PROGRESS REPORT

Fall 2022

Human Flourishing Project

Education Sub-Team

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Progress Report Fall 2022

1 Summary

What is the Open Design process?

Open Design builds on human-centered design with the intention of creating a design process better suited to solve issues of human flourishing. The principles of active inclusivity, transparency, and collaboration heavily inform the Open Design process. For our group, active inclusively has manifested through the recognition of voices being left out of our feedback channels.

Our project:

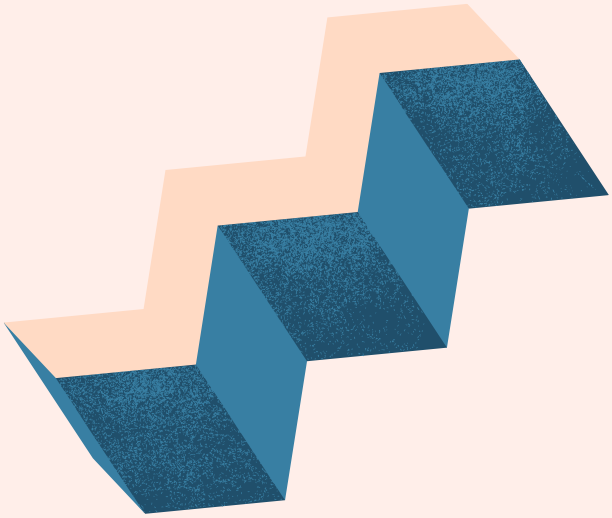
Teachers at Phillips Andover High School created a set of lessons that use project-based learning to teach computer science students how to work through ethical dilemmas as they build technology — not after the fact. These teachers have partnered with the Open Design Studio in order to scale this way of teaching computer science and ethics. A working session with the Andover teachers this summer led to an identification of the following problems:

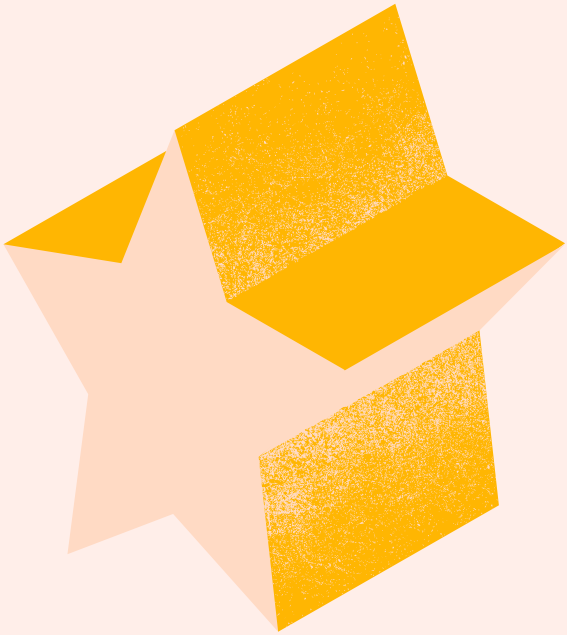
- Technology is a vital part of almost every aspect of our lives, yet most high school students–and especially non-male-identifying students and students of color–do not learn computer science; for those students that do, they see a pedagogy that is shortsighted in terms of the impacts of the technology that they create.
- Although the ethical issues tied to contemporary computing involve fundamental rights and social justice, most students do not have a working knowledge of the ethical implications of technology or the tools necessary to participate in building, using, or advocating for ethical technology.
- The predominant system of education in the US is inequitable, outdated, and deeply harmful to many students.

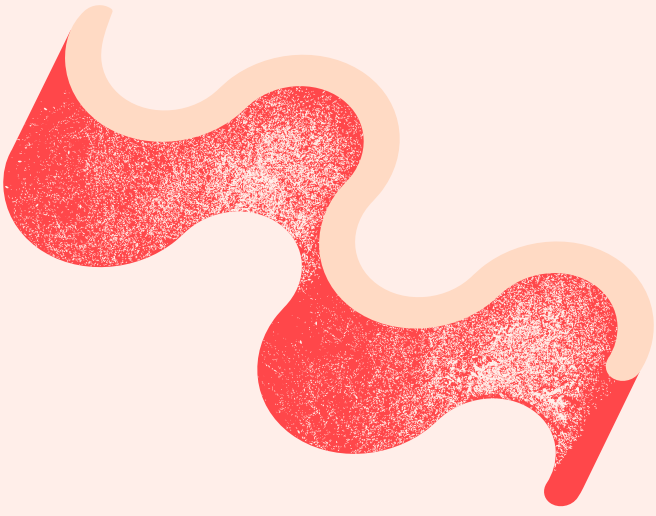
Our current working "What-if" statement guiding our project is:

> What if high school educators could intuitively integrate ethical decision-making into technical project work in existing computer science curriculum?

