

Developing a Web-Based Academic Help Resource for Students

An Interactive Qualifying Project
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This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academics/Projects>.

ABSTRACT

The goal of this project was to design and create an easy to use website for WPI students that gave them access to a wide variety of academic resources. Over the course of the project our team designed, built, and tested the website. We received feedback from our sponsors, our peers, and a test group of students to help refine our product. As this is the first group in a multi-year IQP we have also provided suggestions for future groups.

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EXECUTIVE SUMMARY

The goal of our interactive qualifying project was to create something that would help WPI students to function to the best of their abilities academically. We hoped to accomplish this by using universal design for learning concepts. We believe that by developing this website, we are delivering a technology-based IQP that will have a great social impact for the WPI community. We also hope that in the future, the site designed by our group will evolve into a tool that is useful for the greater academic community at-large. Universal design for learning is an educational framework research based upon learning sciences that can help incorporate individual learning differences. To do this we focused on an aspect of education that we felt was underutilized; online resources. Many different groups have made different programs designed to help their users in some aspect that incorporates universal design for learning principles. Our goal is to collect and categorizes these programs so that WPI students can get the tools and resources they need to be able to learn and work in ways that accommodate their own learning style. We not only wanted those students to get those tools and resources but also for the students to get them in a way that embody the concepts of universal design. To accomplish all the goals we set out for ourselves decided to make a website to hold all the different learning resources WPI has access to and allow student to have easy access to them as well.

Our first step was to learn more about universal design for learning and what we would need to do to incorporate them into our website design. We gathered up all to the tools and resources that we had, created any of the aspects that we didn't already have. We also made sure that anything that anything that went onto the website embody some aspect of universal design for learn. We tested what we developed by bringing it to the project sponsors, our advisors and WPI students. Took the information we got from that would then apply it to aspects of our website design.

Final Recommendations

While building the website we came up with several ideas that we were unable to implement into our design for the website. For future group working to continue and perfect the website and its content there is certain aspects we think would be greatly beneficial to the website. A rating system so that students could give feedback to other students about what works and what doesn't. A specialized learning style test to help students discover what is their own learning style. And more programs and services on off to help a wider range of different students learning styles.

CHAPTER 1: INTRODUCTION

In relation to most other first-world countries, education in America is sub-par. In 2013 the Organization for Economic Co-operation and Development (OECD) put out an official global ranking of education. It was based on the 2012 Program for International Student Assessment (PISA) and ranked every developed country based on student's scores on the test's reading, math, and science sections. The United States scored 21st in reading, 31st in math, and 24th in science. All three of these scores were worse than how the U.S. ranked in 2009. Furthermore, the United States' mean score ranked well below the OECD average in both math and reading. The U.S. mean score in science only beat the OECD average by two points (Weisenthal, 2013). There is no one single reason for the fall in rankings, or for the pre-existing low scores. The education system in the U.S. is flawed and could benefit from reform, but for no one group of students more than for those with disabilities. U.S. Department of education data from 2011-2012 shows that students with disabilities have a higher dropout rate than other students. (Horn, 1999). It ranges, from state-to-state: with a low of 3 percent in Montana, and a high of 43 percent in Mississippi. Although this does show a significant range of disparities, the average is still high at 19.65%. This data does not include the States of Idaho, Kentucky, and Oklahoma, so it is not conclusive how they would skew these numbers. Any disparity at all is too much, and with a national average dropout rate of 19.65% America is not doing enough for students with disabilities. What causes this? In some cases students with disabilities find the transition to the radically different environment of college to be too much to handle and feel the need to drop out for emotional or social reasons. However, this does not account for all of the disparity. The

real problem is that not all American colleges and universities have adequate services for their students with disabilities.

In an effort to combat this, the concept of universal design for learning was developed. In essence, universal design for learning attempts to make teaching tools that can help students with a wide variety of learning styles.

For our project, we are attempting to collect all of the various learning resources available to WPI students in one centralized and easy to use website. The site will organize all of the various resources based upon what specific learning weakness they help to alleviate. Long-term, we hope to have a rating system incorporated into the site. As students try different programs, the site will prompt them to express their opinions on how easy to use the program is, how helpful it is for the problem in question, and if they would recommend it to a friend. Our goal is to make the website as helpful as possible. To this end, we are also making our website usable on mobile platforms. Not all students have access to a full computer all or part of the time. While we cannot make up for students who have no access to a computer, we can make things easier for those who use mobile devices. We believe that by developing this website, we are delivering a technology-based IQP that will have a great social impact for the WPI community and later the greater community.

The remaining sections of this paper will discuss the following: the background research of our project, including information of universal design for learning, website design, and using universal design for learning to optimize a website design. Next, in the methodology section we will discuss our plans for completing our IQP. This will touch on our design process for the website, our testing and feedback process for the designs, and our decision process for the

scope of our website's content. In the results section, we will discuss how our plans turned out, how we settled on a final design, and how the input from our peers and mentors ultimately shaped the final version. The rest of our paper discusses our challenges in completing the project, and our recommendations for future IQP groups.

CHAPTER 2: Background

In this section, we discuss the research we did leading up to the actual execution of our project. This includes a discussion on Universal Design for Learning, its application for education today, and how different learning styles need to be addressed to more effectively educate students. We then move into a discussion on website design, design preferences for the eighteen to twenty-two age group, and how website designs can affect usability. We finish the section with a discussion on applying universal design to websites. This includes optimizing for both mobile and desktop use, ensuring that the website can be used with screen readers, and keeping the layout simple so as to not deter users. Our goal is to create a website that brings some of these many different universal design for learning projects to students and allow students to have easy access to them. In order to do this effectively the website itself will need to be designed so that it too will also embody the concept of universal design for learning.

