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WPI First-Year Hub Mobile Application

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WPI First-Year Hub Mobile Application

A Major Qualifying Project

Submitted to the Faculty of Worcester Polytechnic Institute

In partial fulfillment of the requirements for the Degree in

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Abstract

Worcester Polytechnic Institute (WPI) provides many resources for students, especially first-year students. However, knowing where to find a particular resource can be difficult. What WPI lacks is a single platform to find all of the available resources. Therefore, we have created a mobile application called WPI First-Year Hub. It provides access to information about available campus resources and WPI's first-year advising program. When testing our application, we found that relevant tasks were 26% faster on average with the First-Year Hub than without. All six participants that used our application agreed that this application would be helpful during New Student Orientation. This application has shown that consolidating the existing campus resources, especially those for first-year students, would improve the transition to life at WPI.

Acknowledgements

We would like to thank all of the interviewees that took the time out of their personal schedules to answer our questions and test our mobile application. We would especially like to thank the faculty and staff for sharing their expertise on supporting the first-year experience. We would also like to thank Dr. Joseph Beck and Dr. Robert Traver for advising us for the past four terms, answering our questions along the way, and making this whole project worth it.

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Introduction

College life, for the newcomer, is confusing and difficult to navigate. Full of unfamiliar places and new jargon, the college freshman will face challenges in their new environment. Like most four-year colleges, Worcester Polytechnic Institute (WPI) provides many resources for students, many of them targeted towards first-year students. These resources can help students solve the problems they face, but finding and using these resources is a challenge. Various platforms, both physical and virtual, exist as points of contact for students, such as the Bartlett Center, Gordon Library, Canvas, and BannerWeb. However, at a higher level, these contact points are somewhat disconnected. The WPI website and mobile application provides information on most campus resources, if a student already knows what they are looking for. What WPI lacks is an easily accessible and understandable platform to find and explain available resources. The WPI First-Year Hub mobile application aims to solve these problems by 1) providing a platform for discovering and understanding available campus resources and 2) providing a unified platform for communication between first-year students, utilizing the existing Insight Program, WPI's first-year advising program.

In order to create a useful application, there are technical requirements to keep in mind. It is important to have similar experiences for all users, regardless of phone size or operating system. A web application could ensure a similar experience on any internet-connected device, however, it lacks advantages that native applications have, like performance advantages and offline capabilities. Since our limited timeframe and small development team would make application development on separate platforms infeasible, we chose to develop using Facebook's React Native on the front-end. React Native is a framework built on JavaScript and React,

enabling one code base to build native applications easily. For our back-end, we chose to use

Google's Firebase, which allows easy user authentication, No-SQL database functionality, and

cloud storage, in one place.

Background

As we were gathering information about the Insight Program, we spoke to organizers of the program and the students who participate in it. Jessica Karner, the Assistant Director of Academic Advising and coordinator of the Insight Program, was able to provide us with information on how communication currently happens within the program. She explained that most of the communication is through Canvas (WPI's learning management platform) or email. Currently, she tries to limit the number of emails that she sends, but still suspects that her messages are not getting read thoroughly (Karner, 2018). Another issue that she mentioned is that students are more frequently using Google to find answers to their questions, despite the fact that students are also visiting Academic Advising more frequently. Our student interviews corroborated this: some participants mentioned asking peers for help, instead of using official support channels. We also found that the students were only aware of some of the available resources but were not always aware of what services those resources provided. This may explain why students are not fully utilizing the resources available to them.

Along with physical offices on campus, most of the resources that WPI provides have web pages on the WPI website. These web pages provide information on what the purpose of a resource is, where it is located, and how to utilize it. Alongside the information provided on the WPI website, many resources have their own online presence, or use other technologies. For example, the Academic Resource Center's tutoring program uses TutorTrac to set up appointments, while the Career Development Center runs its appointment request interface through Handshake. A student looking for personal information, from their mailbox number to what courses they are registered for, must go to BannerWeb. While there is a Scheduler on

BannerWeb, and the course catalog is provided on the WPI website, first-year students are encouraged to use an entirely separate tool called the WPI Planner to create their schedule (Wobbe, 2018). When we surveyed first-year students, a majority of them were only familiar with about half of the resources presented to them (Appendix A). This shows that there are many resources available that the average first-year student is not aware of, and thus will not use.

Currently, first-year students communicate with their advisers in person or via email. The Insight Adviser (IA), a faculty member, along with the student Resident Adviser (RA) and Community Adviser (CA), hold meetings with their Insight Group during New Student Orientation (NSO). These meetings provide plenty of in-person interaction to get first-year students ready for the first few weeks of classes. These meetings continue during the first semester and provide some time for the advisers to communicate information to first-year students and to answer their questions. However, these meetings are not mandatory, and so important information is communicated by email. This is still not a perfect system, as students don't always read or respond to email communication, nor does the technology support the ability to detect if a student has read an email. This may be due to the perception that emails are more formal, and require more work to respond to, than a text message (Natanson, 2018). Several medical studies have found that young adult patients are more likely to respond to text messages than to emails (Zilber, 2016). Therefore, a text-message-style notification may be a better means to communicate with students.

In this project, we aim to address the problems we uncovered in our research, specifically the scattered structure of the many campus resources and the imperfect communication system that currently exists.

User Methodology

Our team conducted interviews with WPI students as well as faculty and staff to understand the extent of campus resources and students' knowledge of them. We also conducted a survey with a larger sample of first-year students. We designed this survey to see if there were more social, academic, or other issues with adjusting to college life and what features in a mobile application could aid that transition.

Interviews

Resource Knowledge Interviews

Our team interviewed first and second-year students to determine what resources the students know about. Additionally, we used the interview results to compare first and second-year students' knowledge of campus resources.

First-Year Interviews

We interviewed two first-year students. Both reported that they participate in various clubs and are involved in Greek life. When asked about campus resources they were familiar with, both students immediately listed academic resources such as Math & Science Help (MASH) and the Gordon Library. Both expressed that they had no issues adjusting socially, but one student had trouble academically. That student used MASH and office hours to help manage the more difficult course material. The only other difficulty both students reported having was living in a new environment with roommates, but they knew that their resident advisers were a good resource to use in that situation.

We also asked the participants what they thought would be useful features for a mobile application to help acclimate to college life. One student said a list of building and food location hours, tutoring hours, and a list of club and event schedules would be helpful. The other student recommended that the application have information on how to use each of the campus resources.

Second-Year Interviews

The team interviewed two second-year students to get perspective from students who are still familiar with first-year adjustments but have more experience on campus. When asked what resources they could list, both included the Student Development and Counseling Center (SDCC). The first-year students did not list the SDCC at all. Each second-year student primarily listed resources related to activities they are involved with on campus.

We also asked these students what features they would have found useful in a mobile application during their first year on campus. The first student said it would be useful to have somewhere to easily find the hours of dining locations on campus, a financial aid section that describes all of the different financial aid resources, a better way to search for classes of interest, and the hours of the Sports and Recreation Center. The second student suggested an interactive map with student-driven descriptions, the hours of dining locations, and a place with all of the tracking sheets, and information on minors and concentrations.

