Human Computer Interfaces 4HC3

MentorHub

Group 12

December 2023

Abstract

In this design project, our objective was to develop a user-centric interface to tackle the prevalent issue of inconsistent academic support and mentorship at McMaster University, which impedes students from achieving their full academic potential. The project was structured into five milestones: the first involved identifying user goals and tasks, using idea-generation techniques to find potential solutions. The second milestone focused on evaluating user-centric requirements elicitation methods to better comprehend the needs of McMaster students. In the third milestone, we applied these methods to gather in-depth information about users' goals, tasks, and current processes, leading to the creation of personas, scenarios, and a hierarchical task analysis. The fourth milestone adopted an iterative design approach, encompassing ideation, storyboarding, development of low-fidelity prototypes, and preliminary evaluations. Finally, in the fifth milestone, we progressed from a low-fidelity to a high-fidelity prototype, followed by an additional round of user evaluations. This process culminated in a refined, user-centered design solution aimed at enhancing the academic support structure at McMaster University.

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1 Introduction

1.1 Problem Statement

Students at McMaster University often face challenges in accessing consistent academic support and mentorship, which is crucial for excelling in their studies. This issue largely stems from variations in the availability of academic assistance across different courses and instructors. A significant number of students lack access to tutors or experienced peers for necessary guidance. Insufficient support can detrimentally affect a student's academic performance, and neglecting this issue might lead to long-term negative impacts on both students and the university. It could result in a general decline in student

motivation and potentially harm the university's reputation. Our objective is to create an online platform that facilitates connections between students and peer tutors or mentors, offering academic help and advice. This platform would also enable students to find classmates and form study groups.

1.2 User Groups

McMaster is home to 37,537 undergraduate and graduate students.[1] In the 2019-20 academic year, McMaster welcomed 6,820 first-generation students, 536 Indigenous learners (First Nations, Métis, and Inuit), and 2,465 students with disabilities.[2] In the 2022-23 academic year, 17.5% of all McMaster students were international students, coming from 125 countries.[1] With over 300 clubs, the McMaster population is diverse in physical, social, and cultural interests. McMaster Athletics and Recreation includes, but is not limited to, activities such as badminton, climbing, jiu-jitsu, kung fu, and sailing.[3] McMaster students are also passionate about raising awareness and funds for mental health (Jack.org), youth homelessness (Trek for Teens), health equity and advocacy in science (HEAS), and many more causes.[3] Culture is an important part of the McMaster community with groups such as the Black Student Association, Desi Students at McMaster (DSM), Korean Culture and Language Club (KCLC), etc.[3] These demographics represent all individuals who will benefit from this project proposal.

There are two primary groups of users:

- McMaster students seeking academic support.
- McMaster students/alumni who are interested in gaining volunteer experience and/or are excited about the opportunity to tutor fellow students.

At any point in time, a student at McMaster could relate to both categories. For example, a third-year Computer Science student at McMaster seeking support in COMPSCI 4HC3 might also be interested in tutoring first-year students in MATH 1ZA3.

Other user groups could include McMaster faculty, staff, researchers, and future students. McMaster faculty and staff would be tertiary users, as they are indirectly impacted by students having a better understanding of course content. Researchers and clinicians at McMaster would be a valuable connection for graduate students and therefore be considered secondary users. Future students would find particular value in speaking to current McMaster students and alumni, and would also be considered secondary users.

1.3 Identified User Needs

The team conducted surveys and interviews to gather user requirements. The results identified several top needs for any study group platform or method:

- **Speed:** Quick response times are essential, especially with a large number of members in the group.
- **Availability:** The platform should be accessible at any time and from any location. One respondent mentioned, "It was a situation where if it was 2 AM, you could still ask a question and someone would reply..."
- **Centralized Knowledge:** A common space where frequently asked questions are visible to everyone. As one user noted, "It's a mixture of students feeling supported, discussing midterms and exams, and having a small area for all the knowledge you need."

Challenges identified in these types of platforms include:

- **Capacity Limits:** Particularly in group chats, where the number of participants can be overwhelming.
- **Spam:** With a large number of members, not all discussions are relevant to everyone. Filtering out irrelevant information while remaining alert to relevant discussions is challenging.
- **Impersonal Interactions:** Due to members not knowing each other personally, interactions can feel distant with everyone being just a username.
- **Schedule Conflicts:** Every student has a unique timetable, making it challenging to find a suitable time for everyone, especially for tutoring sessions in lower-level courses.
- **Informational Gaps:** Different sources and methods of information retrieval can significantly impact the effectiveness of the platform. This may depend on personal preferences, skills, and knowledge of the products/services.
- **Teaching Quality:** It is difficult for users to assess teaching quality without attending the class. Instructor ratings might be the only pre-class information available.

