

# **Capstone 2020 Project Proposal**

Partnered with UW Continuum College

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## Introduction

For our project we are working with UW Continuum College, an organization within UW dedicated to providing educational programs to meet the needs of all types of students. They have tasked us with optimizing UW's current learning management system (LMS), Canvas to better integrate online tools in order to provide a seamless and encouraging learning environment for students. We plan to explore the concept of expanding the scope of Canvas to encompass more than just grades, discussions, and quizzes and actually design learning modules for online course content.

## Design Question

How can we decrease the cognitive load of students taking online courses through Canvas and design better content learning modules using H5P, an interactive HTML library?

## Motivation

Our work is motivated by the thousands of people who enroll in the UW continuum college's programs to not only help them create a better opportunity for themselves, but also become lifelong learners. Even though our focus is only on Summer Quarter students, we believe that our designs could have the potential to optimize the learning experience on Canvas, but other Learning Management Systems as well.

Besides our primary motivation, our team has used Canvas for online classes and hope to create a better learning experience for our fellow students through reducing the cognitive load of using multiple integrated tools. From personal experience and research from the UW Continuum College, there is a problem with the integration of software across courses. For example, with multiple modular learning programs such as MasteringPhysics and Aleks, it's difficult for students to keep track of everything. Students taking both physics and chemistry have to do their online learning on the respective software and keep track of their grades in Canvas. We aim to address this problem space and take a deep dive into how we can improve the overall online learning experience for students.

## Target User Group

The primary user group that we have outlined for this project are students enrolled in the Summer Quarter program. Secondary users that we have identified are instructors and instructional designers. The tertiary users would be the vendors and specialists of H5P who help with the integration of H5P within Canvas. Our user groups were defined with assistance from our sponsor, who identified several characteristics of our primary and secondary users.

### Primary User Characteristics - Students

**Age:** 16+ (High School Age and Beyond to enroll in Summer Quarter)

**Education:** Post-secondary level

**Attitude:** Motivated to learn, achieve career goals

**Motivation:** Learn new things, update skills or transition to new career field

**Technology Abilities:** Basic knowledge of computers

**Ability Constraints:** Potential constraints - Vision, Hearing, Motion, Time,  
English as Second Language

**Socio-Economic Status:** Varies (Low, Middle, & Upper Class)

**Employment:** Full-time, part-time, or non-employed

### Secondary User Characteristics - Instructors & Instructional Designers

**Age:** 18+ (Minimum Bachelor's Degree to teach or be an Instructional Designer)

**Education:** Post-Tertiary level

**Attitude:** Motivated to pass on knowledge and help students

**Motivation:** Design and/or teach course content for students at UW

**Technology Abilities:** Advanced knowledge of computers

**Ability Constraints:** Potential constraints - Vision, Hearing, Motion, Time,  
English as Second Language

**Socio-Economic Status:** Middle & Upper Class (Average UW lecturer - \$76k) [1]

**Employment:** Full-time, part-time (part-time faculty)

## Background Research

To gain a better understanding of our problem space, our team conducted a literary review of related academic articles. We read and evaluated eight different articles from the Association for Computing Machinery. Below are four short summaries of the most relevant articles from our research.

### ***Using Learning Analytics to Explore Help-seeking Learner Profiles in MOOCs***

In “Using Learning Analytics to Explore Help-seeking Learner Profiles in MOOCs”, Corrin et al. discuss their findings on how students seek help in online learning courses [2]. The focus of their research was to explore the most common patterns of students seeking help to design for better online support of MOOCs. The researchers applied learning analytics around 2400 students’ course and clickbase data. Then, the researchers identified five learning profiles that portray the different help-seeking behavior groups.

The overall applications and key findings of the study lie within the five profiles identified. The profiles were low engagement, assessment focused - low grades, passive engagement, active engagement, assessment focused - high grades [2]. The engagement profiles are related to how active the student is with page views, forums, and discussions while the assessment focused profiles refer to the number of takes/retakes for assessments. The key findings are that more engagement (passive and active vs. low) in forums, discussions, etc. are correlated with higher grades. However, with assessment focused students who take quizzes multiple times but do not engage in forums, there is a mixture of low and high grades [2].

For our capstone project, this article provides valuable insight because we are designing the integration of a new learning module for students. Because the modules are new, students most likely will seek help and so, understanding the large-scale student patterns for how they approach and learn from LMSs’ will help inform our design decisions during the ideation and design milestones.