Faculty & Staff Interviews

We interviewed faculty and staff involved in the Insight program to understand how first-year students adjust, what resources are brought to the students' attention, and what services are available to first-year students. First, we talked to the Associate Dean of Undergraduate Studies,

Dr. Kristin Wobbe, who works primarily with first-year students. We then interviewed Jessica Karner, who runs the Insight program, and Charlana Simmons from the Office of Multicultural Affairs. We also interviewed an experienced Insight adviser, Dr. Stephen Kmiotek.

The Associate Dean of Undergraduate Studies, Dr. Kristin Wobbe, is a Great Problems Seminar (GPS) professor and Insight Adviser. GPS courses introduce first-year students to WPI's project-based learning system. The team interviewed her because of her unique perspective and involvement in handling first-year students' problems. She said that common issues, such as choosing classes blindly, have decreased. She also told us about new resources, such as the First Year Experience brochure and web page. Additionally, she explained that students now have secondary advisers from the Office of Academic Advising. The team asked what resources she thought were underutilized by first-year students and what features would be helpful to have in a mobile application. Underutilized resources include the Humanities and Arts website to understand graduation requirements. As for recommended features, she suggested an acronym dictionary and a frequently asked questions page to answer questions such as, "Where do I go if I have questions about majors, courses, degree requirements, etc." (Wobbe, 2018). She made a point that a mobile application would have to be easy to use for faculty members as well.

The next person we interviewed was Charlana Simmons, who was the Director of Multicultural Affairs at the time. She coordinated Connections, a program for first-year domestic students of color. She described the program to the team, explaining the types of workshops that are available. They include etiquette workshops to prepare for interviews, and academic preview to prepare students for the first term of classes (Simmons, 2018). Connections students have an adviser from the Office of Multicultural Affairs (OMA). She told us that it is possible for any student to request an adviser from OMA to help with academic and personal growth and health.

OMA supports any student who sees it as a safe space. OMA supports any and all diversity and inclusion, including the LGBTQ+ community, anti-violence campaigns, and gender equality. Speaking with Ms. Simmons helped the team understand the first-year experience of a student in the Connections program and resources that may not necessarily be known to students, such as the advising that OMA offers.

A big portion of the first-year experience is coordinated by the Insight Program. The next person we interviewed was the Assistant Director of Academic Advising, Jessica Karner, who oversees the Insight Program. Ms. Karner described the Insight Program as a whole, explaining the communication structure between the Office of Academic Advising, Insight Advisers (IAs), Senior Community Advisers (SCAs), Community Advisers (CAs), Resident Advisers (RAs), and first-year students. She confirmed that a way to send announcements to students through a mobile application would be useful (Karner, 2018). She also referred us to experienced Insight Advisers who could provide a better understanding of the day-to-day functions of the Insight program.

The last faculty member we interviewed was Dr. Stephen Kmiotek, a Chemical Engineering professor at WPI and an experienced Insight Adviser. He was able to communicate what issues he has seen first-year students face, what resources are underutilized, how he communicates with his Insight group, and recommendations for a mobile application for first-year students. He said students struggle to find locations for office hours, find answers to major-specific questions, and to understand the different types of resources such as individual tutoring and MASH. He believes that most resources are underutilized. For example, he said that there is a stigma around the SDCC that causes it to be an underutilized resource (Kmiotek, 2018). To communicate with his Insight group, he emails students as a group or individually. If he does not

get a response, he has the CA or RA of the student contact them in person. Lastly, he recommended that the mobile application should display resources that will suit a diverse group of students as class sizes grow and diversify.

Surveys

The team administered a survey to first-year students through Google forms and promoted it through the Insight program. The survey was designed to gauge if first-year students had more trouble adjusting academically or socially, what resources could have helped them, and what campus resources they are familiar with. The survey results can be found in Appendix A. Twenty-one students participated in the survey. We discovered that students found it more difficult to adjust academically than socially. The most commonly known resources were MASH, major tracking sheets, and Academic Advising with 18-19 students familiar with each of them. The least known resources were ID Services, the Student Activities Office, and OMA with just 2-4 students familiar with each of them. About 10 students were aware of each of the remaining resources. There was no resource that all 21 participants knew about.

Technical Methodology

Our project, the WPI First-Year Hub, is a mobile application that provides a central hub for both finding available campus resources and facilitating communication between advisers and first-year students. Firstly, the app contains a map of the WPI campus with points of interest and their related resources marked on it. The points can be filtered using preset categories or searched to find the physical location of a specific resource. The directory of resources, organized by category, is also available. Useful information, such as the hours of operation, phone number, and a description of the services provided are available there, along with a link to its physical location on the map. For first-year students, the app provides information about the student's Insight Team, including announcements. This functionality is contained within an easy-to-use interface so that accessing the information is intuitive and will help students find the information and support they need.

Here is an overview of the process of creating the First-Year Hub, including research, development, and testing phases:
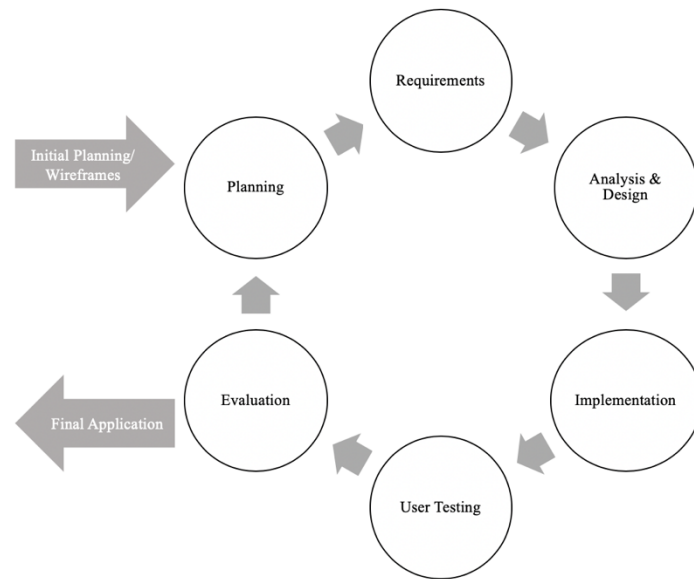
Figure 1: Iterative Application Development Flow Chart

Software Environment

Front-End Development

To develop the front-end for our application, we decided to use Facebook's React Native JavaScript framework. React Native is an app development language built on the existing React framework. React is a powerful, declarative, and component-based JavaScript framework. React Native uses the same fundamental design as React but translates web-based components to native components for building applications on iOS and Android. In essence, this allows developers to use JavaScript to create native mobile applications. This functionality allowed our team to develop and deploy our code much more quickly, since we did not need to develop different code for both iOS and Android simultaneously (Facebook, Inc., 2019).

In addition to React Native, our team used Expo, a feature-rich toolchain for building React Native applications. Expo simulates React Native code wirelessly and in real-time, greatly speeding up the development process. Changes can be made instantly on a real device, without the need for build tools or emulators (Expo, 2019).

