

define CS196 + EDU T217

set term to Spring

set year to 2024

set code to CS196 + EDU T217

set title to Designing K–12 Computer Science Learning Experiences

set website to <https://canvas.harvard.edu/courses/133665>

say Welcome to the syllabus for the for 2 seconds

say join term join join year offering of for 2 seconds

say join code join : title for 2 seconds

say Learn more on the course website at: for 2 seconds

say website for 5 seconds

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(last updated 2024.01.15)

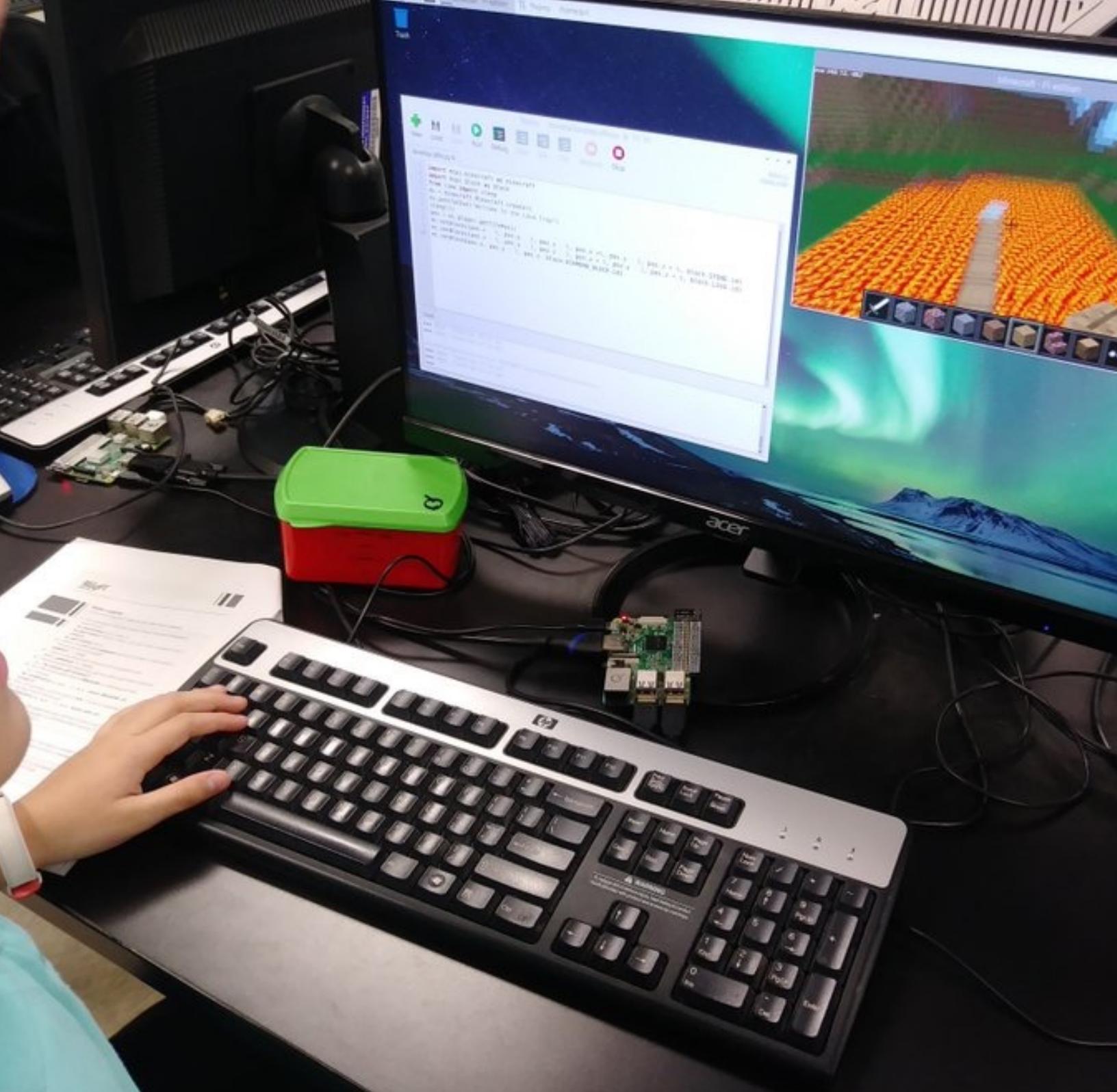


Overview

There is presently considerable interest in and excitement about making computer science education accessible to all K–12 students. In this course, we will examine the state of K–12 computing education—questioning its value, examining its history, and imagining and contributing to its potential—through the lens of design.

I've been designing computer science learning experiences for the past 20 years—first, as a college and high school classroom teacher, then as a member of the MIT Scratch Team, and now as the director of the Creative Computing Lab at HGSE. My goal with this course is to build a community of people who are similarly curious about and committed to designing for K–12 CS education.

In this document, I have attempted to provide enough detail to describe the course, but there are undoubtedly aspects that I have forgotten—or are simply better experienced than expressed through text. If you have any questions that remain unanswered, please do not hesitate to let me know.



Participation

CS196 + T217 2024 is offered as an in-person course.

Class sessions are on Wednesdays, from 9:00am to 11:45am at the Harvard Graduate School of Education.

Our first class is on Wednesday, January 24.

Our final class is on Wednesday, April 24.

Individual end-of-term meetings will take place April 29 to May 3.

There are no course prerequisites, but prior (or anticipated) experience with K–12 computer science is encouraged.

To participate, you must: (1) have permission of the instructor (please refer to the course website for the course enrollment procedure) and (2) attend the first session of the course on Wednesday, January 24.

Facilitation team

We are so excited to work with you this term—and we encourage you to connect with us early and often! For meetings, please send an email with your available days and times.

Karen Brennan (Course Instructor)

Email: karen_brennan@gse.harvard.edu

Brian Yu (TF)

Email: brian@cs.harvard.edu



Expectations

A few words on what I expect of you and what you can expect of me, as we work together to build a learning community throughout the semester.

What do I expect of you?