So far, the project has consisted of interviews with a variety of stakeholders, concept creation and feedback, prototype creation, and a draft of a test plan for the prototype. Along the way, we have kept our co-designers updated through presentations.







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2 Artifacts & Analysis
Open Design: Understand

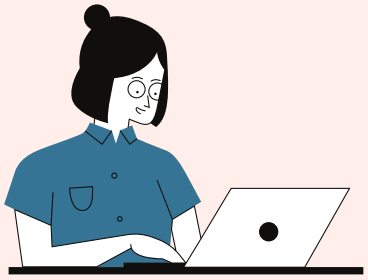
As we kicked off the "Understand" phase, it was key for us to better understand the needs, desires, and hopes of the community we are trying to serve. While technology is becoming increasingly global, traditional forms of computer science education fail to engage with how technology impacts society. As a result of this misalignment, our subteam aims to focus on the fact that students lack the necessary knowledge and experience to understand the ethical implications of building and using technology.

As we embarked on this process: we collaborated with our co-designers: Nick Zufelt, Ryan Ravanpack and Kiran Bhardwaj who are computer science and philosophy teachers at Phillips Academy Andover, respectively. To have a better understanding of perceptions related to ethics and technology in the classroom, we interviewed roughly 12 high school and college students, our 3 co-designers, 4 computer science educators, 4 education consultants, and 1 ethical tech expert.

While we were able to get meaningful insights from the gracious people that took the time to talk with us, it is incredibly important to understand that there were certain groups that were underrepresented in our outreach efforts. For instance, we weren't able to talk to administrators which is important because their insight can provide nuance towards how education policy can actively impact ethical computer science curriculums. We were not able to talk to as many public school teachers as we hoped, which is important to note because our insights and the people we talk to should be reflective of the community we aim to serve. Similarly, we were not able to talk to as many people on the margins impacted by technology, which is particularly meaningful as computer science is a field with immense racial, gender, and socioeconomic disparities.

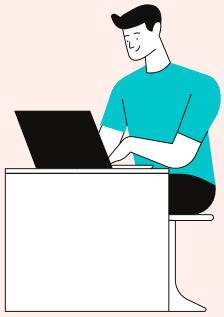
Through our conversations, we were able to gather key learnings. Different cultures exercise the need for personalized applications of ethics, Educators lack the training required to navigate ethical conversations without causing harm, as well as the immense inequity associated with the adoption of CS ethics.

Concluding this phase of open design, we were left with three insight statements:



Insight Statement 1

Educators want to create culturally competent classrooms because technology is growing rapidly and it is important to have a sense of vigilance when creating technology but more needs to be done in terms of educating students on ensuring that they possess this sense of vigilance.



Insight Statement 2

CS educators want to integrate ethics into their curriculum because they believe computer scientists play an important role in society but requirements from school and district leadership keep them from creating an innovative curriculum.

Insight Statement 3

Students want more opportunities to explore ethical CS because they feel disconnected from ethics and CS within their courses but they cannot access a lot of courses to explore this connection.

3 Artifacts & Analysis
Open Design: Create

Following the "Understand" phase, our sub-team was left with three key takeaways: we needed to make our solution something that could be easily integrated into the pre-existing computer science curriculum, something that would make educators more comfortable with facilitating conversations about ethics, and something that would be extremely easy to both access and view. Out of these takeaways, we began brainstorming how we could integrate ethi{cs} projects our co-designers had formulated into a new format that would fulfill all of the traits.

1 Accessibility

With this in mind, we opted to use the platform of Notion to house our prototype. Typically, computer scientists use web applications like GitHub to distribute their code and materials but, in an effort to increase accessibility, we formatted our centralized hub for ethi{cs} in Notion. Furthermore, to make our prototype even more adaptable, we also created a tag for the project length. This functionality was implementred so that, based on how much time an instructor had or wanted to dedicate to their lesson, they would be able to easily identify a project lesson plan that would fit within their constraints.