React Basics

React's model, which React Native is built upon, is composed of three main parts: components, props (properties), and state.

Components are the building blocks of interfaces in React. By default, components are encapsulated and manage their own state. They are intended to be independent and reusable, which can simplify development and debugging.

Props, or properties, are fields that are used before React renders a component for the first time. React calls this process *mounting*. If components are like JavaScript functions, then props are like the parameters to those functions. For example, if there exists an <Image> component in an application, there needs to be a "source" prop which supplies the source of the image to display.

State, as its name suggests, refers to the dynamic state of an application. Any changing data that should be shown in a component are contained within that component's state. State is similar to props, but it is private and fully controlled by a component. A component's state can be updated after it is initially rendered. When its state is updated, React will re-render that component to reflect the new state.

The React Lifecycle

React automates some of the boilerplate code like mounting components and re-rendering them automatically when the state is updated. This may seem like a loss of control from a developer's standpoint, since React's control flow is predefined. However, lifecycle methods are built into React. While not fundamentally changing the control flow, these methods allow a developer to "piggyback" onto the existing flow and inject their own code accordingly. For example, one very commonly used lifecycle method is ComponentDidMount. This function can be used within any React component, and is executed once the component *mounts*, meaning it has been rendered once. In most cases, including ours, components should show data from an external database to the user. ComponentDidMount is the perfect place to query a database, since it happens once—when a component is rendered.

Logic Behind React

React is a declarative framework, which means a programmer can easily write instructions at a high level without necessarily knowing how React turns JavaScript code into a web page, or in our case, a mobile application. However, it can be useful to know how React implements its algorithms so that we can use its features to our advantage. In most computing contexts, the term "diffing" refers to the process of comparing files to determine how, and where, they differ. How React implements its "diffing algorithm" is important for understanding how to write React code, and in turn React Native code, efficiently. React calls this implementation reconciliation.

Every React component class has a render function, which describes its elements and produces a tree of these elements. When the state or properties of a component are updated, the

component must re-render. Obviously, re-rendering the entire tree of React elements upon the change of a single element would be inefficient. The problem lies in making the minimum amount of changes from one tree to the next, which maximizes efficiency. Generic solutions to this tree diffing algorithm exist but are computationally very complex. Modern algorithms are in the order of $O(n^3)$, which would be considered impractical for large trees. Instead, React relies on two key assumptions to diff in $O(n)$ time: 1) two elements of different types will produce different trees, and 2) stable child elements can be identified with a "key" property.

The first assumption is important, but has little effect on programming decisions in practice. Simply, when two elements are of a different type entirely, its entire tree will be rebuilt from scratch. For instance, if a component has a <Comment> tree that is replaced by a <Reply> tree, the entire tree from this point onward will be completely rebuilt.

The second assumption is much more relevant to making programming decisions. By default, when React iterates over a list of children, it does so in order and identifies a change when one doesn't match the other. This works well for ordered lists where an element is added to the end, but not in most other cases. For example, if an element is placed at the top of the list, each element is shifted down, so all comparisons will be considered "different", and the entire tree will be re-rendered. However, programmers can associate a unique "key" property with a list of children, which helps identify children so that it can realize which have really been changed. This way, order has little importance, and elements can be inserted and changed without having much effect on performance (Facebook, Inc., 2019).

Since a React application is re-rendered each time a component's state updates, the efficiency of this render function can have a large impact on performance. A poorly implemented reconciliation algorithm would result in the entire application tree being rebuilt each time

something changes. For large scale applications, this would mean a slow and unresponsive experience. An efficient tree-diffing algorithm means efficient renders, and furthermore, a responsive application interface.

Database Development

To create the back-end for our application, we used Google's Firebase. Firebase is a mobile and web development platform, providing integrated solutions for hosting, authentication, databases, analytics, and more. Our team used Firebase's database and user authentication solutions (Google, 2019).

One of the main features of our application involves retrieving large amounts of data to display to users using Firebase's database, Cloud Firestore. Firestore is a NoSQL, real-time database. A NoSQL database is unlike a traditional relational database, in that it is organized by collections and documents rather than tabular sets. A flexible schema, a characteristic of NoSQL databases, proved helpful as our needs varied across the various documents that we needed to store and retrieve.

Like most applications, we needed to identify and distinguish between users. We used Firebase Authentication to handle authenticating users in our application. This solution simplified development, as it provides security using an SDK rather than writing secure and elegant solutions on our own. This allows for an easy and secure authentication system while also improving the sign-up and sign-in experience for end users. Additionally, Firebase Authentication offers features such as secondary authentication via email and account recovery, which would have been impractical to implement on our own, given our resources and timeframe (Google, 2019).

Database Schema

Since large amounts of data are constantly stored and retrieved by our application, we needed to design our database to be orderly, easily understandable, and easily modifiable. Since our NoSQL database has no strict schema, organization is important. Our database has five high-level collections that stores all the data:

1. "Announcements" stores announcements, which typically have a title, body, identifier which indicates who the message is intended for, and a timestamp.

2. "Insight" stores all Insight group information, in our case, for the year 2018. Each Insight group has a CA (Community Adviser), RA (Resident Adviser), and IA (Insight Adviser), along with information to help identify which floor the Insight group belongs to.

3. "POI", or points of interest, stores markers for our campus map. Only physical locations belong to POI.

4. "Resources" stores information pertaining to on-campus resources, whether they exist physically or not. Such information includes hours of operation, a description of the resource, and a location. If the resource has a physical location, it stores a reference to an existing point of interest, so that the two are linked.

5. "Users" stores extra information that Firebase Authentication does not support. Since we need to store additional information about users such as residence hall, graduation year, and major, we needed to create a collection that relates to the same UID (user identifier) that is used in Firebase Authentication.

Organizational Tools

Project Management

To manage our project, we used Trello. Trello is a project management application that allows teams to collaboratively specify tasks and update their statuses during development. Our team used the agile software development methodology throughout the project. The agile methodology is a project management style, where work is divided into sprints (Project320, 2019). Sprints are relatively short time periods where predefined tasks are completed. The product should be evaluated in intervals and tasks should be adjusted accordingly. The team updated our backlog of tasks after every meeting with our advisers, where feedback was given. Additionally, after regular user testing, tasks were added for revisions.

File Management

For file management, we used Google Drive. Our team had experience using Google Drive in previous classes and projects so we knew it would be helpful when it came to organizing our files and collaborating. Keeping all of our files in shared, online folders allowed us to collaborate easily.

Our team's code was kept within GitHub, a popular web-based source control tool. This allowed us to write code simultaneously and gave us a tool to merge code together in the event of conflicts.

Team Communications

To communicate as a team, we used Slack. Slack is a tool used for team communication, collaboration, and file sharing. Slack allows messages to be organized by channel (topic), keeping all of our information and communications orderly (Slack, 2019). We were also able to integrate GitHub and Trello into our Slack workspace, so we were aware of when tasks and commits were completed.