2 Design Process

2.1 Ideation and Prototyping

The design process began with ideation, aimed at finding solutions to the identified problem. Group brainstorming sessions were conducted using Brain Netting and Rapid Ideation techniques. In Rapid Ideation, team members immediately wrote down ideas as they occurred, which were then critiqued or enhanced by another member. Brain Netting allowed for a continuous flow of ideas, where each concept led to further idea

generation rather than immediate feedback. This approach resulted in various potential solutions, laying the groundwork for a low-fidelity prototype. Two primary storyboards emerged: one focused on academic matching based on courses taken, and another (the second) on enabling students to create profiles/groups and decide group formation methods. The storyboards can be viewed by following this link.

The storyboard emphasizing group formation and profile creation (storyboard 2) was selected to inspire the first iteration of the low-fidelity prototype. This prototype allowed users to search for tutors and groups, each with distinct profiles under 'Find Groups' and 'Find Tutors' functionalities. It detailed user interactions necessary to achieve their objectives and address the core problem. Following this iteration, user interviews and peer evaluations provided insights for enhancing design and usability. Key feedback included:

1. Confusion between the FIND GROUPS page and MY GROUPS.
2. Need for more advanced search filters on the FIND GROUPS page.
3. Insufficient display of search criteria on the FIND GROUPS page.
4. Difficulty transitioning between Tutors and Groups without returning to the Dashboard.
5. Overcrowding on the FIND GROUPS page.
6. Requirement for a more modular Dashboard to better differentiate between groups and tutors.
7. Ambiguity in accessing MY ROUPS, with the page lacking distinct information. This led to the integration of this functionality with the dashboard in the second iteration.

Positive aspects noted were:

1. Useful information on the FIND GROUPS page and effective separation of groups and tutors.
2. Well-organized MY GROUPS page with clear meeting times.
3. Efficient Tutor functionality, albeit with room for improved accessibility.
4. Comprehensive user information collection.
5. Functional and well-designed Dashboard.

The second prototype iteration explored alternative design ideas, independent of user evaluations. It differed from the first iterations, using some interfaces and interactions from the first but with a new task flow and organization. The design shifted from segregating tutors and groups to organizing the interface by subject matter/course, allowing students to view tutors and groups simultaneously in a new interface style. Links to the second prototype: Iteration 2 slides. Iteration 2 walkthrough video.

The third and final iteration synthesized learnings from user feedback and the first prototype, along with design inspirations from the second iteration. This iteration refined both prototypes, enhancing the messaging systems and search features from the second prototype and addressing the cluttered interfaces issue identified in user evaluations of the first prototype. The following links show prototype 3: Iteration 3 slides, Iteration 3 video, which describes interactions and task flows between the states.

2.2 Preliminary (Prototype) evaluations

The low fidelity prototype used was a 13-frame paper prototype, in the user evaluations of the design. A team member would switch the frames and pop-ups (implemented with sticky notes) as necessary. The users were to pretend they were looking for tutors and study groups for a course they're seeking support for. They were prompted to navigate the interface as they would naturally. The papers (pages) were switched as needed when the user performed actions. In addition to speaking there thoughts and actions out loud at each step participants were eventually asked about rating or commenting on the intuitiveness of the design.

Scenario description

The user should act as though they are a McMaster student who is struggling in one of their courses. The user is seeking out a tutor or study group who can support them with their coursework.

Tasks

1. Get started by creating a personal profile and filling out key details on the setup page.
2. Find a study group and join the group.
3. RSVP to a study group meeting.
4. Navigate to one tutor's profile.
5. Send one tutor a message to propose a meeting.

Pre-evaluation Questions

1. "Have you ever used a similar design before, such as a professional tutoring site?"
2. "Do you have any concerns about the objectives of this evaluation?"

Post-task Questions

These are general questions to guide conversation with the users during peer evaluations.

1. "Have you ever performed a similar task before?"
2. "Was there anything ambiguous about the task you were asked to perform?"
3. "Are the functions of any of the controls you see on the interface unclear?"