Universal Design & Learning

The Center for Universal Design defines universal design as, "the design of products and environments to be usable by all people, to the greatest extent possible."(CUD, 2008) Universal design for learning (UDL) takes this concept and applies it to education allowing people who

learn in different ways to have same level of accessibility to learning. The problem then becomes how to implement the concepts in a useful way. As we look at the tools available to us to help implement this we see that technology holds the key. Like its use to help students who struggle with reading, “gain access to research-based, balanced literacy approaches is through the integration of UDL and technology to create more supportive and accessible learning environments.” (NCUDL, 2009) Many groups are now taking the principles of universal design for learning and are using it to create programs and systems meant to help people learn in a way that fits with their strengths.

The National Center on Universal Design for Learning states that when trying to break down how someone learns they will need to account for the person’s ability to “bring [a] huge variety of skills, needs, [and] interests to learning.” (Rose, 2011) These factors are incredibly different from one person to another and to be effective the website will need to cater to what students bring to learning. A single style of imparting the information to all users would be impossible or as the National Center on Universal Design for Learning put it’ “there is not one means of action and expression that will be optimal for learners; providing options for action and expression is essential.” (Rose, 2011) Someone who is good at learning the information presented but suffers from poor time management skill will still have problems with the navigation of the website. Likewise, someone who learns best from doing or experimenting with subject matter will be at a disadvantage in a situation where the information they are supposed to be learning is concept base. Multiple ways of communicating the same concept to individuals will allow students the ability to focus on the way that will be most advantageous for them. “Research on UDL has focused on integrating technology and media with sound

instructional strategies and curricula to create customized scaffolded learning experiences.”

(NCUDL, 2009) By using technology to implement methods of different learning styles creates a network of possible learning experiences. Universal design allows information to be presented in such a way, or in a number of ways, such that anyone may be able to learn the information in a way that works with their learning strengths. Technological advances are then used to strengthen aspects of each of the learning styles allowing users some level of customizability. It is the hope that students who try multiple learning techniques will be able to, “express themselves, demonstrate what they know, and engage with material. This can help tap into students' interests, offer appropriate challenges, and increase motivation.” (Colburn, 2010) By taking the information and changing the way it is presented the information becomes accessible to different groups of students. That is the goal of the website: to present information and universal design for learning services in such a way that it easy for students to access, use and become comfortable with at their own pace.

Website Design

With the constant use of websites in modern day life, students have much to say about their preferences in website designs. For our project, we felt it vital that the final design was one that would appeal to them, the ultimate users. We informally interviewed friends and peers to get a sense of their opinions on the layout and design of popular websites. Some people accessing websites use mobile devices, but many use only desktop computers for using the Internet. Not all mobile device users use apps for websites. People download apps for websites that are simple to use. For example, although Facebook is used very regularly by a

large percentage of people, most people access it primarily from a desktop computer since they find the user interface to be complicated and more difficult to navigate on a small touch screen. Since apps also take additional memory space on a mobile device, people who use Internet on their mobile devices regularly often conserve memory space by using the website in an Internet browser. Users of mobile devices also complain that websites load much slower on their devices than on a computer.

For websites that are used for quick reference, people who use both a mobile device and a computer say they prefer using the full version, as opposed to the mobile version of the website on both so that it is less confusing. When they have both devices with them, most people prefer to get quick information on their phone (such as consulting IMDB for a fact) but watch videos and interact more extensively on the larger space available on a computer. People also appreciate the option to choose on a mobile device whether to access the site as the mobile format or the full format. When the site includes images the user may want to save an image. Some people who use iPhones prefer to use a mobile device so they can save image easily to the built-in Camera Roll app.

Google is a website widely liked for its simple “search box” usability and way it uses data taken from previous users to predict useful information. Multiple people surveyed say that on full websites they prefer navigation that, if not simply using a “search box,” is icon driven. They prefer the simplicity and speed of images as opposed to text. An example cited as a favorite in terms of navigation ease is www.smashbrothers.com, which is described to look like a mobile site because of its icons. Among mobile sites, a group of least favorites is the “wiki” encyclopedia types because zooming in to see text changes the shape of the text and the way

search bars pop up makes it likely for the user to accidentally click links when trying to use the search bar. Among full websites, many dislike Facebook, despite its wide and frequent usage. It is described as being very cluttered, although not all those surveyed find this a large problem. Still, some dislike the way chat boxes pop up in front of text when using Facebook and other distracting and confusing functions that seem to be too much for the user to address at once. Users of the photo weblogging website tumblr.com say their main complaint about it is how it is not possible to expand an image they want to see more clearly without being scrolled back to the top of the list of images after. Facebook users report the same problem. Long lists of images can make efficient navigation difficult.

For the visual impact of a website, people have varying preferences. Some like simple color schemes that are easy to read and not distracting. Others like more interesting and involved colors and images that they say give the website more personality and are less boring. Many people say that a simple background to important text ensures that the website is functional with interesting and attractive images to fill space that doesn't have text is a good balance.

Overall, the majority of people seem to gravitate to websites that get them information quickly with little navigation and distraction. Though not everyone uses mobile devices, those who do like to be able to choose the mode in which they view the website.