Design

Initial Wireframes

To create our initial wireframes for the application, we began with drawings by hand. We eventually moved to Invision and Sketch when we began our development stage. We designed each screen to be as user-friendly and simple as possible. As more iterations were completed, we moved back to drawings by hand to rapidly prototype the application's behavior. These wireframes can be found in Appendix B and C.

Styling

To pick our colors and logos for the mobile application, we referred to the WPI logo policy (Worcester Polytechnic Institute, 2019). This policy gives insight on the specific colors to use when creating a WPI specific resource as well as how to properly utilize WPI's logo. We used the logo from the logo usage page and did not recreate it or alter it in any way.

Evaluation

Testing During Development

The team conducted task-centered user interface testing throughout the development process to improve our design. The target user for our application is a first-year student at WPI in their first weeks of adjusting to life on campus. We chose test users that were close to the target user, however we did not start testing until the second semester. Our test users were still first-year students, but they all had been through a full semester at WPI and therefore, are more familiar with WPI resources and the campus in general. We used the Thinking Aloud method to conduct the testing. This method involves asking a user to do a task and speak aloud about what they are thinking, doing, questioning, and reading as they complete it (Lewis & Rieman, 1994). Using this method made us aware of their thought processes and their actions as they interacted with our application.

The purpose of initial user testing was to see if the application's user interface and the organization of the resources were intuitive. The participants were asked basic information about themselves. We found that they all participated in different organizations on campus. Some participants used iPhones and others used Android. Additionally, there was a mix of genders. This variety allowed for a diverse sample of responses. They were then asked to do various tasks on a provided phone. The test script can be seen in Appendix D. At this point in development, we were testing the functionality and organization of our application rather than aesthetics.

Initial user testing began on January 29th, 2019. The two participants in the first session were first-year students at Worcester Polytechnic Institute. Both used iPhones. When asked to

find Daniels Hall on the campus map, both participants navigated to the map and were able to find the Daniels Hall pin easily. Both participants were also able to find the phone number of Health Services quickly. The last task was to find information on the Student Development and Counseling Center, which is on its resource page within the application. Both participants initially navigated to the Student Life category instead of Health & Safety where the resource page was located.

It was noted that these participants are familiar with campus after attending classes for nearly three terms. Therefore, finding places on the map was easy for them. However, it would not be as easy for students during their first few days on campus. For this reason, it was decided to add a 'show on map' button to resource pages and create filters and search functionality on the campus map. Other potential revisions that the team considered were adjusting resources to make them available under all categories that apply. A search bar could also be added to find an individual resource without going through categories.

The next rounds of task-centered user interface testing were on February 25th and 26th, 2019. There were four participants. These participants will be referred to as Student A, B, C, and D. All students were first-year students at WPI. Students A and B tested on the first day and C and D on the second. The team made revisions on the application from the last testing session and added other functionality as well. More tasks were asked during this testing session. These tasks included creating an account, checking Insight program information, using map filtering for the campus map, using map pins to find information about a location, and navigating the resource pages. This test script can be found in Appendix E.

When creating accounts, Students C and D both overlooked the question, "Are you a first-year student at WPI?" with a switch toggle and clicked to the next page. However, both

students navigated back and answered the question without being prompted. The next task was to check the Insight information. All four students found the information easily, but Students A and B both had a Resident Adviser that changed midway through the year, leaving the information in the application outdated. The next tasks were focused on the campus map. The first map task was, "From this screen, locate the residence halls". Students A and B both tried to point out locations on the map based on their knowledge instead of using filters or searching. We attributed this to two things: these test users already had knowledge of campus locations, and the task was ambiguous. For the second session, we changed this task to "Return to the map and display just the residence halls" to be more specific. Students A and B recommended changing the icon for the filter button because they did not recognize the icon. During the second session, the only prevalent issue was that purple pins were difficult to view on the map if pins were sparse.

The next tasks were navigating through the resource pages. None of the participants had issues with this. Additionally, all of the students were able to display a location on the campus map through the resource page. The last task was to log out of the application. Since the previous task brought the users to a nested resource page, it took many back clicks to return to the home page and sign out.

These sessions were incredibly helpful in making smaller revisions that had a large impact. Questions in the sign-up pages such as "Are you a first-year student?" were enlarged. The filter button was changed to a better-known icon. The pin colors were changed on the map to more distinguishable colors. Resource pages were styled, and the home button was added to all resource pages. Additionally, Student A recommended having a place on the application for a

user's major adviser information. This is a great idea for future implementation with access to BannerWeb.

Final Testing

Final testing was conducted after finishing all changes from the iterative testing. The script also followed task-centered user testing guidelines and the Thinking Aloud method. It can be seen in Appendix F. It is split into two main components: tasks to be done on our application and the same tasks to be done on a phone without our application. To avoid skewed results, half of the participants started with the application and the other half without. There were six total participants and they will be referred to as Student A, B, C, D, E, and F. None of these students participated in our testing sessions during development. The tasks for final testing were developed to simulate students' actual questions when searching for resources. The tasks include a short scenario with an open-ended question. For example, one task was, "Your friend comes to you and tells you that they have been feeling depressed lately, find the phone number of a place that could help them". Each task was timed. At the end of testing, some feedback questions were asked.

Results

The recorded times (in minutes: seconds) for each task are shown below:

Time per Task for Each Student without the First-Year Hub Application

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9
Student A	1:12	0:34	2:04	1:13	0:45	1:20	1:56	1:01	0:15
Student B	1:58	1:20	1:25	0:55	0:48	1:29	1:14	1:32	0:40
Student C	3:32	2:48	0:46	1:19	1:10	0:51	1:20	1:03	0:53
Student D	0:53	1:57	0:13	0:46	0:55	0:37	0:13	0:10	0:12
Student E	0:37	0:33	0:35	0:59	0:05	0:45	0:38	0:43	0:18
Student F	1:04	0:08	0:08	0:11	0:12	0:12	0:09	0:29	0:06
Average	1:32	1:13	0:51	0:53	0:39	0:52	0:55	0:49	0:24

Time per Task for Each Student with the First-Year Hub Application

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9
Student A	1:01	0:27	0:29	0:14	0:16	0:28	1:29	0:08	0:48
Student B	0:53	0:30	0:42	0:34	0:21	0:12	0:17	0:05	0:20
Student C	0:40	1:01	0:55	0:58	1:07	1:20	0:49	0:18	0:56
Student D	0:34	0:14	0:16	0:26	0:02	0:03	0:40	0:22	0:10
Student E	0:14	0:17	0:12	0:13	0:16	0:26	0:24	0:12	0:15
Student F	0:41	0:12	0:09	0:10	0:14	0:30	0:16	0:03	0:03
Average	0:40	0:26	0:27	0:25	0:22	0:29	0:39	0:11	0:25