2 AP-Aligned

Another feature we prioritized was ensuring that our ethi{cs} projects would be packaged in the AP Computer Science curriculum. In order to do so, we generated a way in which projects could be tagged with a particular AP Computer Science A objective. Thus, given that public school instructors have to prepare their students for AP exams, these teachers could easily integrate a project into their lesson because that particular project would align with a specific AP unit/objective.

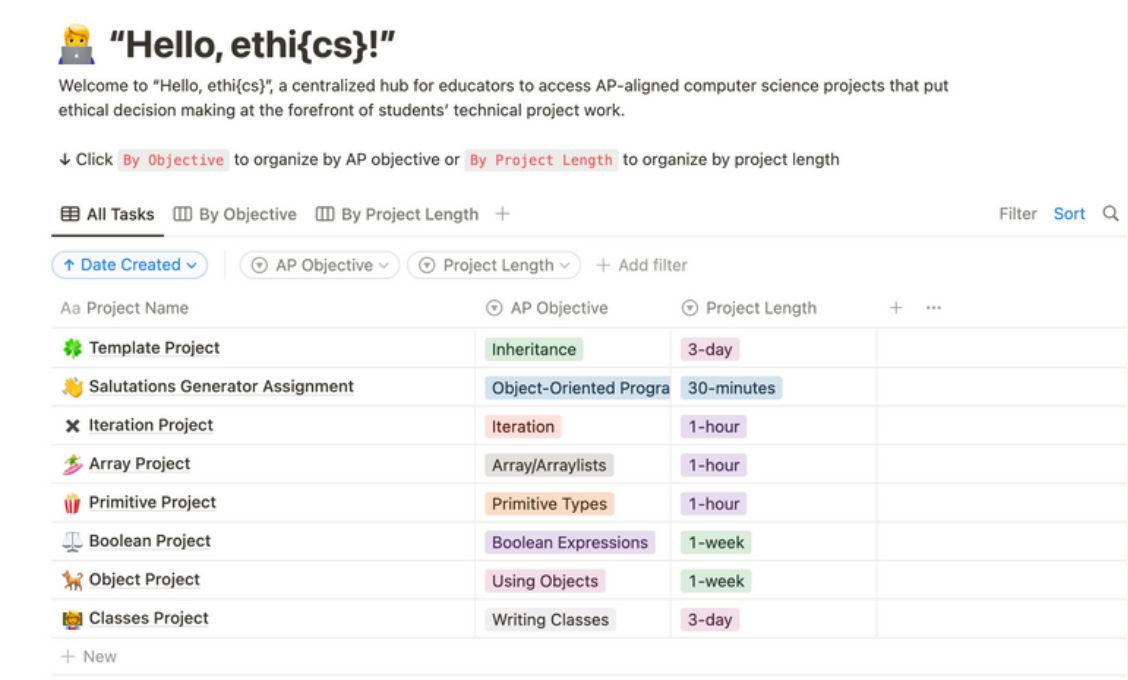
3

Equipping Educators

Within each project on the Notion page, our team was determined to not only provide project-based learning materials, but also to help equip educators with the tools they need to facilitate these lessons. To address this, we included sections within each project's subpage giving a highly detailed overview of the lesson plan and also a section regarding suggestions for assessment.

Our Prototype

Ultimately, we decided on the name "Hello, Ethi{cs}!", a play on the first thing computer science students learn to print "Hello, World!" because it encapsulated the approchability of our centralized hub for ethi{cs} project materials.



Visit our page: https://helloethics.notion.site/5bd79270662444c39b00a5ceab2a7e8d?v=c576bf071bbe40bd8abb84c2ad5573ce

"Hello, Ethi{cs}!"

Key features in action

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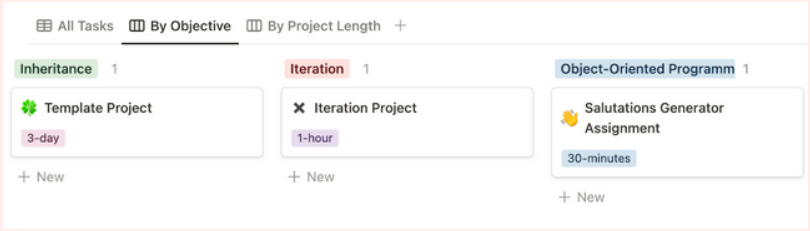
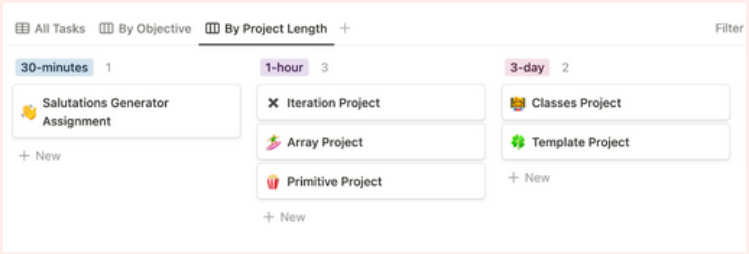
AP-Aligned