Universal Design in Websites

In order for the website to be effective when designing it we will need to focus on the intended user. The main users of the website will be students, with or without disabilities, who

feel that they could do better if they could approach or deal with the information and work they receive in more successful ways. Many other colleges have schools with universal design for learning based structures since, “learners differ in the ways that they can navigate a learning environment and express what they know.”_ While some schools have websites, or portions of websites, dedicated to helping students who may be challenged in some aspect, none of the other colleges have tried to meet the level of options we are trying to impart as far as we have seen. By looking at the trends of what websites that are similar to our own and seeing what they have and lack we can compare different universal design for learning techniques.

Techniques for organization, accessibility of material, explanations and making these universally comprehensible already exist and are being refined; the trick is only in learning what each one has to teach us. By using other colleges’ websites and information that is already established as stepping stones to help strengthen the website we wish to implement. The programs offered on the website will be able to cater to the needs of students since there are so many different programs designed to help their users in a variety of different ways. However there is only planned to be one website to contain them all, so the trick now becomes designing the website environment in a way that is easily accessible for all users. In order for students to be able to use the website effectively they will need to be able to navigate_ through the information in a way that stimulates their learning style.

When building a website it is important to understand how information will be communicated with the user. Usually this is done through text; information is recorded and can be read by the user at their convenience. The problem with this method is that not everyone is at the same level when it comes to gaining information from a text-based source. When this

idea was put to the test it was found that, “different instructional formats resulted in differential learning rates depending on the learners' experience” (Kalyuga, 2000). Everyone learns information differently and for some text based information is harder to understand than a picture or listening to an explanation. People with certain disabilities like dyslexia or who have poor eyesight find written information hard to decipher and digest and are thus less likely going to want to slog through text in order to gain the information. Those who don't work well with a style of learning can find that it becomes very mentally taxing to work with it and will not retain the information well. The key to retaining information is, “information presentation techniques should be designed to reduce the burden on working memory” (Tindall-Ford, 1997). The less work it takes to remember information the more information is retained in one's memory. Others who may not find a learning style as much of a hindrance may still be intimidated when they see only an undesired style of learning presented are less likely to try and go through it. It is for reasons like these that many universal design of learning websites have a second backup method for imparting information. These methods usually work along with the text in order to impart the same information to those who do not understand the text data. By having multiple forms of the same information can be highly beneficial, “physically integrating instructional formats enhances learning as they reduce the burden on limited working memory” (Tindall-Ford, 1997). For example along with the text information there will be a link or download for an audio version of the information so students can listen instead of reading and get the same information. It is important to note that, “non-concurrent duplication of information using different modes presentation might not increase the risk of overloading working memory capacities and should not have negative learning consequences” (Kalyuga,

2000). Methods based around different styles of learning, like audio and visual should not be combined as it can cause split focus. Another method is to break the text into small sections then use pictures to help show what the text is explaining. The point of the website is universal learning and while it may not be possible to meet everyone specific learning strengths the more options we have the more people will find something to their strength.

Another important aspect of website design is organization of all the aspects of your website into easy to follow forms. The incorporation of universal design aspects is key to making a viable website for this project. In addition, universal design is based around structuring objects, websites, or devices for easy access. “UD principles prompted architectural and environmental designs to enhance accessibility and usability for as many people as possible” (Roberts, 2011). If the website is going to be effective at supplying students with different technologies then it needs to be well organized so that students can navigate it easily. Although every college website is different, they all follow the rule that whatever is being presented on their site must be set up in such a way so that users may find what they are looking for. Having multiple sources would become more harmful than helpful if students could not easily tell what it applies to, “multiple sources of information that must be mentally integrated before meaning can be derived from the material” (Tindall-Ford, 1997). If everything we want to present on the site was placed on a single page it would be hard and daunting to try and understand what is being presented. From experimentation on humans learning process it was found that, “Human cognitive capacity is limited: we can process only a very limited amount of information at any one time” (Kalyuga, 2000). That means that all the information

will need to be set up so that things that can be easily categorized with each other are grouped together and easy to find.

Another section to consider is for when a student will want assistance. A student who uses the site may need to contact a faculty member with questions or a problem so it is important to have contact information present and immediately visible so that they can find it. For most sites this is done by either organizing the site so that the contact information is in the same location on each page or by presenting it at the beginning when one first enters the site so that it can be easily found again. Since this is a WPI sponsored site it should look like other WPI sites which follow a trend of putting contact and help information off to one side on every page so that it is always readily available. Another factor concerning organization will apply to the list of programs on offer. While students will use the tools offered as they see fit ones that are very similar or are used for similar tasks can be grouped together as well. By grouping the programs by their use students can limit their choices to what they feel they need them for then run through their options until they find the one that fits best. This organizational method also allows information to be sectioned off until it is needed. Hiding options students don't need, allows them the ability to focus on the learning style that works best for them and to avoid problems where, "different sources of concurrently presented information are intelligible in isolation and where each source provides similar information but in a different form" (Kalyuga, 2000). One idea could be to start each tool category with a short description, presented in such a way that the section is easily identified. Once in a section each of the programs can be presented with short descriptions of their goals and how they work, allowing users to quickly go through the list of options. Once an option has been chosen, students can get a more in-depth

description of the program as well as guides for use and installation and possibly some form of rating system based upon student's feedback. This method will allow for all the information to only be presented when called upon, keeping the site neat and easy to navigate. If more programs or tools are added to the site later they will not run the risk of making the site clustered.

Our stated goal is to create a website that brings some of these many different universal design for learning elements to students and allow the students to have easy access to them. In the following section, we will discuss our designs and plans for implementation.