### ***Personalized Recommendation System for Advanced Learning Management Systems***

This article outlines research into developing new methods that would help a Learning Management System (LMS) recommend different materials that could be used to help a user during their learning. The motivation for this research is due to recommendations from others in this field that a Recommendation System (RS) would alleviate the problems of current LMSs such as, having too much information available, the redundancy of the materials, and the inability to personalize the information given to the student.

The researchers developed two different methods for creating recommendations, one was the Most Recently Referenced (MRR), which compiles a list of the most used references by analyzing the bibliography of student assignments for the class from the previous semester it was offered, and the All Time Referred (ATR), which compiles a list of the most used references by students in their assignments for a class over the entire school year. These methods were then tested using data from the LMS at their institution by calculating how often a recommended work was referenced in student works. Through their testing they were able to verify that both methods had high precision values and could recommend either for utilization in a RS for an LMS [3].

This research will be valuable for our project because it has verified that recommendation systems for learning materials in a LMS are very viable in helping students to learn. So, as we work through our project we will keep the idea of a recommendation system in mind as something to include with the incorporation of the new learning module. It will most likely come up during the competitive analysis of the research milestone to see if others have incorporated a recommendation system along with learning modules, and if yes, then how it was accomplished from a design perspective. It will also likely come up during our ideation and design milestones to see if it can be included in the solutions we create.

### ***The Importance of Human Mental Workload in Web Design***

The article by Longo et al., “The Importance of Human Mental Workload in Web Design” focuses on the concept of Human Mental Workload (HMW) in web design. HMW is defined as an important factor in a user’s interaction in design, as it represents the mental work necessary to complete a task. More specifically, as defined by the

author, “the construct emerges from the interaction between the requirements of a given task, the circumstances under which it is performed, the context and the skills, behaviors, emotional state and perceptions of the operator.” [4] This study focuses on applying usability concepts in measuring HMW.

This study was conducted using two popular websites: Wikipedia and Google. Each website was represented as their original version, as well as a modified version. 19 participants were directed to complete four similar information search tasks on both the original and modified websites.

The overall findings show that HMW has potential in reliably measuring cognitive load in web and interaction design. The measure of workload actually showed an inverted correlation with the usability perception of the users, as “increments in required mental workload correspond to decrements in usability perception and vice-versa.” [4]

This study also presents a value to our project with Continuum College as we are looking to improve the workflow and interaction of the interface design to minimize cognitive load, and this HMW measure would be useful in both understanding the relevant measures as well as supporting us in our own discovery. For actual utilization during our process, this research would come into play mainly during the research milestone by focusing the questions we ask during our evaluations and data collection around the HMW concept.

### ***New Construction Process of Standardized Learner Profile***

In the paper, “New Construction Process of Standardized Learner Profile”, researchers Nissrin Nehiri and Noura Akin analyze current technologies for crafting an interoperable “Learner Profile” in relation to Learning Management Systems and propose a new architecture that aims to bridge current gaps in the previous tools. In the beginning of the paper, the researchers conduct competitive analyses and introduce the current limitations of Learning Management Systems (like Canvas) such as the lack of relevant personal data in relation to the learner’s performance. While the goal of the Learner Profile is to utilize a variety of data to enrich the learner’s performance, it lacks the correct categorization for labeling of metadata, yielding it inoperable for transferring key information between different Learning Management



Systems [5]. With these limitations in mind, the researchers explain the two core pieces of technology that all Learner profiles must have: IMS LIP Learner Information Package and the Experience API. The IMS LIP Learner Information Package is essentially the information that describes the Learner. Information includes all demographic, goal, activity, interests, competency, accessibility, transcript data that is then used to enrich and personalize the learner's experience. The Experience API is a service that allows the sharing of metadata between multiple Learning Management Systems, enabling a unified view of the Learner. Based on these core pieces of technology, the researchers proposed to have a new architecture that exchanges learner profile information between educational systems that will evolve over time as more information is collected about the learner [5].

Through learning about the proposed architecture of crafting Learner Profiles, our team can better understand how to integrate other educational systems within the UW continuum college. As such this research will be most utilized during our ideation phase as we develop the solutions for the integration of a new system of learning for the student.

### **Capstone Project Implications**

From our initial background research, our team found research involving LMS metrics and optimization and research on cognitive load for web design, but did not find a research study that combined both topics. With this in mind, our capstone project serves as a new addition to the research space of LMS by examining the cognitive load of such systems with a human-centered approach rather than a metric-based one.