Adaptable

Built for Educators

👋

Salutations Generator Assignment

AP Objective: Object-Oriented Programming

Project Length: 30-minutes

Detailed Plan

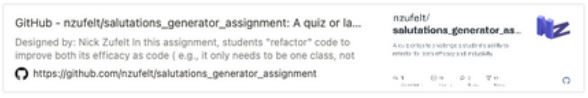
We begin this class by being given the code (see the swift and java versions) and the following prompt.

> Suppose that you received the below code from a teammate on a project. There are a few problems with it. First of all, it certainly could be more inclusive. It also doesn't really need to be two different classes. These are not necessarily the only issues; however, there are no bugs in the code. It's not "wrong", it's "bad". Write and test a class which would better solve the same problem of encoding data about people potentially getting married and their desired salutation(s). This means you have some choices!

Typically, my students, when faced with code that they haven't written, struggle to understand what it is doing: *what is its purpose, what are its outputs?* So, we typically begin by having students partner up to answer only those questions. We discuss as a class afterward how that is a necessary technical step in a design process, but it isn't sufficient. This is usually motivated by the above prompt. I then ask for full-class discussion on the topic, *"In what ways is this code not inclusive?"* With these two discussions under a student's belt, I find that they typically have what they need to get started, either on their own or in partnerships using pair programming.

Before students begin coding, though, I typically tell them that I will be asking them to make/submit/share arguments of the form, *"The code did X, but that's not good because Y, so I changed it to do Z instead"*. So, they should make note of these changes as they go, and their as-they-go notes can be in any form that makes sense to them. As the instructor, you may choose to be more explicit in this requirement.

Once students are done with the assignment, I typically have them submit their code, and *then* group up with other students to share the changes they made. Since I don't grade this assignment on the quality of their changes (see "Learning Objectives and Assessment" above), students typically bring a deep understanding and attention to this discussion, but when I've been less explicit about how I will assess the assignment, I find that students a frustrated by this discussion.



Context

I have used this assignment in my iOS app development course and in an AP Computer Science A course. At my school, both of these classes have assumed no prior coding knowledge and are geared toward a similar difficulty level. Typically, by this point, students have spent time learning many of the basics of coding, such as functions, branching, iteration, and the beginnings of object-oriented programming. Students likely will need knowledge of all of these topics for this assignment, with the possible exception of iteration.

By this point, we have also typically discussed some ethical concepts such as user rights and needs, data collection practices, and friction in app design (for example, slowing down the infinite scroll effect in social media). I believe that having some experience arguing for the rights and needs of their users is critical for this assignment, though it certainly could be introduced in conjunction with it. Any other ethical topics could add helpful nuance to the conversations in this assignment, though likely none of them are critical.

This assignment could be used to reinforce students' understanding of classes and objects, which is often discussed in ethically inert ways such as *"create a `Car` class and a `Factory` class which can create `Car` objects"*. In particular, I don't believe that this should be the assignment used to *introduce* the concept of classes, because students will need some degree of technical fluency with classes and methods to get started on this assignment.

Learning Objectives

After completing this project, students can:

- make informed arguments about the potential users of their code which were *not* considered in the design process (*"Who's not in the room?"*),
- state the goals of "refactoring" code and perform basic refactoring,
- make arguments about their programming choices which are informed by their knowledge of their ethical considerations.

Format of Assessment

A helpful assessment for this assignment is not only the ending code that students end up creating, but also something which captures their arguments of the form, *"The code did X, but that's not good because Y, so I changed it to do Z instead"*. Depending on the experience level of your students, a simple with these three columns, a written reflection, or a small-group conversation could help augment the coding could work. Finally, I ask students to write these sorts of statements in their (code) comments.

My assessment for this assignment is usually broken into the following rubric categories:

- **Refactoring**: Does the code still run, and does it function in ways that the outside world expects? For example, if I used your class in my program previously, does your refactoring work break my code? Ideally, it shouldn't!
- **Argument Alignment**: As part of your work, you stated that you made changes to the code because of certain technical or ethical limitations of the previous version. Do the code changes you make correctly address the concerns you raise?
- **Considering others**: As part of your work, do you explicitly seek to include people who are different from you?
- **Documentation, code formatting**: Does your code follow our established conventions?