Some of what I expect is obvious—that you will invest yourself in the course, attend class, and participate in activities. I expect that you will be curious about new ideas, humble when faced with the challenges of learning, honest in your intellectual output, generous with your colleagues in our learning community, and respectful of our wonderful collective diversity of experiences and identities.

There are four specific expectations that I consider especially important:

- (1) being present, (2) the 1/N rule, (3) academic honesty, and
- (4) communication.

Being present

First, I look forward to seeing you in class, which will start promptly at 9:00am and end promptly by 11:45am. Being present means not only being physically present in the space but also being as fully engaged as possible: observing closely, listening genuinely, and supporting generously. If you are unable to make it to class (due to illness, unavoidable travel, etc.), please send Brian and me an email in advance of the session, or as soon as possible. If missing a class is unavoidable, please do not worry! I will ask you to submit supplementary writing.

The 1/N rule

Second, please be aware of your contributions in relation to others. I love enthusiastic participation. That said, some people need more time to think through ideas or are just shy. (This may come as a surprise, but I am incredibly shy in groups of people.) As such, I am fond of the 1/N rule in groups: with N people, each person should have 1/N of group airspace. If you find yourself contributing a lot, think about how to create space for others; if you've been holding back, think about what might help you share.

Academic honesty

Third, please be aware of appropriate credit and attribution in your work. If you're considering intentionally plagiarizing, please don't do it. I would much rather have a conversation about an extension than about academic misconduct. This includes generative AI. Generative AI has become an incredibly helpful in my own work and I encourage you to use it as part of your process. But please use and credit it appropriately. No one wants to read ChatGPT pretending to be you—you are so much more interesting!

Communication

Fourth, I've found that people do their best work and have great experiences when they are seen, heard, and supported. The foundation of this is open communication. In addition to the various ways that we'll be checking in throughout the term (e.g., ongoing documentation of your creative process and evolving thinking through design journals, connecting outside of class via Slack), I encourage you to communicate early and often with Brian and me about how things are going and how we can support you. Whether it's a moment of challenge or a moment of celebration (or anything else), please know that we'd love to hear from you.