Comparison of Averages with and without the First-Year Hub Application

Average for tasks without FYH app	1:32	1:13	0:51	0:53	0:39	0:52	0:55	0:49	0:24
Average for tasks with FYH app	0:40	0:26	0:27	0:25	0:22	0:29	0:39	0:11	0:25
Mean ratio	0.43	0.36	0.53	0.47	0.56	0.56	0.71	0.22	1.04
Percent increase	0.57	0.64	0.47	0.53	0.44	0.44	0.29	0.78	-0.04

Average of mean ratios: 0.74, Average percent increase: 0.26
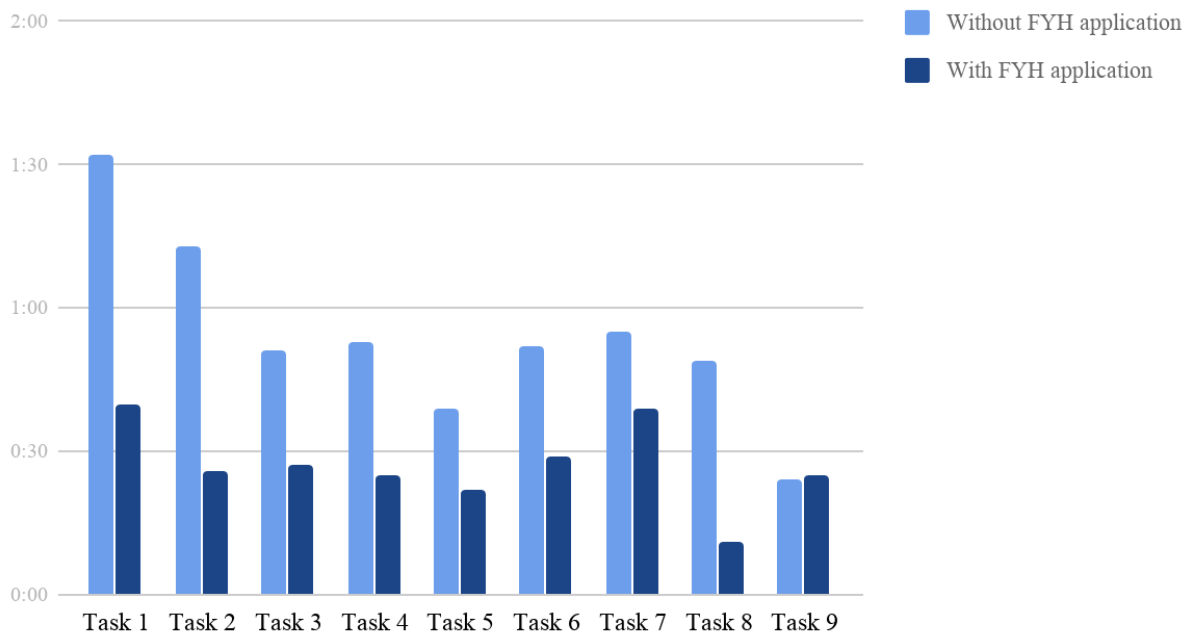
Average Time for Each Task

Figure 2: Average Time of Task with and without First-Year Hub Application

As shown in the tables and graph above, all but one task was faster on average with the First-Year Hub mobile application. The average time to complete a task on the First-Year Hub mobile application was 26% faster than without the application. During testing sessions, it was clear that students had different ways of finding information. For example, Student B used the mobile applications of WPI, Google Maps, and Dine on Campus, but Student D used Google on a browser for nearly all of the tasks. Many students gave similar feedback. For example, Students A and B both mentioned that the resources are very nested. This made navigating the resources in the application harder to do. The students also had helpful suggestions to improve the application in the future, such as an overall search bar for resources and being able to download pages to view without a network connection. However, the students also thought it was helpful to

have all of the resources consolidated into one application. Additionally, all six participants in

final testing agreed that this application would be helpful during New Student Orientation.

Conclusion

After developing and testing, it was found that The First-Year Hub application can help students save time and easily find WPI's resources. This application gives students an accessible and understandable platform to find information. This platform would aid the transition into college life at WPI. After final testing, it is clear that there could be improvements made to the application. It would be helpful to have additional experimental research about categorizing WPI's resources and understanding user navigation. More potential additions are discussed in the Future Work section. Despite the potential for improvement, the core functionality of the application has been shown to be a support to new students. Overall, this application has the potential to improve the college experience for students at WPI.

Future Work

Throughout development and testing, there were a few features that were brought up but were not implemented. From our interviews with Insight Advisers, we discovered that it would be easier for them to continue to use email instead of needing to interact with the app directly. Therefore, it would be useful for them to be able to send announcements to the app via email. This feature would bridge the technology generation gap between staff members and students. Another feature we would like to see further developed is a way for first-year students to connect through our application. Ideally, students could list their hobbies and interests when they sign up and the application would recommend extracurricular activities or connect them to students with similar interests. We would also like our map to be enhanced to help students navigate campus more efficiently. A personalized class schedule could be imported into the application so students can receive walking directions to each class. Another idea is to integrate the calendar of campus events on Campus Labs into our application. Finally, interior maps of buildings would help students navigate to specific classrooms and offices. These suggestions could be implemented in the future to advance the application and further aid the college transition process for WPI first-year students.