4 Artifacts & Analysis
Open Design: Evaluate

Our plan to test the efficacy of the ethi{cs} Notion platform prototype can be split into 4 discrete steps. The first step is to hand the prototype, which contains a 30-minute project-based lesson plan, off to CS educators. The second step is to have students and educators fill out surveys before and after the educator conducts the lesson. The third step is to measure the students' improvement in their confidence in learning the relevant technical and ethical decision-making skills associated with the project-based lesson plan as well as measure the difference in planning times for the aforementioned lesson vs. usual lesson planning time for educators. The fourth step is to identify any patterns in our survey data.

First Phase of Testing

With the first step to hand the prototype, it is crucial to test the ethi{cs} platform among a diverse array of CS educators, respective to the schools they teach in and the students they teach. As such, it would be valuable to hear from public, private, magnet, and charter school teachers as well as think about the backgrounds of the students they teach.

Second Phase of Testing

With the second step being surveying teachers and students before as well as after the lesson, it is important to think about the questions to be asked in order to have a meaningful baseline to measure from. Given the conditions that teachers and students are within, the time and energy associated with filling out two surveys can be a confounding variable for the quality of results. We aim to work with our co-designers on creating relevant and appropriate questions.

Third Phase of Testing

With the third step to measure differences in pre & post-surveys among students and teachers, a major goal on the teacher's side is to see if using the ethi{cs} platform is less of a hassle than the standard. Major improvements in this metric would aid in the process of adoption as teachers have more influence on course content than students. Similarly, we hope to measure students' confidence in technical and ethical skills, relative to the project, to see if the content is actually helpful because the students are the end-person we are trying to impact. Apart from just seeing if they're learning new technical & ethical skills, we also hope to make sure that the learning of ethical skills does not impede the learning of technical skills.