For any additional support for accessibility and accommodations, please contact the Office of Student Affairs. Accommodation letters are ideally accompanied by a conversation between you, Brian, and me, so we can co-design supports that work best for you.

HGSE's Office of Student Affairs has documented other services and supports to help you care for your whole self, including physical health, mental health, and academic supports. Learn about these resources on the OSA site: <https://osa.gse.harvard.edu/support-services>

And what can you expect of me?

You can expect that I will strive to curate meaningful, rich learning opportunities for you and with you, that I will give you honest feedback when asked, that I will be curious about what you are passionate about, that I will have extremely high expectations of you, and that I will be available to meet with you, as you need.

I think that learning is (and should be) hard—more specifically, as Seymour Papert said, hard fun. As such, you can expect that I will encourage you and support you in taking on challenges.

CS196 + T217 is organized as a discussion seminar and design studio, with most of our time dedicated to unpacking of readings and critical conversations about our design projects. As such, you should not expect to hear from me in a lecture format. I want you to have the space to develop your own responses to the course ideas and others' work, without distraction from my interpretations. More importantly, if I'm talking, I can't listen—to you and to how you are making sense of the course ideas.

As noted earlier, please do not hesitate to meet with me. I would be very happy to hear from you.



Grading

Too often, I see grades preventing people from taking intellectual risks, discouraging people from being bold, causing people to worry about the least important part of the experience. So let us remove that concern.

You have an A. Or a SAT, if you prefer to take the course as SAT/NCR (Satisfactory/No Credit). If you're making a sincere intellectual investment in the course material, participating in activities, attending class, etc., this will not change. If you are chronically late submitting assignments or arriving to class, this will impact your grade.

Throughout the course, you will get written responses from others in the course. The purpose of this feedback is to help you identify strengths and areas of potential growth—ideally, moving you from where you are to a deeper engagement with the course material.

I hope that *your own* evaluation of your process, your products, and your learning direct you throughout the course. Are you engaged in work that matters to you? Are you proud of what you're doing and of how you're doing it?

Of course, there are moments where outside perspectives will be helpful. You'll have opportunities to talk about your work with others in the course, including colleagues, TFs, and me. And if you want more feedback, then I encourage you to ask for it. What is it you need to help you advance your ideas and your creations? How can we help you?

If you decide to take the course SAT/NCR and, after your time at HGSE, you need a letter grade for the course (for example, for course credit in a subsequent degree), I would be happy to prepare a statement that explains the letter grade equivalence.

If you're interested in reading about grading and its discontents, I'd recommend: Alfie Kohn's *Punished by rewards: The trouble with gold stars, incentive plans, A's, praise, and other bribes*, and Howard Kirschenbaum, Rodney Napier, and Sidney B. Simon's *Wad-ja-get? The grading game in American education*.



Weekly activities

I think that the best way to learn about design is to study others' designs, create our own designs, and reflect on our own and others' designs. This triplet—studying, designing, and reflecting—will guide our weekly activities. These activities are both individual and collaborative.

Studying

For most of the course, each week is focused on a design that I'm inspired by. There are so many designs that inspire me; it felt like an impossible challenge to be constrained to just 9. Until this course is 300 sessions long and I'm able to include every project that I'd love for you to explore, I hope that you will forgive me for this necessarily short list!

We'll be studying these designs through reading and exploring the designs themselves, from programming languages, to curricula, to frameworks, and more. In the first part of class each week, we will take turns facilitating the ideas presented in the readings and the designs.

Designing

Unsurprisingly, a course about design involves designing things. Either by yourself or in a small group, you will develop a project (or projects) that advance your learning. We will be working on projects for the entire course, with the second part of each class session dedicated to collaborative work time, in addition to the out-of-class time you'll be devoting to your project.