# Methods

## Milestone 1 - Research (April 17th)

**Project Manager:** Amelia Wang

### *Motivation*

To comprehend and understand the current functionality and UX of Canvas alongside H5P.

### *Methods*

To gain an understanding of Canvas and the problem space, we will conduct contextual inquiries, usability testing, and competitive analysis. First, we will evaluate Canvas with Jakob Nielsen's heuristics to identify current usability problems. Then we will conduct several usability tests to understand how users interact with the platform. To expand our knowledge, we will then analyze competing LMS systems for how they integrate other software into their system. With our solid foundation from these methods, we will then come up with a concrete design question after writing up a research report.

### Recruiting Participants

This method will help to ensure that we recruit participants for our contextual inquiries and usability testing that matches up to the characteristics that we developed for our Primary User. Recruitment will most likely be done through a Google form survey that asks questions which verify whether they meet the requirements that we have for our participants distributed among peers and friends. We will aim to recruit at least five, hopefully eight, participants for our testing so that we have a wide variety of feedback.

### Contextual Inquiry

With a contextual inquiry, our team hopes to gain insight into our target user group through direct interaction as well as understand how they interact with Canvas. We aim to conduct two to four 30 minute voice-recorded interviews online with students previously or currently enrolled in online courses. These interviews will be conducted with at least two members of our team, one as an interviewer and the other as a notetaker. To reduce bias, our team will prepare an interview script, complete with

several tasks for the user to complete. After analyzing the recordings and notes, our team will compile a written summary of our findings.

### Usability Testing

With a usability test, we hope to understand pain points and limitations of previous summer courses not using H5P, as well as new summer courses using the library. Through discovering pain points of the new and old system, we can better understand what needs to be done and improved upon.

### Competitive Analysis

To broaden our perspective within the problem space of learning management systems, our team will evaluate at least three other LMS for how they integrate online tools into their system. We will investigate the leading LMS in college environments, preferably for four-year colleges, and compare them to Canvas. Depending on the access we can get, our analysis may comprise online reviews, forum discussions, articles, or direct testing. Our analysis will be shared among the team and with our Sponsor on an informal written document.

### **Resources**

Our team will require minimal resources for the completion of the Research milestone. For competitive analysis, our team only needs to have access to our desired technology for analysis. We will need access to Canvas and other LMS. Our team has already verified with our sponsor regarding sandbox accounts, filled with relevant modules for evaluation and testing. We will need to explore accessing other LMS as students. With the contextual inquiry and usability testing, we have confirmed with our sponsor that we have access to participants when we desire to interview.

Some nice-to-have resources would be monetary compensation for participants to help with recruitment in addition to a dedicated working space. However, both are not necessary to complete our Research milestone.

***Deliverable***

For this milestone, our team will be satisfied once we have a strong understanding of Canvas in relation to other tools and our problem space.

Our final deliverable for this milestone will be a comprehensive written report summarizing our methods, findings, and newly identified design question. This report will serve us in the next milestones as a reference to refer to keep us on the right track.

**Milestone 2 - Ideate (May 1st)**

**Project Manager:** Alex Harr

***Motivation***

To brainstorm design solutions for our problem space and begin our design process with low-fidelity prototypes

***Methods***

Utilizing previous research, we will begin to brainstorm potential solutions to solve for key business and user requirements. The methods below are listed in order as they will be conducted. To begin with, we will have three brainstorming sessions in order to generate concrete and viable options that we could potentially design for. From there, we will then create user flows depicting the major interactions that our user will have within the platform. Finally, we will create wireframes of our design solution that will ultimately lay the base foundation of our design. The methods that will be used for the ideation phase are detailed below including their goal, scope, and scale.

**Unstructured Brainstorming Sessions**

We will have three unstructured brainstorming sessions where we will dissect our design requirements and translate them into “How might we” questions. These questions will then serve as prompts for us to generate as many possibilities to solve for our design requirements as well as other general ideas. Moreover, we will aim to deliver at least 5 concrete ideas that can then be used for user flows.

### User Flows

With our design requirements and potential solutions, we will then translate them into three major user flows, first on whiteboards then on Figma. These flows will depict the major actions the student will undertake when interacting with the platform and our proposed content modules. Furthermore, these user flows will serve as the basis for wireframing.

### Wireframing

From our User Flows, we will generate low-fidelity wireframes to create a general layout with accompanying elements.

### ***Deliverable***

The deliverable for this milestone will consist of our recommendations for the layout of H5P for use in future classes as well as wireframes and user flows to be used to refine our exploratory redesign.