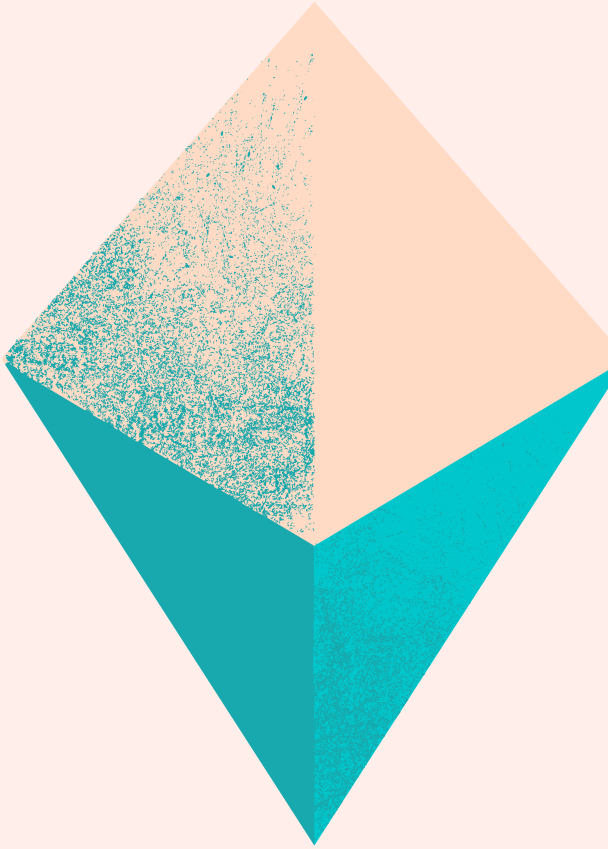
Fourth Phase of Testing

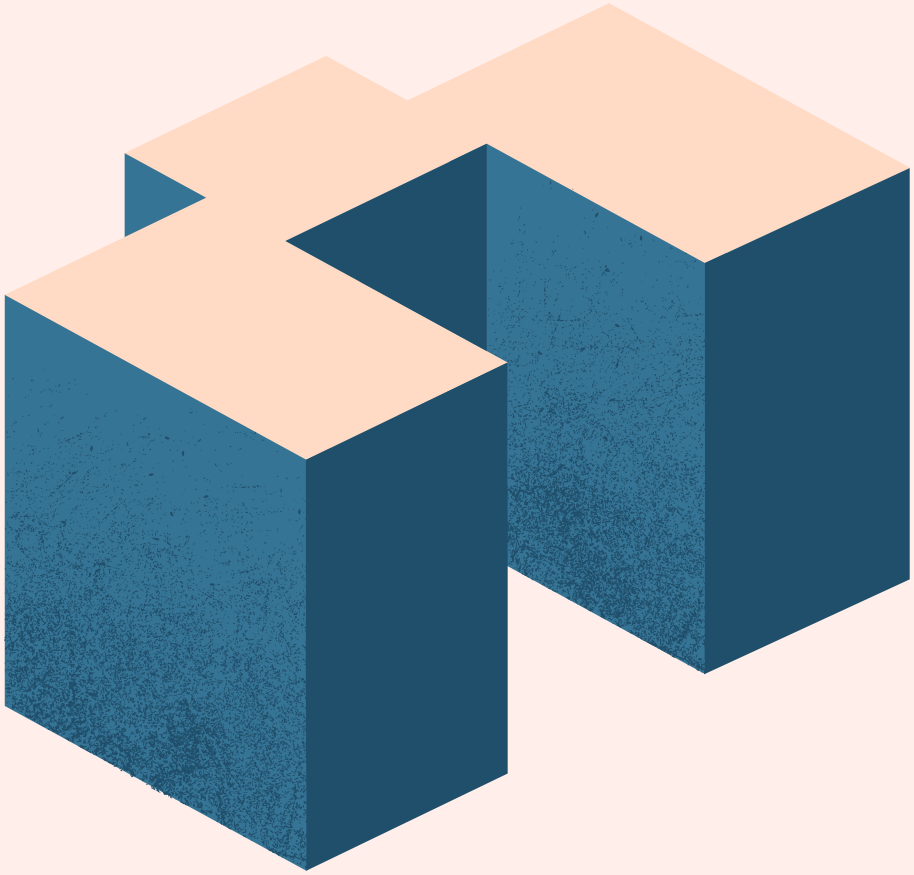
Finally, the fourth step is important as any iterations/improvements we make for future versions of the prototype will be a byproduct of the quality of analysis we're able to source from our surveys.

5 Conclusion
Takeaways & Next Steps

As we move into the next phase of this project, our main priority will be finding teachers who reflect the population we ultimately want to reach: those who teach AP Computer Science in the public school system. This will require expanding past obvious connections in our own networks. Since we will likely have to do more "cold" outreach, we will have to be more explicit in how collaborating with our project would benefit those we contact.

Additionally, we will start to work closer with our Andover co-designers to prioritize lessons and projects that will live on our platform. This will most likely involve prioritizing AP objectives and ethical dilemmas to address. While we will not include these additional lessons in the initial test plan, they will help lay the groundwork for future prototypes to test.





Acknowledgements

We want to extend our gratitude to all those who have helped us! This project would not be in existence if it weren't for our contributors:

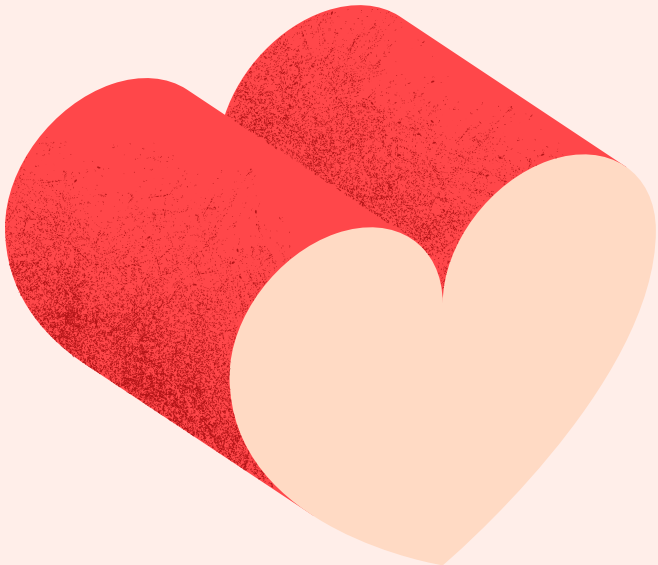
Our **undergraduate researchers** Kartik Chamarti and Megan Fong

Our **design strategist** Amanda Booth

The **Bass Connections team leaders** Aria Chernik and Kevin Hoch

Our **co-designers** Nick Zufelt, Ryan Ravanpak, and Kiran Bhardwaj

We thank you for your continued support in our efforts to contribute to human flourishment.



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