Reflecting

You will maintain a (semi-)public design journal that is accessible to other members of class, both for reading and for commenting. The format of the design journal is Google Slides. (Further information about creating and sharing the journal is available on the course site.)

Each week, you will prepare a reflective response to your studying and designing work and post it in your design journal. Each response is approximately 500 words (or the equivalent in another medium or format).

I cannot overstate the importance of the design journal; everything related to your class activities should be shared here.

I ask that all the weekly posting be completed **by Mondays at 11:59pm**, so that others have an opportunity to read and respond to your journal before class on Wednesday. We will take turns responding to each other's design journals.

An overview of the course's topics, organized by week:

Session 1 (January 24): Getting Started

Session 2 (January 31): Design Case – Scratch

Session 3 (February 7): Design Case – Inclusive Pedagogy Frameworks

Session 4 (February 14): Design Case – CS First

Session 5 (February 21): Design Case – Exploring Computer Science

Session 6 (February 28): Design Case – E-Textiles

Session 7 (March 6): Mid-Term Project Presentations

No Session (March 13): Spring Recess

Session 8 (March 20): Design Case – CS Unplugged

Session 9 (March 27): Design Case – TeachAI

Session 10 (April 3): Design Case – Getting Unstuck

Session 11 (April 10): Design Case – Kibo

Session 12 (April 17): Project Co-Working

Session 13 (April 24): End-of-Term Project Presentations

After course (Friday, April 26): Final Projects Due

After course (April 29–May 3): End-of-Term Meetings

(The design cases are subject to change!)



Session 1: Getting Started

January 24

Studying

- Course syllabus
- Brennan, K. (2022). A Case for Why: School, Society, Self. In S.-C. Kong & H. Abelson (Eds.), Computational Thinking Education in K–12: Artificial Intelligence Literacy and Physical Computing. MIT Press.
- National Academies of Sciences, Engineering, and Medicine. (2021). Cultivating interest and competencies in computing: Authentic experiences and design factors (Chapter 7). The National Academies Press.

Designing

- Create your design journal and submit the link by Monday, January 22 at 11:59pm. Information about how to create, customize, and share your design journal with Google Slides is available on the course site.

Reflecting

- Write 500-word reflective statement in your design journal.

Please check the course site for other start-of-term tasks, including preparing a group introduction and joining Slack.



Session 2: Scratch

January 31

Studying

- Scratch website. <https://scratch.mit.edu/>
- Resnick, M., Maloney, J., Monroy-Hernández, A., Rusk, N., Eastmond, E., Brennan, K., . . . Kafai, Y. (2009). Scratch: Programming for All. *Communications of the ACM*, 52(11), 60-67.
- Resnick, M., & Rusk, N. (2020). Coding at a Crossroads. *Communications of the ACM*, 63(11), 120–127.
- Resnick, M. (2017). Lifelong Kindergarten (pp. 157-185). MIT Press.

Designing

- Draft 3 ideas for the design project you will be developing this term.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 3: Inclusive Pedagogy Frameworks

February 7

Studying

- Kapor Center. (2021). Culturally Responsive-Sustaining Computer Science Education: A Framework.
- National Center for Women & Information Technology. (n.d.). Engagement practices framework.
- Israel, M., Lash, T. A., & Jeong, G. (2017). Utilizing the Universal Design for Learning framework in K–12 computer science education. Project TACTIC: Teaching All Computational Thinking through Inclusion and Collaboration.

Designing

- Pick a project, develop a proposal, and draft a timeline.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 4: CS First

February 14

Studying

- CS First. <https://csfirst.withgoogle.com/>
- Turkle, S., & Papert, S. (1990). Epistemological Pluralism: Styles and Voices within the Computer Culture. *Signs*, 16(1), 128–157.
- Goode, J., & Ryoo, J. (2019). Teacher Knowledge for Inclusive Computing Learning. In S. Fincher & A. Robins (Eds.), *The Cambridge Handbook of Computing Education Research* (Cambridge Handbooks in Psychology, pp. 709–726). Cambridge: Cambridge University Press.