### ***Resources***

In order to conduct satisfactory brainstorming sessions, we will need sticky notes as well as whiteboard markers. Moving to User Flows and Wireframing, we will need pen, paper, as well as the software Figma.

## **Milestone 3 - Design (May 22)**

**Project Manager:** Seung Won Shin

### ***Motivation***

Scope in on the ideas developed during the ideation phase and refine the idea selected into a testable design solution.

### ***Methods***

In order to refine the design selected we will first create a medium fidelity mockup, then recruit participants and conduct usability tests on the mockup for feedback. We will first recruit participants and vet them to ensure that we are testing those that are

actually part of the user group. Then we will conduct usability tests using the wireframes developed previously to gain feedback and insights from our primary user group. Afterwards we will analyze the feedback received to develop insights and ideas for refinement of the design. Finally using this feedback we will develop a high-fidelity mockup along with an interactive demo that models the design and allows us to develop the details of the design solution.

### Medium Fidelity Mockup

With this method we will work to create a digital mockup that contains most of the UI interactions we hope to have while lacking some of the smaller visual details. This version will allow us to create a mockup of the design solution that gives users a good sense of how the final prototype will function and can be used in a usability test to gather feedback about our design for further refinement into the final High Fidelity Prototype.

### Recruiting Participants

This method will help to ensure that we recruit participants for our usability test that matches up to the characteristics that we developed for our Primary User. Recruitment will most likely be done through a Google form survey that asks questions which verify whether they meet the requirements that we have for our participants distributed among peers and friends. We will aim to recruit at least four participants for our usability tests so that we have a wide variety of feedback.

### Usability Testing

The usability testing at this stage will be used to gather feedback on the solutions that we developed during the ideation phase. By conducting these usability tests we will be able to identify usability problems we have not been able to see during development from the perspective of the user. The feedback from these usability tests will also help us in creating insights we can incorporate into our high fidelity prototype.

### Feedback Analysis

This method will be based on the feedback that we gather from the usability tests conducted previously. It will allow us to develop concrete ideas and insights that can be applied to the refinement and development of the next iteration of the prototype.

Each member of the team will do a deep analysis of the notes from the usability tests to form usable insights.

### High Fidelity Prototypes

We will then work to create a final digital mockup that contains all of the UI interactions we hope to have with optimized visual details. These high fidelity prototypes will be built in Figma.

### Interactive Demos

We will design several interactive demos with the high fidelity prototypes to highlight the essential user flows that we identified in Milestone 2. These interactive demos will be built in InVision.

### Resources

For this phase of our process we will most likely not need too many resources. As previously mentioned some monetary resources to use as incentive during recruitment will be nice but not completely necessary as it will most likely be able to be accomplished without incentives. For the usability test we will most likely utilize the interview rooms located on the third floor of Sieg in order to conduct the tests while maintaining the privacy of the participants. For the feedback analysis and development of the mockup the team will only need to commit time in order to complete these methods.

### ***Deliverable***

The deliverable for this milestone will be the high-fidelity working prototype and its interactive demos finalized through the other methods utilized during this milestone.

## **Open House (June 2)**

**Project Manager:** Daniel Nguyen

***Deliverables***

For the Open House, our team will have three deliverables: a poster, a video, and a presentation.

**Poster**

Our team will design a poster explaining our process and end result to show at the HCDE Open House. We will use the poster to help our presentations during the Open House.

**Video**

We will compile an overview video of our project, highlighting our end-to-end process. This video will emphasize the work we have done for this project and discuss the applications of our project.

**Presentation**

Our team will prepare a detailed presentation for our Capstone sponsor in addition to a brief presentation for the HCDE open house. Both presentations will discuss the work we have done and will supplement the poster and video.