Post-evaluation Questions

1. "Do you have any comments on the intuitiveness of the design?"
2. "What would you rate the design intuitiveness on a scale from 1 to 5 (1 being the least intuitive and 5 being the most intuitive)?"

2.2.1 Process Summary

Two peers were evaluated, with each session being about 10 minutes in length. Participants are McMaster University students in software and computer science related programs. Both participants are 20 years old and additional demographic information was not disclosed. Objectives of evaluation were to assess how seamless the flow was, find the reason behind pauses and confusion, as well as get comments from the participants regarding the instrument.

Peer 1

The user chose the option STUDENT and filled out the fields in the setup page starting from the top to the bottom and clicked done. The discovery page was displayed. Selects one of the tutors and the tutor's profile page is displayed. User clicks on AGREE Then user navigates back to the discovery page and focuses on FIND GROUPS. User chooses a group and system says "you've joined." User asked what the difference is between the FIND GROUPS" page and MY GROUPS page. On the MY GROUPS page, user understands that it shows what each group is focusing on. User points out that there's an ambiguity between finding groups page and the page of the groups you're already in. User suggested adding more search-related features to the FIND GROUPS page. He noted that FIND GROUPS page has a lot of good information and important details. An issue the user pointed out is that the show groups page doesn't provide feedback on what filters and parameters are currently applied in the search query. We explained that it filters results depending on what the user set up the account with, which we realized

isn't communicated to the user. The user added that he liked the tutors page and the message center page.

Design intuitiveness: 3.5/5

Peer 2

The user chose the option STUDENT and filled out their information. The user mentioned that there was "a lot going on with space." User clicks FIND CLASSMATES and the FIND GROUPS page is displayed. User asked if those were groups for a specific subject. User clicks JOIN for a group and the MY GROUPS page is displayed. User clicks MESSAGE CENTER and the message center page is displayed. User clicks on RSVP on a group meeting and said "I think that's very useful." User asked if a group can have two meetings at the same time, we responded that this might be a back-end concern and there could be constraints in place to prevent that situation from occurring, or potentially allow that fully like the case is for Microsoft Teams since different meetings could be for different purposes. User clicks on house button at the top and is redirected to the dashboard page. User clicks FIND TUTOR and the tutors page is displayed. User clicks MORE next to Paul's profile and Paul's profile is displayed. She decides she wants to send Paul a message so she clicks MESSAGE and message center page is displayed. She clicks on the checkmark for "meeting proposed."

Final Comments on Intuitiveness: Options were laid out nicely and icons were simple and intuitive. The FIND GROUPS page was cluttered but other than that it looked good.

2.2.2 Key Insights

Make MY GROUPS page and FIND GROUPS page more distinct in content or more descriptive in name. Make applied search filters visible and adjustable. User should be informed when entering information during setup that the information they provide will be used for the purpose of filtering.

Try a simpler layout especially for FIND GROUPS page. Since different meetings can be for different purposes, meeting titles can be implemented.

One user was confused about the difference between MY GROUPS page and FIND GROUPS page, implying it seemed like they had the same purpose, even though they didn't. They both didn't know the basis on which the displayed groups in FIND GROUPS page were filtered; in other words, why of all the groups in the system a few of them were displayed. They didn't know that the information they filled at the beginning was what dictated which groups they're shown. Both peers commented on the fact that the FIND GROUPS page looked cluttered. One user asked whether two meetings can be conducted simultaneously in the same group, and although that's an implementation question, this decision will eventually have to be made, and UI accommodations will have to be made.

2.2.3 Takeaways

Taking into consideration peer comments recorded during the peer evaluation sessions, possible improvements include:

1. Make My Groups page and Find Groups page more distinct in content or in name.
2. Make applied search filters for Find Groups visible and adjustable.
3. User should be informed when entering information during setup that the information they provide will be used for the purpose of filtering.
4. Try a simpler layout especially for Find Groups page.
5. Since different meetings can be for different purposes in the same group, meeting titles can be implemented.

2.3 Design Changes

The following section justifies the design differences between the prototypes and the final app, linking concepts from the M4 methodology where applicable:

- **Group Events on groups Page:** The decision to place group events under the groups page rather than the message center stemmed from the need to distinguish between current group memberships and potential new groups. This approach, aligning with the first low-fidelity iteration, aimed to reduce interface clutter, addressing concerns from users seeking a streamlined app to organize study groups or tutoring sessions.
- **Separation of groups and tutors Pages:** Originally conceived in the first low-fidelity prototype, this design was revisited in the high-fidelity prototype. User feedback suggested the value in keeping these features separate, as they serve distinct purposes at different times. The final design prominently features these two modes on the nav-bar for easy switching.