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 5: Exploring Computer Science

February 21

Studying

- Exploring Computer Science (Course Overview). <http://www.exploringcs.org>
- Margolis, J. (2010). Stuck in the Shallow End: Education, Race, and Computing (pp. vii-viii, 1-25, 97-116). MIT Press.
- Madkins, T. C., et al. (2019). Culturally Relevant Computer Science Pedagogy: From Theory to Practice. Research on Equity and Sustained Participation in Engineering, Computing, and Technology (RESPECT).

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 6: E-Textiles

February 28

Studying

- Buechley, L., Eisenberg, M., Catchen, J., & Crockett, A. (2008). The LilyPad Arduino: Using computational textiles to investigate engagement, aesthetics, and diversity in computer science education. Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, Florence, Italy.
- Fields, D. A., Kafai, Y. B., Morales-Navarro, L., & Walker, J. T. (2021). Debugging by design: A constructionist approach to high school students' crafting and coding of electronic textiles as failure artefacts. *British Journal of Educational Technology*, 52, 1078–1092.

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 7: Mid-Term Project Presentations

March 6

Studying

No readings this week.

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 8: CS Unplugged

March 20

Studying

- CS Unplugged. <https://www.csunplugged.org/>
- Tim Bell, “What’s the big idea with CS Education in K-12?” SIGCSE 2018 Keynote Talks.
- Curzon, P., Bell, T., Waite, J., & Dorling, M. (2019). Computational Thinking. In S. Fincher & A. Robins (Eds.), *The Cambridge Handbook of Computing Education Research* (Cambridge Handbooks in Psychology, pp. 513-546). Cambridge: Cambridge University Press.
- Bell, T., Rosamond, F., Casey, N. (2012). Computer Science Unplugged and Related Projects in Math and Computer Science Popularization.

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



DIGITAL
YOUTH
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DIGITAL
YOUTH
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Session 9: TeachAI

March 27

Studying

- TeachAI. <https://www.teachai.org/>
- Code.org's AI101. <https://code.org/ai/pl/101>
- Becker, B. A. et al. (2022). Programming Is Hard — Or at Least It Used to Be: Educational Opportunities and Challenges of AI Code Generation.