CHAPTER 3: METHODS

The main purpose of the project was to find out the best design for a universal learning based website. Before we could do that we needed to understand the characteristics of universal learning and how we could implement them into our website design. We started the first stage of the project by gathering all the information and all the resources at our disposal to help decide on a design. We began researching and learning about universal learning and universal design for learning to find out what would work and what would fail, as well as why. We also sorted through all the various resources and tools we would implement on the website. We needed a sorted list of what was available to be put on the site immediately after it was functional. To this end we started to categorize the programs that showed potential into different categories based upon what they were supposed to accomplish.

At the same time we began to look at other college's universal learning and disability websites to see what design elements they offered. After we sorted through all this information we conducted informal surveys to other students asking them questions about what they thought of certain universal design for learning techniques. Once we gathered enough information we started to devise a timeline for what parts of the website needed to be done by what time.

Once we finished all the planning and information gathering we began to review what we had learned and compare it to what we had hoped to accomplish. Using that information we began to plan out the layout for the website, like how the programs would be categorized and how would information be presented to its users. We finally decide upon four different UI

website designs each designed with different characteristics of universal design for learning as a focus. After that we created a formal survey for the website designs and brought them to a group of WPI Foisie School of Business graduate students to gather their reactions. By weighing the reaction of the graduate students with feedback from the project sponsors on the designs we were then able to decide on a finalized UI design for the website.

The next step in the project was implementing all the work we had done into a physical website design that we could present to the sponsors. With the finalized design presented to the sponsors and agreed upon by the group we began figuring out how to implement it. While one of us started learning website design the rest of us went to meet with a visual design specialist to find out how best to make the website visually appealing to its users. After taking into account the information we got from the specialist we began to implement our design. While some of us focused on coding and making sure the website was functional other focused on the information presented on the website like text and videos.

According to the information we gathered at the beginning it was best for the text to be in the form of small blubs, only a few sentences long. We divided the different programs between the members of the group. Each team member was responsible for researching a set of programs. Once finished the group then wrote short introductions for each of the different section of the website. We also decide to divide up the work on the visual aspect of the website like pictures and videos. For the informational videos for each of the programs we found video explanations and guides made by the makers of the programs or created by users of that program. While some team members went online to find the pictures that would be used on

the website, the team member went through the WPI collection of pictures and used them to help create a short introduction video for the landing page. Finally to show that the project was student created we decide to create a short video about the team. Each member was filmed explaining why they joined the project and what it meant to them. These videos were then edited and combined before being added to the website.

After we had planned out what we wanted the website to look like we began to start building it using an online website designing system to help make it easier. While this was going on we also began to edit the layout of the website adding in the different sections with titles for each page. Then we added in a sidebar system so that each user could go to key sections of the sight from any page as well as links to other WPI websites. Finally all the information had to be scaled to match how the users would scale the window; therefore we made sure to design the site as responsive, allowing it to be viewed on a desktop computer, laptop, tablet device, or mobile phone.

Once the layout was completed we began to focus on the programs and the pages related to them. We uploaded links to all the different program sources whether that be from WPI or another website. We placed pictures so that users could identify what program they were selecting without needing to read. We also placed pictures on the side of each of the program pages to show what systems the programs would work on. While this was going on we also upload the short descriptions and videos that had been created up to the website. Once we had a satisfactory website design we created a survey for it and gave it to a group of students to test. Each student filled out a survey based upon their experience was regarding the

website. The information was then compiled online and edited by us for analysis. A few last minute edits to the website were to be made based upon things that the sponsors would prefer to see before they handed the site over to the next IQP group to continue. Some of these changes included:

1. Providing a link to where a student might be able to find to purchase a program.
2. Displaying small logos on the side of each page to show what technologies programs were compatible with. For example, some programs were compatible with Windows but not Mac, or only specific Internet browsers.
3. Providing a placeholder learning style quiz until a more specialized one can be made.

CHAPTER 4: RESULTS

When we created the working website it was time to test it and tweak the result. Our group made changes to the site based on input from one another, our advisors, and our sponsor. We also distributed a survey and up-to-date version of the site to members of our target audience—students—to get some user feedback. These were the last steps in developing our product and generating data for its further improvement.

4.1 Process for making website

Step 1: Concept phase

The first step in making the website was brainstorming with the team. Team members came to meetings with some ideas for the visual design and the structure of the website. The structure was quickly decided upon. It started with a home page which branched off into three main segments: the list of programs, a test that would provide information on learning styles, and an about us page. The programs page would then be further split into the program categories, and then finally into the individual programs. The proposals for the visual design of the website were a bit harder to narrow down. The designs were drafted in Microsoft PowerPoint due to the ease at which inexperienced users could maneuver text and shapes to best portray their ideas. Inspiration for these website mock-ups was taken from a myriad of sources, including popular pages such as Facebook and Youtube. Once the ideas were gathered, the IQP team surveyed a group of graduate students and came to a decision based on what seemed to be the most liked. Included in that design was some of the inspiration from the popular sites, specifically the menu bar on the side from which users can navigate the website.

Originally, Wordpress was considered for creating and hosting the website, but it was difficult to adapt the templates provided from WordPress to the visual layout that had been selected. The main programmer decided to implement the website directly in HTML, using a CSS stylesheet and bootstrap to maintain responsive design. The stylesheet allowed the page to be broken up into up to twelve equally spaced columns that would resize themselves to fit whatever screen they were on. One page was created at each layer of the website (eg. home page, programs main page, page for specific program) for a final confirmation with the group before proceeding to fully format the website.