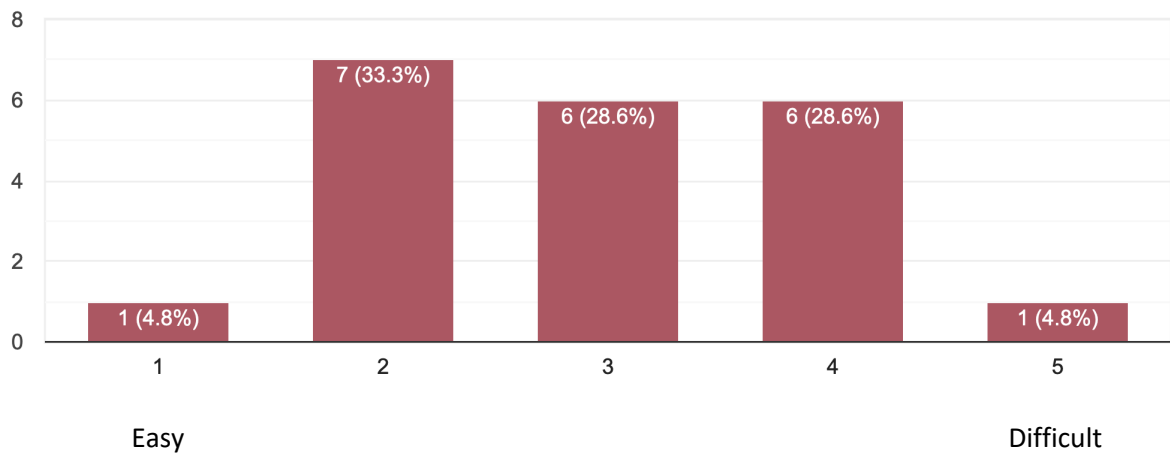# Appendix

Appendix A: First-Year Insight App MQP Survey Results

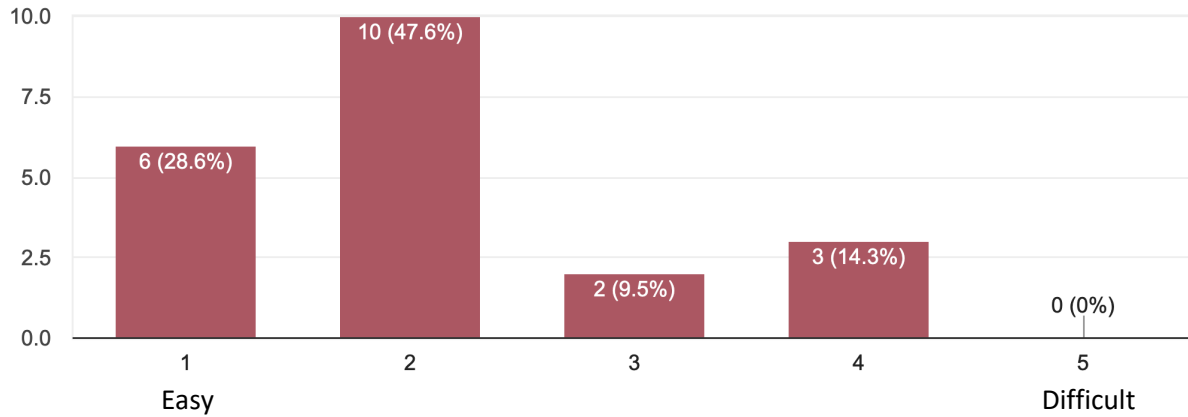### How many clubs do you participate in?
21 responses
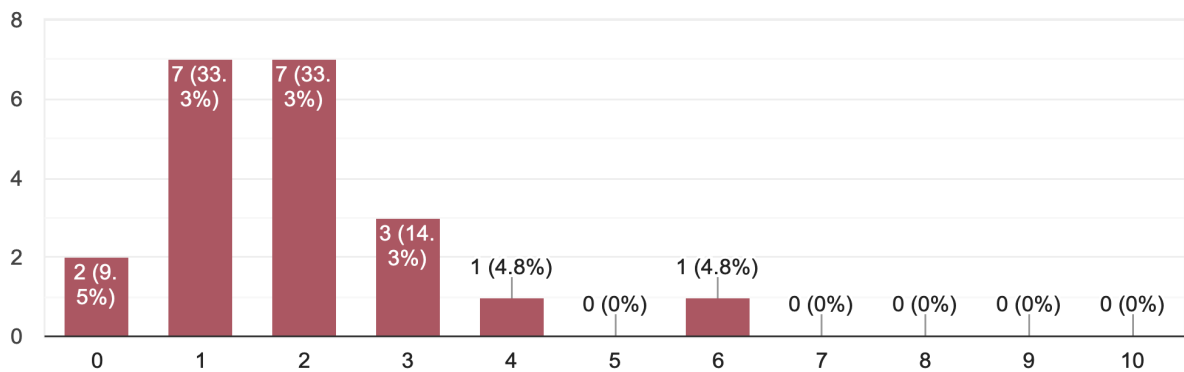
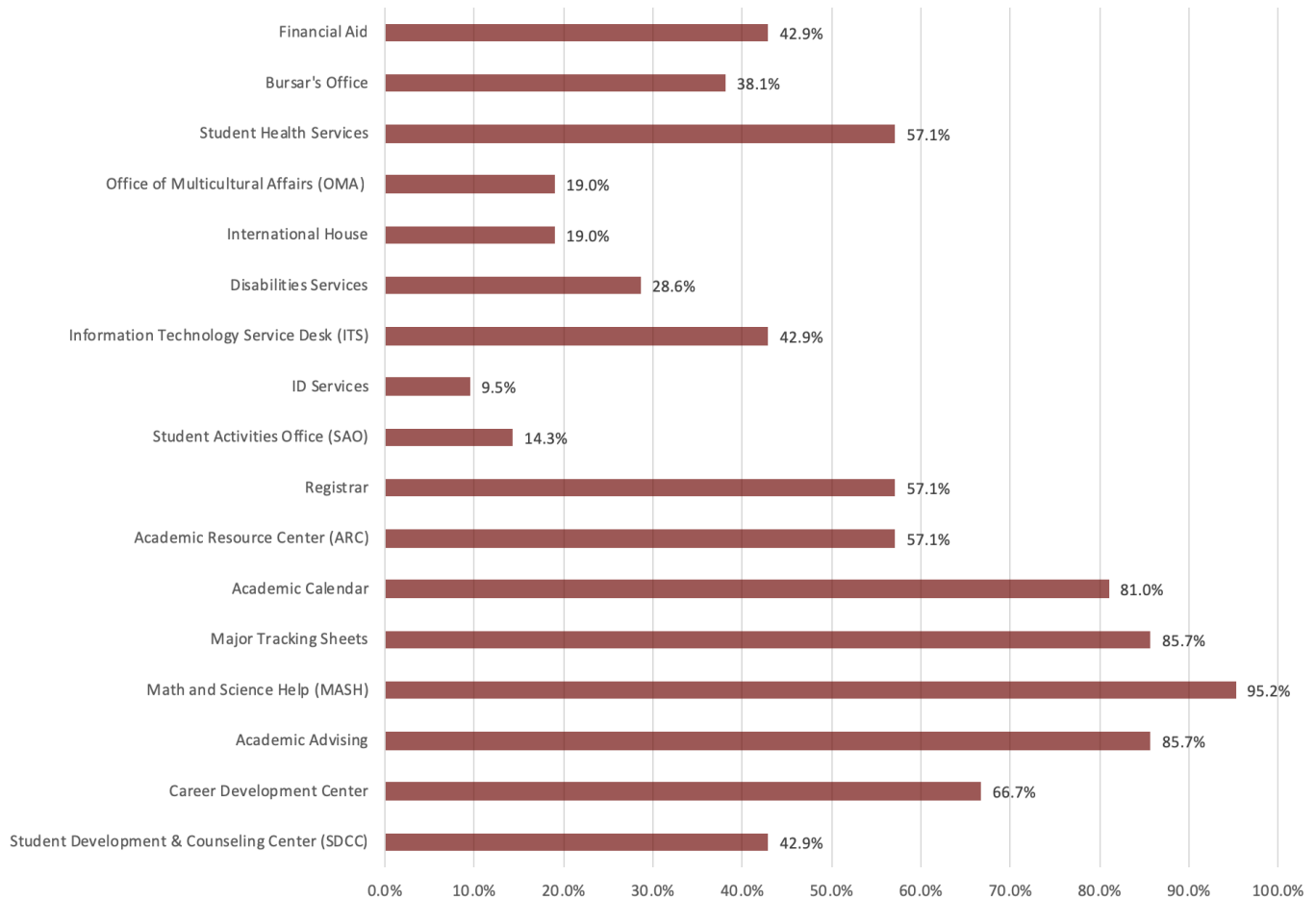### On a scale of 1-5, how difficult has it been adjusting to WPI academically?
21 responses