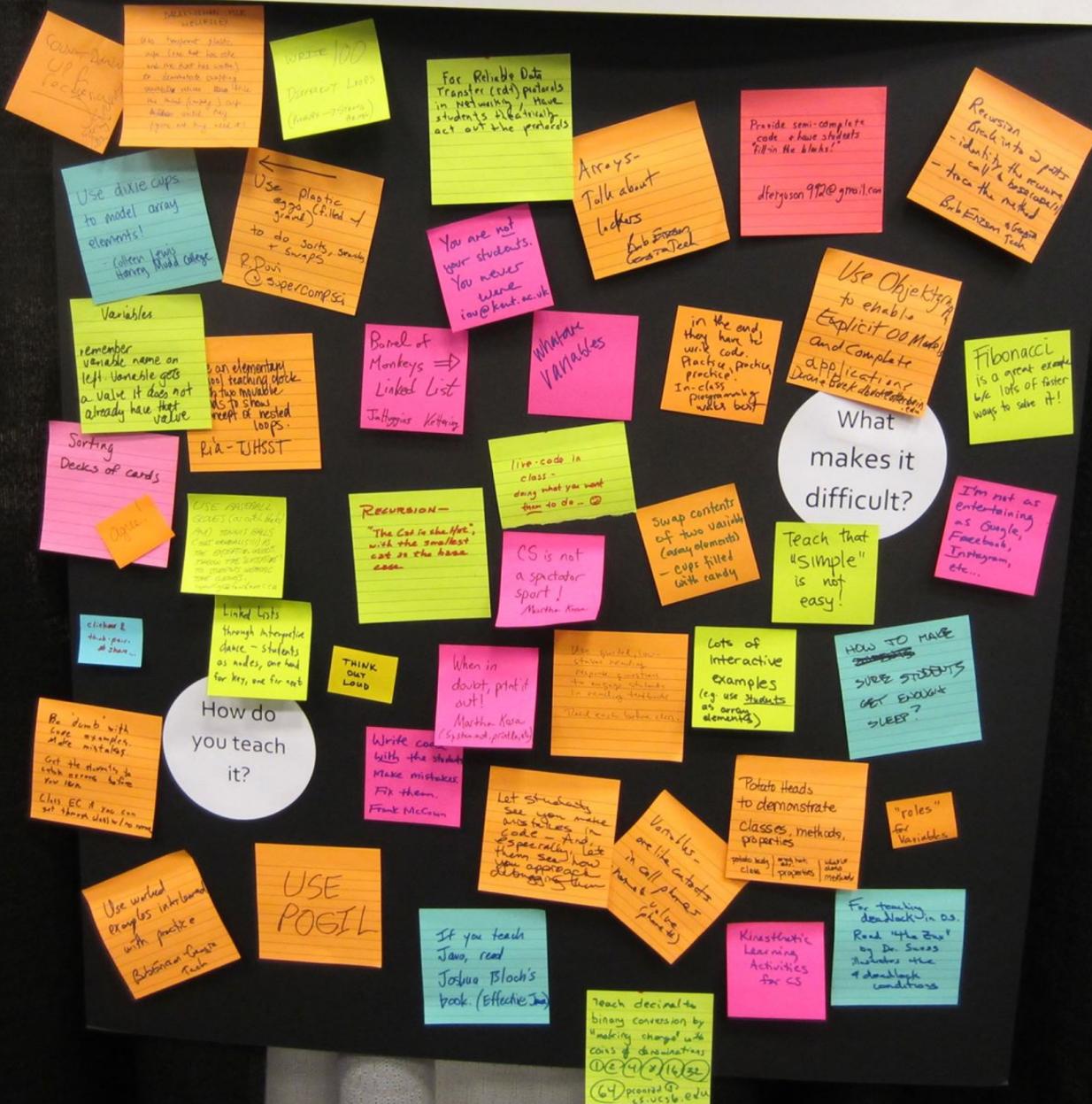
Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.