Once the layout was initialized, one specific branch of program types was implemented to further refine the design, since working with an actual website is significantly different from creating a mock-up. Some of the changes implemented at this stage were minor, such as adding links to the Office of Disabilities Services at the bottom of each page, whereas others were more significant, for example changing the menu location and adding a button that links to where students can access the program they are looking at. Up until this point the website had been hosted locally, so here it was uploaded to a personal WPI account page so it could be further tested. From there the group continued to get feedback from the sponsors and students and more website content was added and modified. As the term came to a close, website changes became less significant and more focused towards ensuring that the sponsors were happy with the product provided, with the last few changes including things like adding compatibility logos and modifying the centering of titles.

4.2 Sponsor Reactions

An important aspect of our IQP project was that it should clearly represent the ideals the project sponsors imagined when they gave us the project. To this end we have tried to get as much feedback from them as possible at every major step of the project. In the beginning of the project they helped guide us by indicating the direction they wanted the project to go. They did this by helping to identify what aspects of the websites they had envisioned were particularly important to them and guiding our research in that direction. They also helped point the project in a proactive direction by eliminating ideas and designs that did not fit in with their view of the final project. When the group created multiple designs for the website we showed each one to the sponsors to find out which one was more like their original concept, why that was and what was missing. By using the feedback from them, as well as from the consumer data we collected, we eventually ended up with our current final design.

Towards the end of the project the sponsors assisted us with editing and finalizing aspects of the website design. They would frequently go over the website and look for inconsistencies in the way the layout was set up. Any inconsistencies were presented to the team with ideas on how to fix them or what they thought it should be like. For example the different programs pages; the sponsors helped us make each of our designs more consistent by choosing a design for each of the programs icons that followed the same basic rules. They also commented on the text used, having more experience with proper language format for universal design concepts. They edited each of the blurbs used to explain the programs and our own scripts for videos so that it better reflected the ideals for the website. They also created their own text as suggestions or examples of what they wanted us to follow, even going as far as developing sample introductory text for the landing page of the website.

4.3 Survey

Since the most important part of the website is usability for students, testing was an essential step. Our survey, created in Qualtrics and distributed to graduate level business students at WPI, elicited useful feedback on our website.

The survey was comprised of 11 questions, each on a different aspect of a user’s experience, from the website’s aesthetic to its usefulness and the perceived accuracy of its information. There were multiple choice, yes/no, and open response questions. Respondents were asked to explore our most recent version of the website via a link included at the beginning of the survey. A total of 35 subjects responded. The following is what we found:

Question 1: The website was visually appealing.

The majority of respondents responded “neutral,” meaning they neither liked nor disliked the aesthetic of the site overall. No respondent strongly agreed that the website was visually appealing, but one did strongly disagree. The response to the website’s visual appeal was not very high.

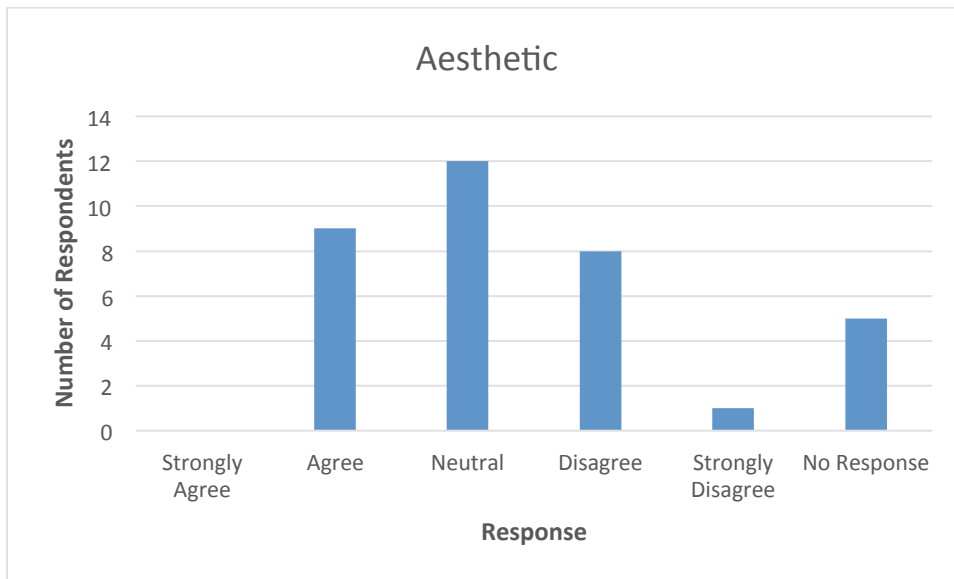


Figure 1: For each of the following statements regarding the ULC website, indicate your level of agreement. The website was visually appealing.

Question 2: The website was easy to navigate.

The majority of respondents either agreed or strongly agreed that the website was easy to navigate. There was only one respondent who disagreed or strongly disagreed with the statement. Overall the respondents believed they could explore the website without major problems.

