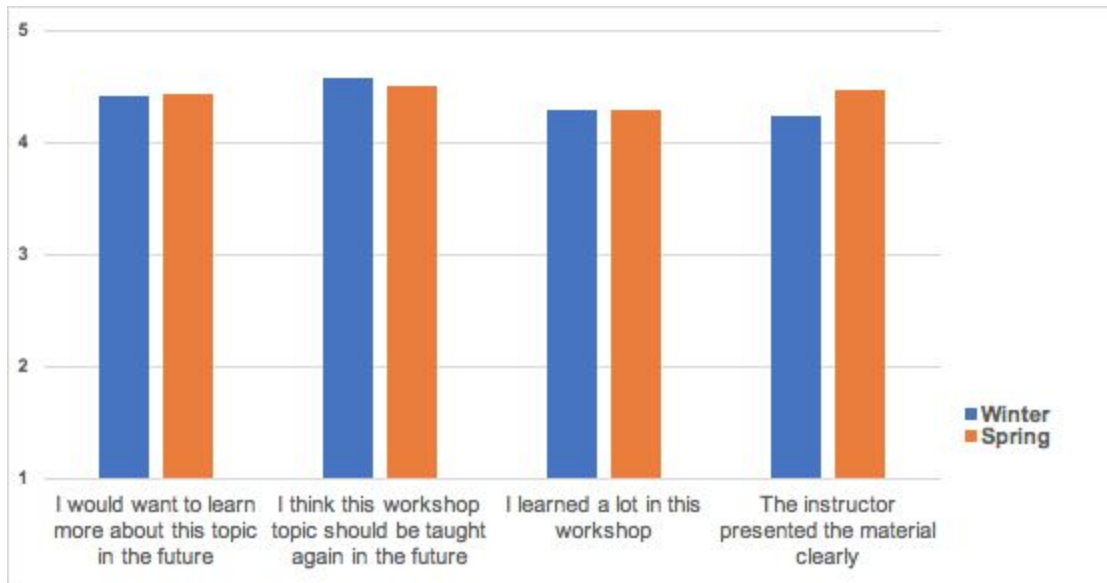


Figure 2: Aggregated student feedback for all workshops, by quarter.  
(1 = Strongly Disagree, 5 = Strongly Agree)

To assess student learning, instructors also added two questionnaire items to each evaluation that reflected key learning objectives for their workshop. While these varied in style and format such that statistical comparison is difficult, the vast majority of the students answered these questions correctly.

More generally, many students appreciated the zero-credit, informal nature of the course. One student said (via email):

*please do not make Computing Everywhere a graded class. I thought this made the class more fun and stress-free for me, since I was able to just come for two hours and not worry about the grade or homework. I already take four graded classes and it was refreshing to be able to learn without a lot of obligations.*

Some students also indicated a desire for more depth in covering certain topics. After the Spring workshop on natural language processing, for example, one student indicated to the instructor that she wished she could have learned this technique prior to working on her honors thesis.

## Instructor Experience

Workshop instructors were asked to complete a brief questionnaire at the completion of each quarter, though instructors who taught during both quarters were not required to complete it twice. The questionnaire was completed by 12 instructors. Feedback was generally positive, with some constructive suggestions for improving the experience.

Overall, 88% of respondents indicated that their experience was “excellent” (33%) or “very good” (50%), with 12% indicating a “good” experience and 0% reporting a fair or poor experience. Moreover, many of the instructors expressed interest in teaching Computing Everywhere workshops in the future. While 27% will graduate or leave NU and no longer be eligible, 100% of those eligible to propose workshops in 2017-18 said they would be “very interested” (88%) or “maybe interested” (12%) in doing so.

In qualitative comments, instructors appreciated the enthusiasm of the students, mentoring and feedback provided by the course coordinator throughout the course, and the experience of watching students learn. One instructor said, “It was really wonderful to take the students from never having coded all the way to using hardware and software!”

Instructors also appreciated the opportunity to teach their workshop twice, which -- of those who commented on this -- all felt was a format that worked well.

Instructors also raised several constructive issues to work on in future offerings, which are addressed in detail below. In general, the main points of feedback were centered around (the seeming lack of) coordination among instructors, the teaching of coding fundamentals, and sometimes poor attendance among students. One instructor also noted that the time was not ideal, as it was late for teaching.

## Lessons Learned and Goals for 2017-18

While the overall trajectory of Computing Everywhere was quite positive this year, there are several challenges that we hope to address in the coming year and beyond. This section is a summary of those issues, some possible solutions and some preliminary proposals for addressing them.

### ***Student Attrition***

While the lightweight, zero-credit format makes Computing Everywhere a low-risk and low-commitment endeavor for students, it also makes it very easy to drop the course. Even though all four sections of the the course filled (cap: 20 students per section) during registration, final enrollment ranged from 11-15 or so. This anecdotally appears to be a greater rate of attrition than for typical for-credit courses.