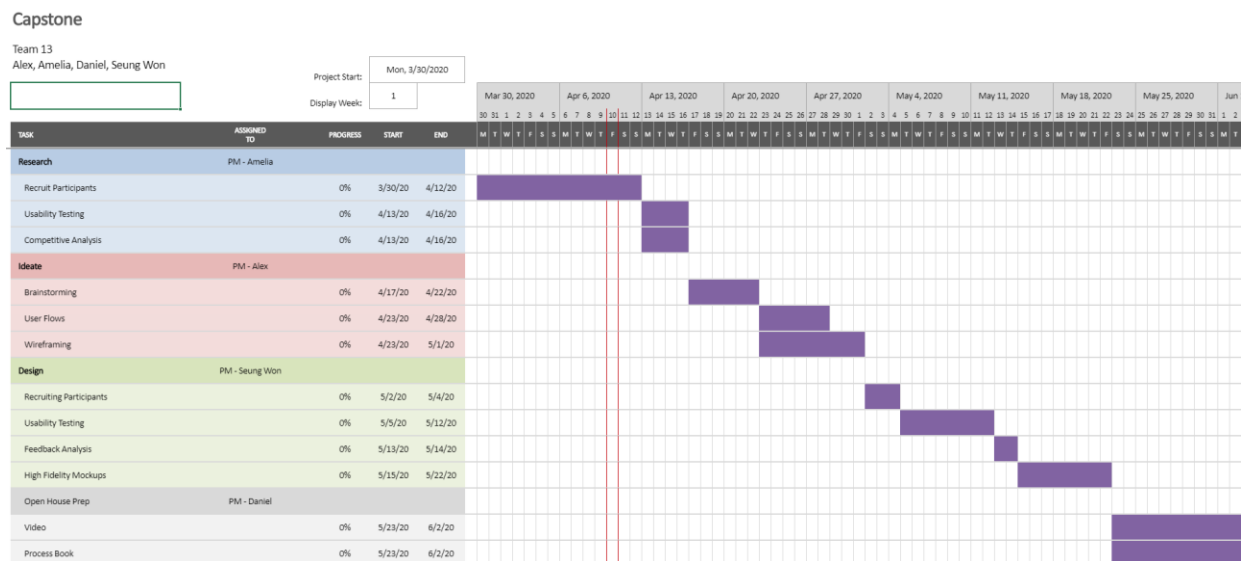


## Timeline

Here is our estimated timeline for our project. We have calculated all relevant tasks and their duration for our design process. The timeline may be subject to change as we move along the project next quarter and have a more realistic understanding of the constraints we might have.

In the case of a team member missing an extended period of time such as a week, the team will continue moving forward as planned with the other members equally sharing the absent team member's work. Once the absent team member returns, they will do extra work to compensate for the team's work time.

Here is our Gantt chart that visualizes each milestone and its related tasks.



[https://uwnetid-my.sharepoint.com/:x:/g/personal/danngu\\_uw\\_edu/ESDyJRjAGldChTwldJXYBaEBR4Y5u1nijmqOTC4ANNwQrg?e=DPDPPW](https://uwnetid-my.sharepoint.com/:x:/g/personal/danngu_uw_edu/ESDyJRjAGldChTwldJXYBaEBR4Y5u1nijmqOTC4ANNwQrg?e=DPDPPW)

## Resources

Resource	Description	Access
Laptops	Take notes, research, design	Team members have their own
Canvas accounts	Sandbox permission	Already granted by sponsor
Canvas data metrics	Access to large scale user patterns	Sponsor will provide
LMS software	Access for competitive analysis	Team members will research and find their own
Quiet space	Quiet areas to conduct interviews and testing	On campus locations such as Sieg 3rd Floor
Paper, markers, sticky notes	Tools for designing and brainstorming	Sieg Design Lab
Participants	Recruitment of participants	Sponsor will assist in finding PCE students and connections
Money	Incentives for participants	Sponsor is requesting from upper level management currently about incentive support
Figma	Main Design Tool	Free for Students
InVision	Interactive Prototyping Tool	Free for Students

## Appendix 1: Team Contract

Below is the team contract for the UW Continuum College project. The contract below serves as an artifact that ensures us to create high quality deliverables while completing our project on time. Our team's goal is to deliver an amazing project and experience while honing and displaying our expertise that we have gained over the course of our HCDE career.

### Team Member Roles and Responsibilities

#### ***Milestone 1: Research (April 13th)***

- PM: Amelia Wang
- Methods
  - Contextual Inquiry
    - Lead - Amelia
    - Support - All
  - Usability Testing
    - Lead - Alex
    - Note Taker - Daniel
  - Competitive Analysis
    - Lead - Seung Won
    - Assistant Researchers - All
- Milestone Deliverable: Written report summarizing our methods, findings, and newly identified design question

#### ***Milestone 2: Ideate (April 27th)***

- PM: Alex Harr
- Methods
  - Unstructured Brainstorming Sessions
    - Lead - Daniel
  - User Flows
    - Lead - Amelia
    - Assistance - All

- Wireframing
  - Lead - Alex
  - Assistance - All
- Milestone Deliverable: The deliverable for this milestone will consist of the collection of wireframes that we have, 3 user flows, along with our recommendations for H5P.