CS TEACHING TIPS



Session 10: Getting Unstuck

April 3

Studying

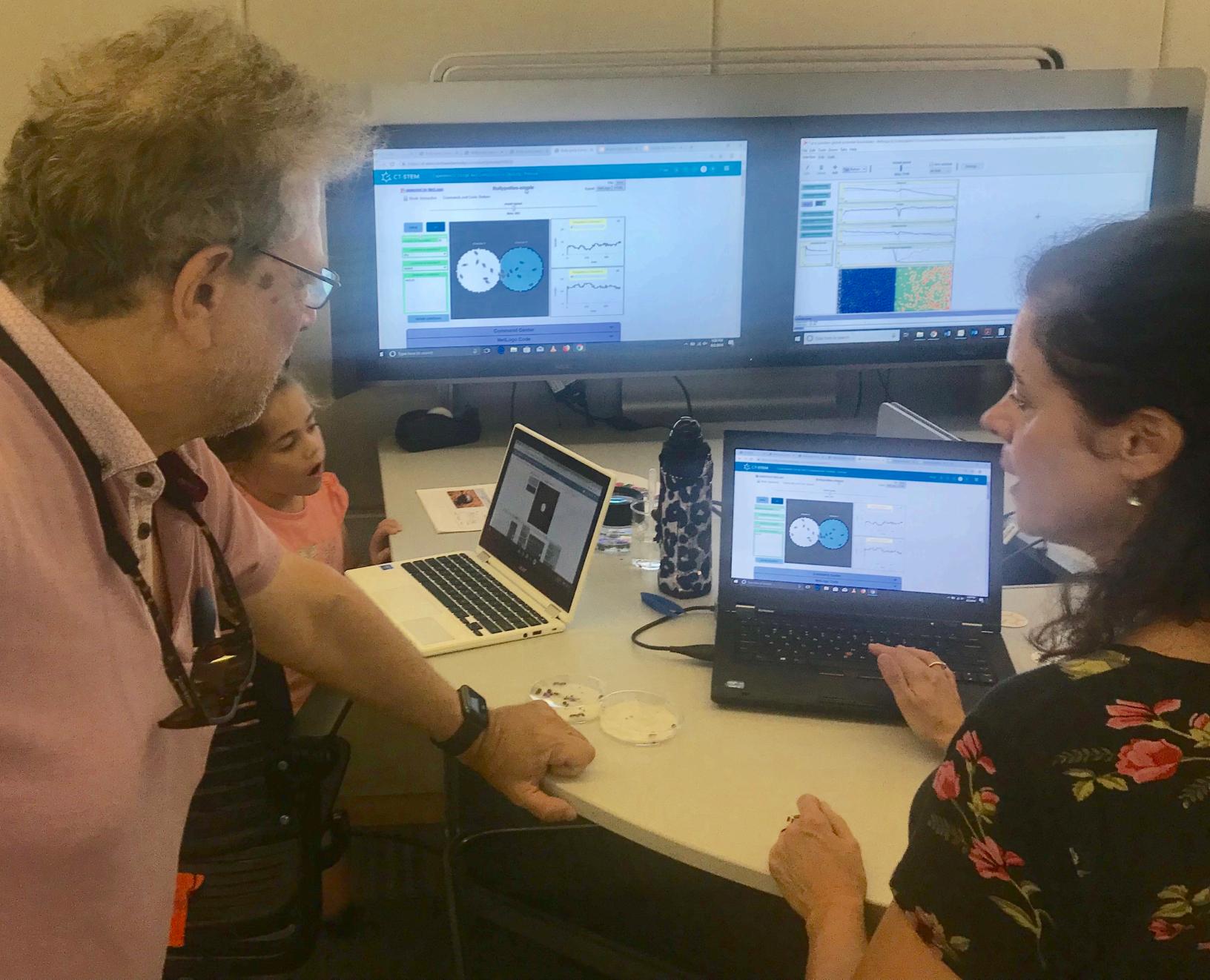
- Brennan, K., Haduong, P., Williamson, M. A., Peters, L., Smolevitz, S., & Yu, B. (2021). Getting Unstuck: An Intermediate Scratch Curriculum to Support Design Studio Culture in the Classroom (Orientation).
<https://gettingunstuck.gse.harvard.edu>
- Brennan, K. (2021). How Kids Manage Self-Directed Programming Projects: Strategies and Structures. *Journal of the Learning Sciences*, 30(4–5), 576–610.
- Haduong, P., & Brennan, K. (2019). Helping K–12 Teachers Get Unstuck with Scratch: The Design of an Online Professional Learning Experience. In E. K. Hawthorne, M. A. Pérez-Quiñones, S. Heckman & J. Zhang (Eds.), *Proceedings of the 50th ACM Technical Symposium on Computer Science Education (SIGCSE'19)* (pp. 1095–1101).

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 11: Kibo

April 10

Studying

- Kibo Resources. <https://resources.kinderlabrobotics.com/>
- Bers, M. U. (2017). Coding as a Playground: Programming and Computational Thinking in the Early Childhood Classroom (pp. 135-184). Routledge.
- Horn, M., & Bers, M. (2019). Tangible Computing. In S. Fincher & A. Robins (Eds.), The Cambridge Handbook of Computing Education Research (Cambridge Handbooks in Psychology, pp. 663-678). Cambridge University Press.

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 12: Project Co-Working

April 17

Studying

No readings this week.

Designing

- Work on your project.

Reflecting

- Write 500-word reflective statement in your design journal.



Session 13: End-of-Term Project Presentations

April 24

Studying

No readings this week.

Designing

- Work on your project.

Reflecting

- Prepare a presentation about your course design project to share in the final class session.