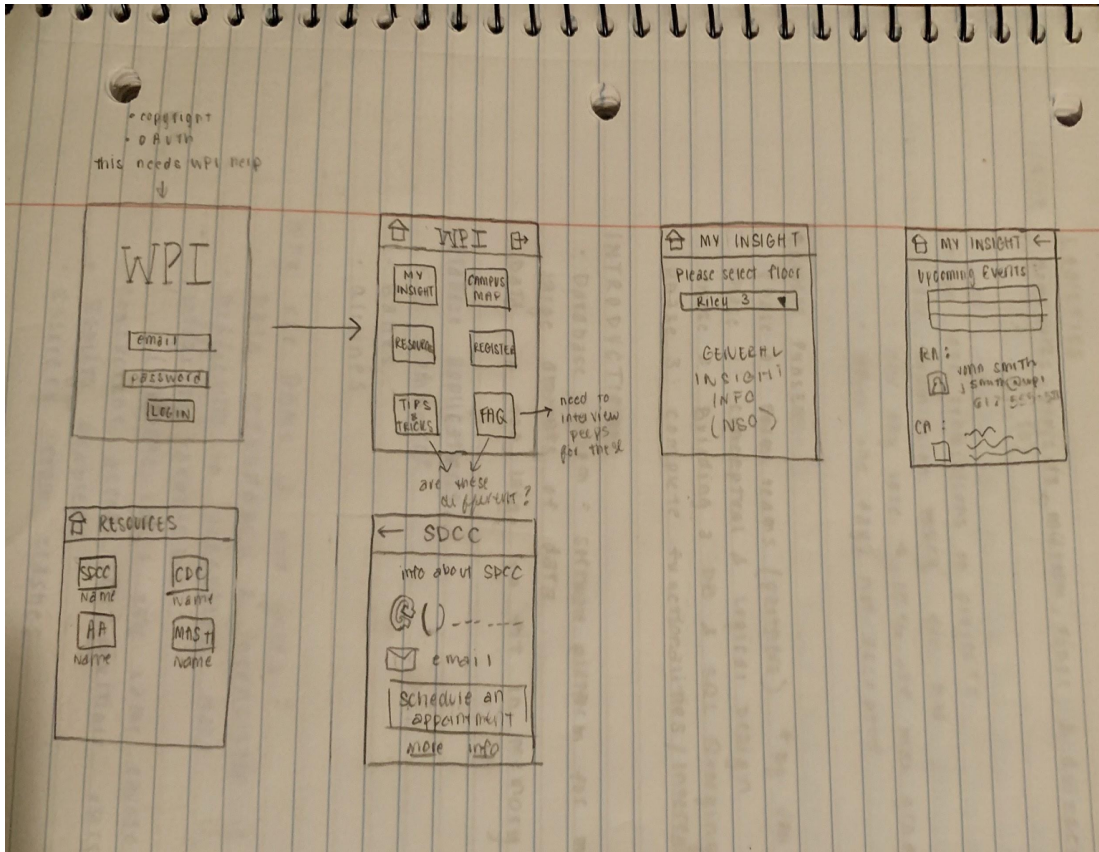# On a scale of 1-5, how difficult has it been adjusting to WPI socially?

21 responses

Easy (1)	6 (28.6%)
(2)	10 (47.6%)
(3)	2 (9.5%)
(4)	3 (14.3%)
Difficult (5)	0 (0%)

Check off the resources that you are familiar with:

Resource	Percent
Financial Aid	42.9%
Bursar's Office	38.1%
Student Health Services	57.1%
Office of Multicultural Affairs (OMA)	19.0%
International House	19.0%
Disabilities Services	28.6%
Information Technology Service Desk (ITS)	42.9%
ID Services	9.5%
Student Activities Office (SAO)	14.3%
Registrar	57.1%
Academic Resource Center (ARC)	57.1%
Academic Calendar	81.0%
Major Tracking Sheets	85.7%
Math and Science Help (MASH)	95.2%
Academic Advising	85.7%
Career Development Center	66.7%
Student Development & Counseling Center (SDCC)	42.9%

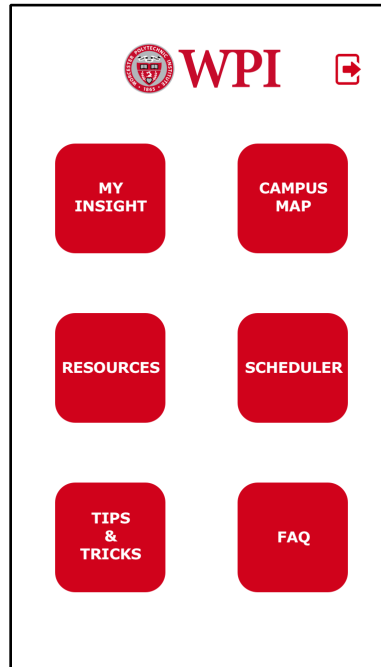# Appendix B: Initial Wireframes

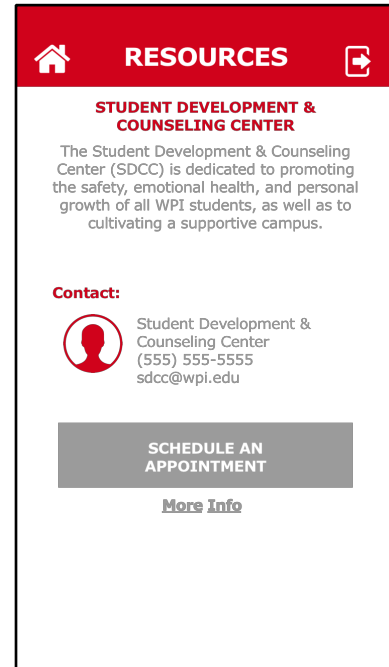*First Wireframe Drawing*

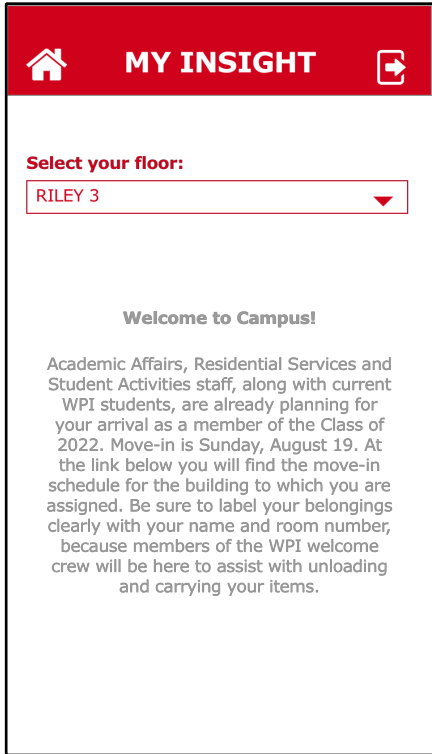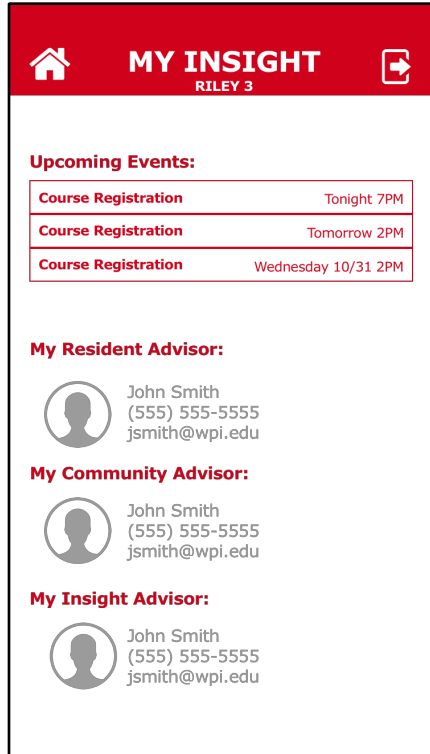# Appendix C: Invision Mockups