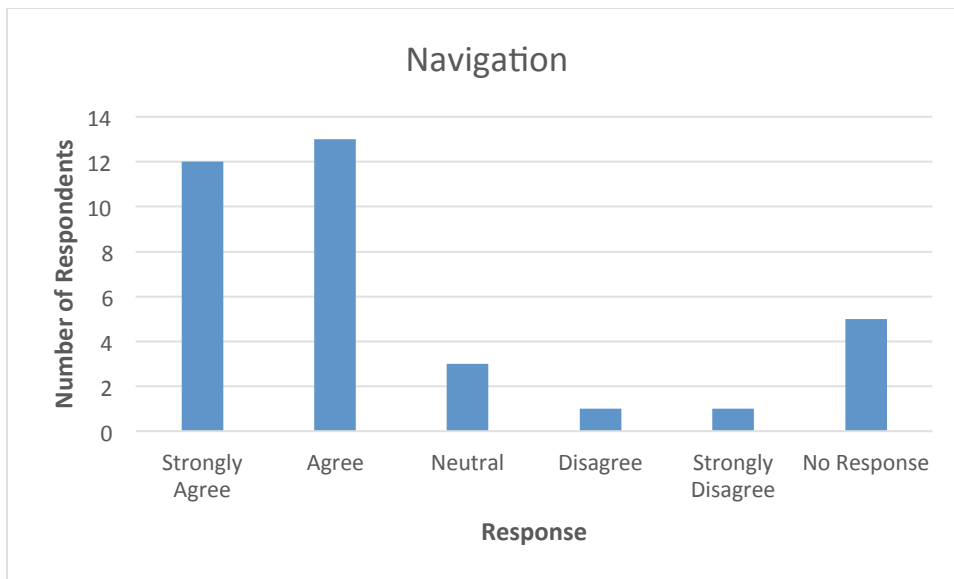


Figure 2: The website was easy to navigate.

Question 3: The website gave me useful information about products I can use.

The majority by far of respondents agreed that the website gave them useful information about products they could use. However, many fewer people strongly agreed with the statement. Only one person strongly disagreed. Overall the respondents found the information on the site relatively helpful.

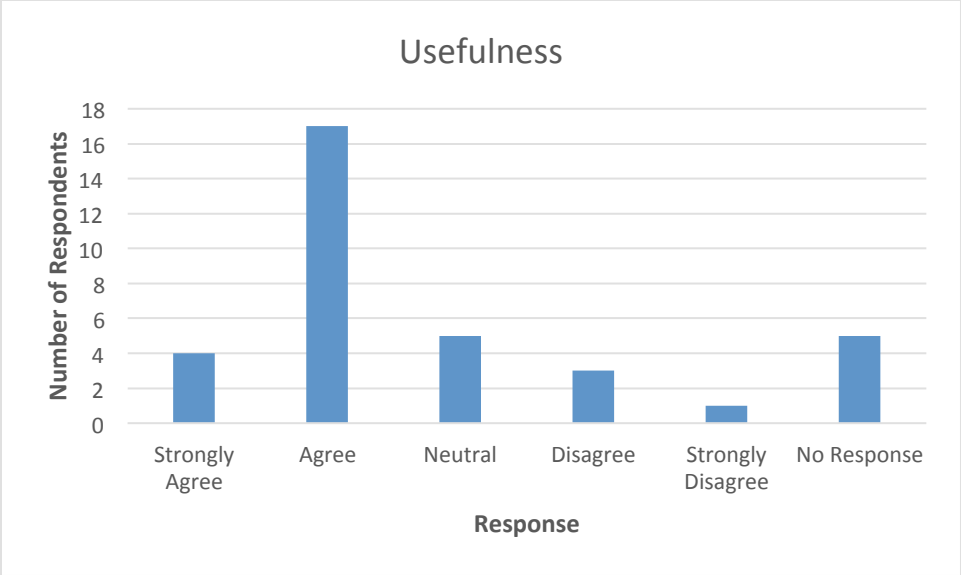


Figure 3: The website gave me useful information about products I can use.

Question 4: I would recommend this website to friends/other students.

The vast majority of responded selected either “agree” or “neutral” about whether they would recommend this website to others. Only one person selected “strongly agree,” “disagree,” or “strongly disagree” each.

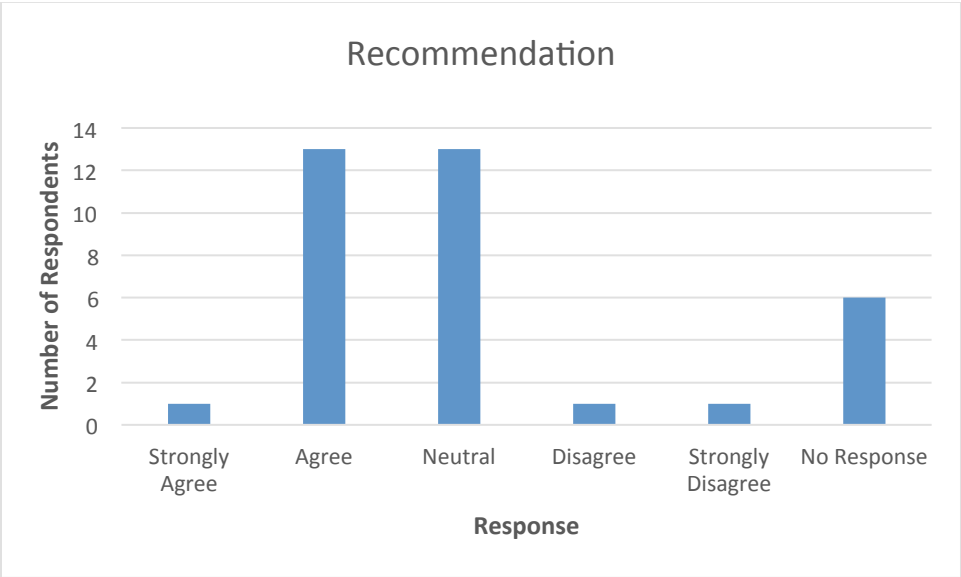


Figure 4: I would recommend this website to friends/other students.

Question 5: What do you like most about the website design?