3 Final Design

MentorHub, a comprehensive online platform designed to assist students in managing study groups and tutoring sessions, underwent a user evaluation to assess its functionality, usability, and overall user satisfaction. This section outlines the evaluation process, data collected, key findings, and design takeaways for future improvements.

3.1 High-Fidelity Prototype Development

3.1.1 Prototype Demonstration

The high-fidelity prototype of MentorHub has been fully realized and can be accessed via the following link: MentorHub Website. The technical details and source code is available at the following link: MentorHub Source Code.

3.1.2 Summary of Changes

The development of the high-fidelity prototype involved several significant changes and enhancements, informed by the iterative design process and user feedback:

1. **Improved Navigation:** The navigation system underwent an overhaul to enhance the user experience. A header, incorporating the logo and title, was introduced for a cohesive visual identity. The navigation bar, now situated within this header, prominently features key functionalities—GROUPS, TUTORS, MESSAGES, and PROFILE—facilitating rapid mode switching and streamlined access to essential sections.

2. **Interface Clarity:** Efforts were concentrated on decluttering the user interface to enhance clarity. The layout has been refined to minimize visual noise and optimize user focus. Notably, details about upcoming events and pending responses for groups and tutors have been relocated from the messages section to the sidebar on the GROUPS and TUTORS pages, ensuring more organized and accessible information presentation.

3. **Enhanced Search Functionality:** Advanced search filters have been implemented, enabling users to more precisely locate groups or tutors based on specific criteria such as subject matter or course.

4. **Responsive Design:** The prototype has been optimized for various devices, ensuring a consistent and accessible experience across desktops, tablets, and mobile phones.

5. **Enhanced Accessibility:** In alignment with the Web Content Accessibility Guidelines (WCAG)[1], the web content has been adapted to be more accessible to individuals with disabilities. This ensures a more inclusive user experience across the platform.

These changes reflect a commitment to continuous improvement and user-centered design, ensuring that MentorHub effectively meets the needs of its diverse user base.

[1] https://www.w3.org/WAI/standards-guidelines/wcag/

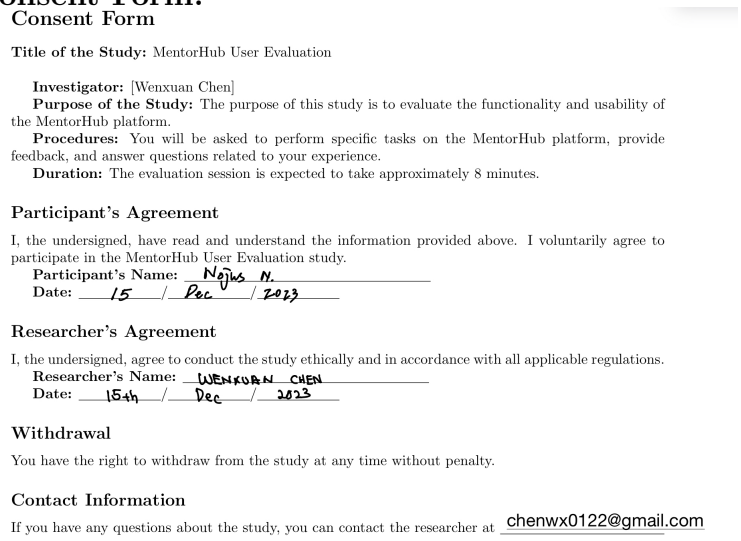
3.2 MentorHub User Evaluation Protocol

The user evaluation aims to assess the functionality, usability, and user satisfaction of MentorHub. Participants will be asked to perform tasks and provide feedback on their experience.

3.2.1 Participants' information and Consent Forms

Participant 1

- **Name:** Nojus N.
- **Age:** 21
- **Major:** Compsci
- **Consent Form:**



Consent Form

Title of the Study: MentorHub User Evaluation

Investigator: [Wenxuan Chen]
Purpose of the Study: The purpose of this study is to evaluate the functionality and usability of the MentorHub platform.
Procedures: You will be asked to perform specific tasks on the MentorHub platform, provide feedback, and answer questions related to your experience.
Duration: The evaluation session is expected to take approximately 8 minutes.