New Resources and Studies in Biocomputational
Artificial Intelligence
Author: Christopher Amato and Kristy
Harrington, PhD

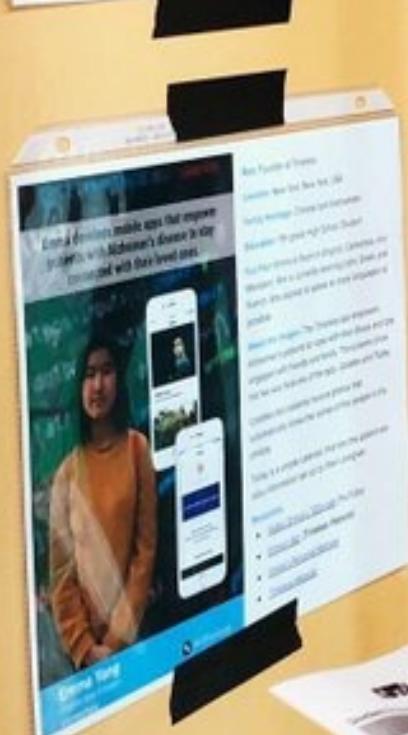
Family members identify亟待解决的
Education University of Central Florida
Wearable device from Americans reduced
Technology (MIT)

Part II: In the last few years, a common theme
also is concerned in health information technology.

Medical image The nanoparticles developed
make it easier to detect breast cancer
with an ultrasound. So far, they've tested it on
200 different cases. But 100% of the
patients that come to the test for breast cancer
receive the test as part of their treatment plan.
After the test, they're able to receive the
information needed for the test and the
treatment that's needed. And we're working
right to now.

Resources:

- [Indiegogo](#)
- [Education Data](#)
- [CSforGood.com](#)



CSforGood Scavenger Hunt

Scavenger Hunt Instructions: Find and check off the following items on your scavenger hunt sheet.

- A computer monitor
- A smartphone
- A laptop
- A tablet
- A television
- A printer
- A keyboard
- A mouse
- A scanner
- A projector
- A monitor
- A keyboard
- A mouse
- A scanner
- A projector



Final Projects and End-of-Term Meetings

April 26; April 29 – May 3

Your final project is due on Friday, April 26 at 5:00pm.

Rather than receiving summative written feedback on final projects, people have found it more helpful to meet and have conversations about projects and experiences more broadly. (I also find it more helpful and meaningful!) And so, Brian and I invite every person to meet with us for 30 minutes, during the week following our final gathering.

These meetings don't have a preset structure; we can talk about your project, your experiences of the course, or whatever else you like.

These meetings will take place April 29 through May 3 and will be scheduled in March, after spring break.



Credits

- 1 Original Scratch project
- 3 twitter.com/bquentin3/status/1217893056277557248/
- 5 twitter.com/bquentin3/status/1217957578401112065
- 8 twitter.com/MsZareen/status/1216859492551286784
- 13 twitter.com/MakerLibPat/status/1207785719252561923
- 16 exploringcs.org/e-textiles/gallery#jp-carousel-4837
- 20 twitter.com/aprilpc/status/1193263895504445440
- 22 twitter.com/KevinKWang/status/999330638908932096
- 24 twitter.com/aprilpc/status/1205479987396186112
- 26 exploringcs.org/for-teachers-districts/photos#jp-carousel-2485
- 28 exploringcs.org/e-textiles/gallery#jp-carousel-4753
- 30 twitter.com/KinderLabRobot/status/1204390446916456449
- 32 constellations.gatech.edu/computing-equity-project
- 34 twitter.com/misrael09/status/1202228305690267654
- 36 twitter.com/ExploreChi/status/774680661219274752
- 38 facebook.com/csteachingtips/photos/a.632479276824461/643673549038367/
- 40 ct-stem.northwestern.edu/static/img/pd4.jpg
- 42 twitter.com/kathleenfugle/status/1215145513118584832
- 44 twitter.com/billmarsland/status/1204209045382422530
- 46 twitter.com/mayhemedu/status/1207912835784818689
- 48 twitter.com/mres/status/1208452294259249152