The vast majority of the respondents reported liking the simple, easy to navigate format of the website and its streamlined look. They used words like “clean,” “easy to use,” “intuitive,” and “well organized.” Multiple respondents said they found the clear click-through format to be easy to navigate quickly for a broad range of users. We learned that users value ease of navigation, so we can infer that students want to get information quickly and efficiently.

Question 6: What do you like least about the website design?

Most respondents reported that the aesthetic of website was their least favorite aspect of the site. Although many had praised its sleek and “modern” design in the previous example, they called the visual design “boring” and “plain” in this question. Some said there was too much white space and they would prefer to see more colors, large pictures and graphics, particularly on the home page. One user said that some of the pictures appeared pixelated or blurry when viewed on a large scale, which detracted from the professional look. There were also comments about navigation problems. One person said it was not obvious that the headings were links so some kind of indication of where to click would be useful. One of the important parts of user testing is discovering what specific functions are not intuitive to some individual users. We, as the creators, would not be able to anticipate all of these by ourselves.

Question 7: Did the categories include an aspect of learning/life in which you would like to improve? If yes, which one(s)? If no, what do you think could be added?

The majority of students responded that at least one of the categories was one in which they would like to improve. They frequently cited the “Notetaking & Studying” and the “Time Management & Focus” categories. None mentioned the “Text/Speech Converter” category. The one respondent who answered “No” said that they are an English Language Learner (ELL) who would like to see resources for helping express ideas in English. Some of the programs we include on the site do have ELL assistive features but since they aren’t presented primarily as

this, it is more difficult to search for this functionality. This comment suggests that the current system of categories may limit some website users in what they can find easily, and the categories can be reconsidered. Some respondents also provided suggestions in their response.

Another respondent said that although the links to programs were very useful they wanted to see short paragraph descriptions about each one under its icon. This problem is a result of not knowing to click on the icon associated with the program being looked at, because there are indeed short descriptions of the programs on the page when clicking on the icon brings up. Again, not knowing what to click was an obstacle to the user experiencing the website fully. Another suggestion was to include music-providing applications such as Pandora and Spotify in the “Time Management & Focus” category because some students use background music as a focus aid.

Question 8: If you have used any of the programs listed, do you feel that the website provides an accurate description?

The most respondents reported that they felt the website’s information was accurate. A moderate portion of people did not respond to this question.

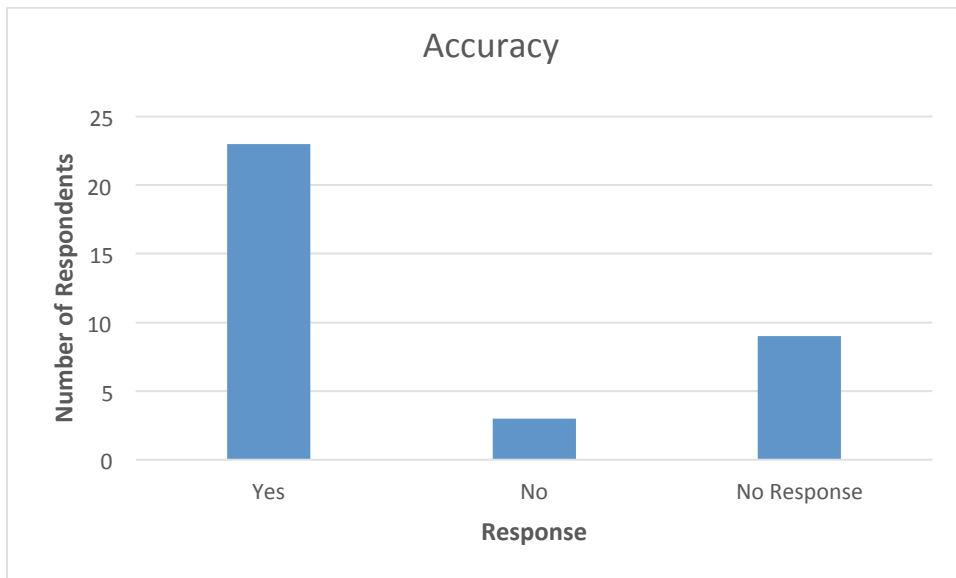


Figure 5: If you have used any of the programs listed, do you feel the website provides accurate description

Question 9: For the programs that you have not used before, did the information provide help?

The great majority of respondents reported that information on the website about programs they had never used before was helpful. A moderate number of people did not respond.

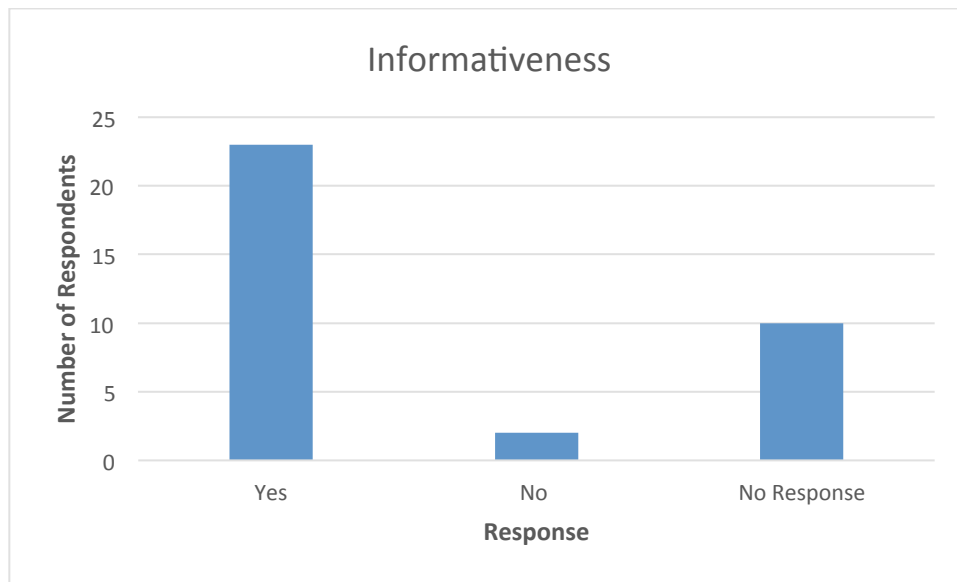


Figure 6: Did the information provide help?