### ***Milestone 3: Design (May 11)***

- PM: Seung Won
- Methods:
  - Recruiting Participants
    - Lead - Seung Won
    - Assistance - All
  - Usability Testing
    - Lead - Amelia
    - Note taking - All
  - Feedback Analysis
    - Lead - Alex
  - Medium Fidelity Mockup
    - Lead - Daniel
    - Support - All
- Deliverable: The deliverable for this milestone will be the high-fidelity prototype developed through the other methods utilized during this milestone.

### **Open House (June 2)**

- PM: Daniel Nguyen
- Methods:
  - Video
    - Lead - Daniel
  - Presentation
    - Lead - All
- Milestone Deliverable: Presentation at Open House

## **Plan for Team Meetings**

We will be meeting on Tuesdays and Thursdays during class (3:30PM - 5:20PM). If necessary, depending on the amount of work needed to be done, additional work meetings will be scheduled. We plan to meet with our Capstone sponsor every week for an hour meeting through Zoom. The date for the weekly sponsor meeting is yet to be determined.

For each meeting, we will have a notetaker keep track of important tasks we plan to do before the next meeting. The meeting will be unstructured work time for our team and will adapt to our timeline. Decisions at the meeting will be made by a majority vote. If any team member cannot make it to the meetings, then they will be briefed on Messenger with the meeting notes and any specific tasks or work they will need to do before the next meeting.

## **Assignment Submissions**

Each assignment will be looked over before submission in their final drafts by every team member. We will take turns every week to submit them officially, trying to avoid having the same member submit multiple times. We will format them per class examples as well as use Google Docs or Figma to agree on and work on the format together.

## **Communication/Collaboration**

For our team of four, communication will be done via Messenger chat and FaceTime. Research documents will be shared in our shared Google Drive while design documents will be shared on Figma in our team folder. Communication with our sponsor will be through Zoom during our weekly meetings, and our primary contact, Amelia, will reach out via email or Slack if necessary.

Work updates will be immediate because of the real-time collaboration tools our team is using. Team members are expected to respond within 24 hours online unless prior notice is given for normal work. On the days that assignments are due, team members are expected to message the team and give an approval of the work by 6PM before the submission deadline.

## **Resolving Conflicts**

To prevent issues with work, all of our work will be done in real-time collaboration tools so everyone is held accountable for their quality of work. We will have regular stand-ups in the beginning of some of our meetings to ensure the quality of work is consistent.

Team members who struggle to communicate with the team will be urged to communicate more after several negative instances occur. Differences of opinions in the direction of the project will be resolved through a majority vote.

To prevent conflict, our team will have several team bonding activities planned the timeline of our project such as team dinners.

## **Team Member Performance Characteristics**

At the end of capstone, we will evaluate our team members on the following characteristics:

- Quality of Work
- Transparency
- Participation
- Communication
- Organization
- Friendliness

## Appendix 2: References

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## Appendix 3: Team Members

### **Amelia Wang**

Amelia Wang is an undergraduate at the University of Washington studying Human Centered Design and Engineering where she has been employed in four different labs across three years specializing in HCI research in various departments including HCDE, iSchool, and Biomedical Informatics. She will be attending UC Santa Cruz this coming fall where she will begin her PhD program under Prof. Leila Takayama in the Computational Media Department focusing on Human-Robot Interaction.

### **Alex Harr**

Alex Harr is an undergraduate student studying Human Centered Design and Engineering at the University of Washington, focusing on Human Computer Interaction. Alex has been in industry for the past 3 years, starting out as a product management intern and evolving to a UX designer for a startup based out of the silicon Valley.

### **Daniel Nguyen**

Daniel Nguyen is an undergraduate student studying Human Centered Design and Engineering (HCDE) at the University of Washington, focusing on Human Computer Interaction and User Experience Research and Design. Since 2017, he has been a part of various HCDE directed research groups ranging from topics such as outreach, natural disasters, and design thinking. In 2019, he joined Garmin briefly as a UX Design intern working on an infotainment platform. He is currently finishing his degree and looking for UX design positions.

### **Seung Won Shin**

Seung Won Shin is a current senior at the University of Washington studying Human Centered Design with a focus in Human Computer Interaction graduating in June 2020. During the course of his time at the University of Washington he has worked with various faculty in directed research groups focusing on health information management and STEM outreach. In the summer of 2019 he worked as a UX Design intern for Hubble Inc.