Participant's Agreement

I, the undersigned, have read and understand the information provided above. I voluntarily agree to participate in the MentorHub User Evaluation study.
Participant's Name: Nojus N.
Date: 15 / Dec / 2023

Researcher's Agreement

I, the undersigned, agree to conduct the study ethically and in accordance with all applicable regulations.
Researcher's Name: WENXUAN CHEN
Date: 15th / Dec / 2023

Withdrawal

You have the right to withdraw from the study at any time without penalty.

Contact Information

If you have any questions about the study, you can contact the researcher at chenwx0122@gmail.com

Participant 2

- **Name:** Adam J.
- **Age:** 20
- **Major:** Math
- **Consent Form:**

Consent Form

Title of the Study: MentorHub User Evaluation

Investigator: [Wenxuan Chen]
Purpose of the Study: The purpose of this study is to evaluate the functionality and usability of the MentorHub platform.
Procedures: You will be asked to perform specific tasks on the MentorHub platform, provide feedback, and answer questions related to your experience.
Duration: The evaluation session is expected to take approximately 8 minutes.

Participant's Agreement

I, the undersigned, have read and understand the information provided above. I voluntarily agree to participate in the MentorHub User Evaluation study.
Participant's Name: Adam Jr
Date: 15 / Dec / 23

Researcher's Agreement

I, the undersigned, agree to conduct the study ethically and in accordance with all applicable regulations.
Researcher's Name: WENXUAN CHEN
Date: 15th / Dec / 2023

Withdrawal

You have the right to withdraw from the study at any time without penalty.

Contact Information

If you have any questions about the study, you can contact the researcher at chenwx0122@gmail.com

3.2.2 Tasks

Participants will be given the following tasks to perform on MentorHub:

Task 1: Join a study group.

Task 2: Schedule a tutoring session with a tutor.

Task 3: Navigate through the platform to explore features and functionalities.

3.2.3 Scale Questions

Participants will be asked to rate the following on a scale of 1 to 5 (1 being strongly disagree and 5 being strongly agree):

1. Joining study groups was easy.
2. Scheduling tutoring sessions was straightforward.
3. Navigating through the platform was user-friendly.
4. Overall satisfied with MentorHub.

3.2.4 Open-ended Feedback

Participants will be encouraged to provide qualitative feedback on the following aspects:

- Strengths of MentorHub.
- Areas for improvement.

3.3 Summary of Collected Data

3.3.1 Response 1

Participant Name : Nojus N.

Task 1: Joining Study Groups

- **Rating:** 4.5/5
- **Positive:** The process was straightforward, and the interface was intuitive. I could easily join a study group.
- **Improvement:** A minor suggestion would be to include more customization options for group profiles.

Task 2: Scheduling Tutoring Sessions

- **Rating:** 4/5
- **Positive:** The scheduling feature is efficient. It's easy to see available sessions and schedule them.
- **Improvement:** The chronological view could be more interactive, allowing users to drag and drop sessions for quick adjustments.

Task 3: Navigating Through the Platform

- **Rating:** 4.2/5
- **Positive:** The navigation is generally user-friendly, and the layout is clean. I can quickly access key features.
- **Improvement:** The search functionality could be enhanced for quicker access to specific study groups or tutors.

Overall Satisfaction

- **Rating:** 4.3/5
- **Positive:** MentorHub fulfills its promise as a study management platform. It brings convenience to organizing study groups and accessing tutoring support.
- **Improvement:** The initial learning curve could be reduced with more prominent onboarding prompts or tutorials.

Qualitative Feedback:

Strengths:

- The design is visually appealing, contributing to a positive user experience.

Areas for Improvement:

- Users might benefit from clearer guidelines on setting group objectives and expectations during the creation process.
- While the platform is overall intuitive, some tooltips or pop-ups could enhance the understanding of certain features.

3.3.2 Response 2

Task 1: Creating Study Groups

- **Rating:** 4/5
- **Positive:** Joining study groups was a generally smooth experience, though I took a moment to get familiar with search options.
- **Improvement:** Making search features more easy to use could enhance user experience.

Task 2: Scheduling Tutoring Sessions

- **Rating:** 3.8/5
- **Positive:** Scheduling sessions is doable, but a bit more guidance on adjusting times and managing notifications would be helpful.
- **Improvement:** Adding more info the interface could make scheduling even easier.