There are several possible remedies to this situation, which reflect two basic approaches. The first approach would provide more incentives for registered students to complete the sequence. This could include assigning letter grades wholly for attendance/participation (pro: significant motivation; cons: potentially dilutes other letter-graded courses and may require more contact hours), allowing students more flexibility in attending workshops over multiple quarters (pro:

flexibility and more options for students; con: tricky record-keeping and difficulty in building coherent knowledge over a series of workshops).

The second approach would be to assume that attrition will be high and just raise the cap to allow more students to participate (pro: administratively easy and selects for the most motivated students; con: potentially leaves out students that might be otherwise incentivized to finish).

*Proposed 2017-18 action: Given student enthusiasm for this as a lightweight course without the stress of grades, we will experiment with raising course capacity to 30 in Winter 2018. As travel distance anecdotally may also play a role in attendance/attrition, we will continue to offer 1 section on north campus and another on south campus.*

### ***Instructor Coordination***

Several instructors felt that the decentralized approach to the course was perhaps too decentralized in that there was often little awareness among the instructors of who else was teaching and what they were covering. While course proposals and lesson plans were available to all in the Google Drive space, there appeared to be little motivation to take the time to read through all of these documents, which is reasonable given many other commitments.

A quarterly kickoff meeting has been suggested where instructors can meet each other, sync on course launch logistics and administrative jobs, and briefly summarize their workshops and identify potential synergies. This appears to be a very reasonable solution to the problem, though to be of maximum value to all instructors (including those who teach earlier in the quarter), the meeting should likely be held at the end of the previous quarter.

Some concerns were also raised around the assignment of administrative tasks to the students, which were sometimes inconsistent across quarters and also sometimes resulted in disparate workloads. Attempts will be made to streamline and standardize this process.

*Proposed 2017-18 action: An instructor kickoff meeting will be held prior to the start of each Computing Everywhere session, ideally at the conclusion of the prior quarter (or no later than Monday of the first week).*

*Possible Corollary action for feedback: To encourage instructors to coordinate in advance, instructors could be invited to submit a proposed sequence of workshops as a collection of up to 5 individual proposals.*

### ***Teaching Coding Fundamentals***

Instructor feedback suggests that students want to learn more about coding, but that it was not always clear how the fundamentals of coding were being taught. During some workshops some fundamental concepts were explicitly covered, but in other cases they were not. There is also

little agreement on what constitutes ‘fundamentals’ and the depth in which these concepts should be covered in a lightweight workshop series.

This is a complicated problem with many possible approaches and few ideal solutions. Teaching 1-2 workshops focused only on coding fundamentals is a possible approach, but this represents a substantial fraction of any given quarter of instruction and some have expressed concern that this might feel too much like a ‘class’ instead of very applied, hands-on workshops with cool concepts.

Teaching an in-depth workshop that lasts a day or more and focuses on coding fundamentals is also a viable solution, but requiring this is problematic in that it would likely detract significantly from enrollment. Unless this is deemed absolutely necessary, this would probably be in conflict with the goal of making the course widely accessible and lightweight. It would be entirely possible, however, to offer an optional in-depth workshop.

A hybrid approach (experimented with in an ad hoc way in Spring 2017) would be to have instructors teach some elements of coding fundamentals in each workshop, but mention that students who want to learn more about this should take the in-depth workshop and/or look at online resources that are available. This would involve some agreement on what these concepts are and could involve workshop proposals that explicitly identify a concept that the workshop would address.

*Proposed 2017-18 action: A document will be set up for identification, definition and discussion among past instructors of core concepts that should be addressed in every quarter of Computing Everywhere. Concepts should be identified and defined **before** the call for workshop proposals is released in the fall. Each proposal will be required to identify one of these concepts to address (with the potential for allowing a rationale in a case where a proposal does not), and proposers will be encouraged to coordinate on what they are thinking of offering (either via, e.g., Slack or a Google Doc). For more depth, instructors will be encouraged to propose an in-depth coding fundamentals workshop (see below) to be offered sometime in 2017-18.*

### **Depth of Instruction and Mentoring**

Student and instructor feedback suggests a desire for more depth on particular topics, both via “deeper-dive” workshops and perhaps additional online instructional materials, and availability of instructors for “office hours” and mentoring on “coding challenge” projects.

To supplement the existing Computing Everywhere curriculum, it is entirely possible to allow instructors to propose additional workshop formats that allow for these opportunities for students. These could include, but are not limited to, an in-depth coding fundamentals workshop (see above), an applied session on a method (e.g., natural language processing) that could be used in student research projects, a session with a concrete, applied takeaway (e.g., ability to construct a functional chatbot).

*Proposed 2017-18 action: Instructors will be invited to propose in-depth or other novel workshops/activities that further the goals of Computing Everywhere by making computing literacy broadly accessible and available to non-technical students. Instructors can essentially propose anything, but some general suggested guidelines and parameters will be provided. Instructors will be compensated for these workshops/activities on a pro-rated basis roughly consistent with traditional CE workshops, with the number of contact hours with students as the key factor in determining compensation.*

*In addition, we will seek to hire a part-time student to construct and maintain a CE web site that includes a description of the program, instructional resources on workshop topics, information for potential instructors, etc.*