Log in screen

Menu Screen

Resource Screen

Insight Screen 1

Insight Screen 2

Campus Map Screen

Appendix D: First Iteration User Testing Script

You are being asked to participate in a research study, but you must be informed of the purpose and usage of this study before giving your consent and participating in this survey. The purpose of this study is to understand the usability of a mobile application made for first-year students at Worcester Polytechnic Institute.

We will ask you if you would like us to record your name, but this will remain confidential. We will then ask you to do tasks on a mobile application and we will record your actions.

Your participation will be confidential. However, the project team members, project advisers, and WPI IRB will have access to this information.

Refusal to participate and/or withdrawal at any point will be without penalty.

Think out loud. We want to know how you navigate through this application so please say the actions you are doing out loud. For example, "I am clicking the Student Life button".

Participant:

Interviewer:

1. Do you normally use an iPhone or Android?

2. Can you find Daniels Hall on the campus map in this application?

3. Can you find the phone number for the Health Center/Services?

4. Can you find how to use SDCC?

5. Is there anything missing in the application?

6. Do you have any suggestions?

Appendix E: Second Iteration User Testing Script

You are being asked to participate in a research study, but you must be informed of the purpose and usage of this study before giving your consent and participating in this survey. The purpose of this study is to understand the usability of a mobile application made for first-year students at Worcester Polytechnic Institute.

We will ask you if you would like us to record your name, but this will remain confidential. We will then ask you to do tasks on a mobile application and we will record your actions.

Your participation will be confidential. However, the project team members, project advisers, and WPI IRB will have access to this information.

Refusal to participate and/or withdrawal at any point will be without penalty.

Think out loud. We want to know how you navigate through this application so please say the actions you are doing out loud. For example, "I am clicking the Student Life button".

Preliminary

1. Do you typically use an iPhone or Android or something else for your cellular device?

Sign in

2.Sign up as a new user. Use your WPI email and use an arbitrary password such as "111111".

Insight

3. Check your insight information. Is it correct?

Campus Map

4. The next tasks have to do with the campus map. Return to the main screen. Find the campus map.

5. Find the Student Development and Counseling Center.
From the map, find the SDCC's resource page.
Find the address of the SDCC.

6. Return to the map and display just the residence halls.

Resources

7. The next portion of this testing is about identifying resources through the application. Return to the main screen. Find the resource page for the Academic Resource Center.

8. Find the phone number for the Mailroom.

9. Find the resource page for Panera Bread.

10. From the resource page, show Panera's location on the map.

Log out

11. Log out of the application.

Post Activity

12. Did you find the resources easy or hard to find? Use a scale between 1 - 10.

13. Do you have suggestions to make the application easier to use?

Appendix F: Final User Testing Script

You are being asked to participate in a research study, but you must be informed of the purpose and usage of this study before giving your consent and participating in this study. The purpose of this study is to understand the usability of a mobile application made for first-year students at WPI.

We will ask you if you would like us to record your name, but this will remain confidential. We will ask you to do tasks on a laptop and we will record your actions. We will then ask you to do tasks on a mobile application and we will record your actions.

Please think out loud. We want to know how you navigate through this application so please say the actions you are doing out loud. For example, "I am clicking the Student Life button". Say what you are doing and what you are thinking. We may remind you to continue speaking. If you have questions pertaining to tasks, we cannot answer questions, but they may be addressed if you cannot move forward at all.

Your participation will be confidential. However, the project team members, project advisers, and WPI IRB will have access to this information.

You can stop at any time if you are uncomfortable.

We will be timing you so please state clearly when you start the task and when you finish in addition to your actions.
Tasks will be limited to 5 minutes per task, it is okay if a task cannot be completed.

Part 1: Tasks on phone (without the First-Year Hub Application)

For part 1, do the following tasks in the most natural way as if we weren't here.
Please remember to speak outloud.
On a phone please do the following tasks:

1. Display a map with just WPI's residence halls marked.

2. You have 3 Amazon packages that were delivered to your WPI mailbox but you have class until 3, find the mailroom hours to determine if you can get your packages on time.

3. Your friend comes to you and tells you that they have been feeling depressed lately, find the phone number of a place that could help them.

4. You are struggling in Physics 1 (PH1110) and could use some help, find the schedule to get a tutor before it's too late!

5. You've been studying all night and just got the hungry horrors, it's 10pm, where can you get food?

6. You want food, but don't want to walk far, which food source is closest to your residence hall?

7. A company just scheduled a phone interview with you, but you've never had one before. Find the resource to contact to seek advice.

8. You are struggling to choose your major. Find the name of your Insight Adviser.

9. You're craving a Spicy Chicken Deluxe from Chick Fil A but have no idea where it is, find the address.

Part 2: On the application

On the First-Year Hub application, please do the following tasks:

1. Display a map with just WPI's residence halls marked.

2. You have 3 Amazon packages that were delivered to your WPI mailbox but you have class until 3, find the mailroom hours to determine if you can get your packages on time.

3. Your friend comes to you and tells you that they have been feeling depressed lately, find the phone number of a place that could help them.

4. You are struggling in Physics 1 (PH1110) and could use some help, find the schedule to get a tutor before it's too late!

5. You've been studying all night and just got the hungry horrors, it's 10pm, where can you get food?

6. You want food, but don't want to walk far, which food source is closest to your residence hall?

7. A company just scheduled a phone interview with you, but you've never had one before. Find the resource to contact to seek advice.

8. You are struggling to choose your major. Find the name of your Insight Adviser.

9. You're craving a Spicy Chicken Deluxe from Chick Fil A but have no idea where it is, find the address.

Part 3: Feedback

1. Was there anything you found particularly difficult in completing these tasks on the app?

2. Was there anything you found particularly easy in completing these tasks on the app?

3. Was there anything you found particularly difficult in completing these tasks on your phone?

4. Was there anything you found particularly easy in completing these tasks on your phone?

5. Would this app have been helpful in A-Term or during NSO here at WPI?

6. In the future, would you prefer using the app or just your phone?

7. Do you have any other comments?

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