Task 3: Navigating Through the Platform

- **Rating:** 4/5
- **Positive:** The layout is neat, though I sometimes had to explore to find specific features.
- **Improvement:** Enhancing the search function would make it simpler to find what I need.

Overall Satisfaction

- **Rating:** 4.2/5
- **Positive:** MentorHub has potential, and with a few adjustments, it could be even more user-friendly.
- **Improvement:** Providing clearer onboarding resources might make the first steps smoother for users.

Qualitative Feedback:

Strengths:

- The idea is promising, and I see potential in the real-time collaboration features.
- Some elements of the dashboard design are visually appealing.

Areas for Improvement:

- Providing clearer guidelines for study group objectives and expectations would be beneficial.
- Including tooltips or pop-ups could improve understanding, especially for less intuitive features.

3.4 Key Findings

1. **Creating Study Groups:**
   - **Positive:** Both participants found the process of joining study groups generally smooth and straightforward.
   - **Improvement:** Customization options for group profiles could be made more prominent to enhance the user experience.
2. **Scheduling Tutoring Sessions:**
   - **Positive:** Participants praised the efficiency of the scheduling feature, finding it easy to coordinate with tutors and group members.
   - **Improvement:** There is a consensus that the session view could be more informative.
3. **Navigating Through the Platform:**
   - **Positive:** Participants generally found the navigation user-friendly, with a neat layout that facilitates quick access to key features.
   - **Improvement:** Both responses highlight the need for an enhanced search functionality to make it easier to access specific study groups or tutors.
4. **Overall Satisfaction:**
   - **Positive:** Both participants expressed positive sentiments about MentorHub, acknowledging its potential and convenience in organizing study groups and accessing tutoring support.
   - **Improvement:** Suggestions include reducing the initial learning curve through more prominent onboarding prompts or tutorials and providing clearer customization guidance.

3.5 Takeaways for Improving the Design

- **Customization Options:** Making customization options for group profiles to address user expectations and enhance the overall experience.
- **Interactive Calendar View:** Implementing a more interactive sessions view that allows users to easily drag and drop sessions for quick adjustments, contributing to a smoother scheduling experience.
- **Enhanced Search Functionality:** Improving the search functionality to enable quicker access to specific study groups or tutors, addressing the identified user need for enhanced navigation.
- **Clearer Guidelines:** Providing clearer guidelines for setting study group objectives and expectations during the creation process to enhance user understanding and facilitate a more purposeful group setup.
- **Tooltips or Pop-ups:** Including tooltips or pop-ups within the platform to enhance user understanding of certain features, particularly for those that may be less intuitive.

4 Final Design Documentation

The team has completed a High-Fidelity Prototype and user evaluation for the design milestone. They have created a website called MentorHub as the main platform for student tutoring practices, allowing students at McMaster to seek or provide academic support for their courses and subjects of study. The website has been designed to be accessible on various electronic devices, with a focus on user usability by implementing multiple concepts from Norman's Principle. The principle of Discoverability has been applied to the prototype, resulting in different interfaces for users on their phones and laptops. However, the main functions will always be preserved. The design also includes signifiers, such as underlining the menu function when the cursor moves over it, to indicate the user's selection during the process. The team referred to Apple's Human Interface Guideline, which covers interface layout and views. The design follows a consistent colour scheme and appropriate button and item sizing to avoid errors by users. The text is also written to be easily understandable for effective communication.

Based on the feedback received from the user evaluation and the HTA during the previous milestone, our team has made some improvements to the interface by adding new features and modifying existing ones to better suit the users' preferences and habits. We have also incorporated multiple interface types into the system to offer diverse user experiences such as Graphic User Interface, Sharable Input Methods, mobile, and more. The design team has made progress in universal design, ensuring flexibility and intuitive use for users with diverse abilities. Sufficient information is provided, and increasing the tolerance of errors such as withdrawing from a group or removing an added event.

Through this design project, our team identified the issue of inadequate academic support for McMaster students. We used IDEO methods to gather and understand the needs and requirements of our users. With this information, we created a persona and used a Hierarchical Task Analysis (HTA) to determine the necessary steps for users to interact with our system. We then began ideation and designing a Low-Fidelity prototype. User feedback was crucial in iteratively improving our design, so we carefully collected and analyzed all suggestions and critiques to develop a High-Fidelity prototype. We conducted further evaluations with users to ensure that our design met their needs. Throughout the project, we followed a Human-Centered Design approach, which involved active participation from primary stakeholder groups of users.

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