Question 10: How often do you think you would use this website?

The greatest number of respondents reported that they thought they would use the website sometimes. Many of the respondents selected "rarely," few responded "often," and none responded "all of the time."

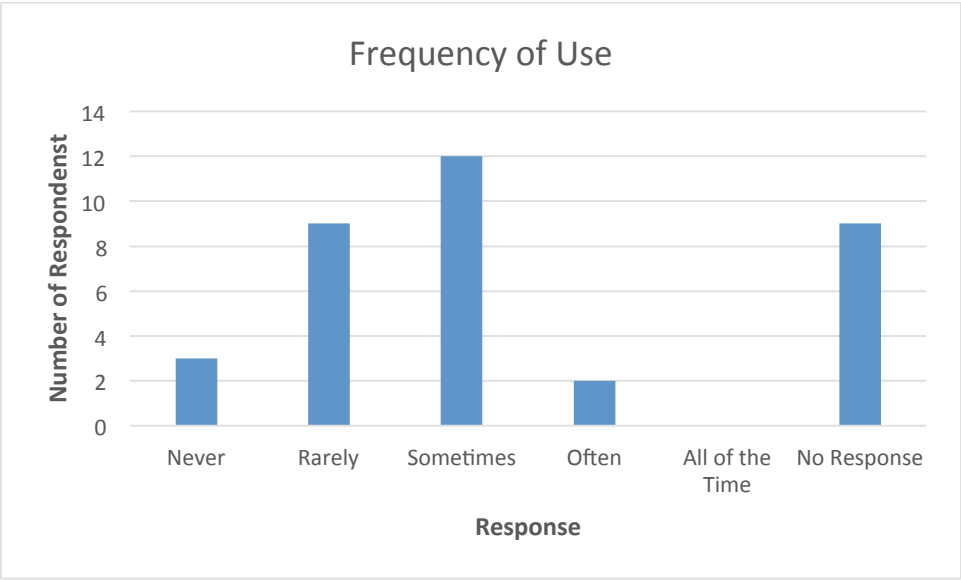


Figure 7: How often do you think you would use this website?

11. Please share with us any additional comments you may have about the website.

Miscellaneous feedback was provided here. One person said that the difference in importance of each level of text on the site should be reflected in the size and font of the text. They said that the uniformity of appearance of the text on the site left the reader confused as to which information was most important. A different respondent said that the minimalist design might actually slow down the user’s navigation because many pages must be clicked through to get to information. That respondent suggested making a short program description appear when the user’s mouse hovers over the respective icon to reduce clicks. They also asked whether necessary citations were included. A respondent identified a problem that it seemed multiple respondents had: they were not able to discern the objective and purpose of the website. This suggests that guiding functions, transitions, or text could be included. Another respondent noticed and complimented the responsive design and another recommended some more programs to include: Evernote and Wunderlist.

Additional suggestions from survey results

These responses are a great indicator of areas to work on for the evolution of this website. Future IQP groups who will continue the work on the website will be able to address the problem areas mentioned by the respondents to maximize the usefulness and appeal of the site. Specifically they can try applying website structures that flow with clear guidance, since this objective was a common source of confusion for respondents. Our group laid the foundation for this website and the following groups can try varying fonts and font sizes and maybe implementing visual themes to guide the addition of pictures and other visual schemes.

The process of distributing the survey also helped our group to think of how testing of the site can be expanded. We found the variety provided by multiple choice, yes/no, and open response questions to be effective for getting both quantitative and qualitative data. A future survey could be distributed to classes of different college levels and different disciplines of study to get a broad range of perspectives. In addition, the expectations can be set even more precisely, to get exactly the kind of feedback sought, by describing in more detail the website's state of completion at the time. This would eliminate feedback we received about the amount of content and number of resources shown since those are meant to be fleshed out more completely in time.

In the next section we will discuss what was learned during the project and ideas for the next group's process.

CHAPTER 5: DISCUSSION AND RECOMMENDATIONS

Discussion

The main purpose of the project was to develop the best design for a universal learning based website to allow students to have easy access to them, and we believe that we have accomplished this goal. The current version of the website is clear and easy to navigate. All of

the functionality that our sponsors requested is present and it works well. We have plans to host it, and soon will be able to help the general student population.

Our project concluded by delivering the completed website to the sponsor. Although we were able to collect a small amount of feedback on the site, we did not able to fully deploy this site for the entire WPI student body. This step was beyond the scope of this project. Therefore, the remaining sections will discuss challenges, lessons learned, and ideas for future IQP projects working on this initiative.

Challenges

The IQP project experience is unlike anything we had done so far in our academic careers and accordingly, we were met with many new challenges. Our obstacles came in layers, from communication and organization to technical and mental dilemmas, all of which helped us to grow. In terms of scale, it was the largest project we have completed at WPI thus far. Four team members, two advisors, two sponsors, and three terms of self-structured time are a lot to manage. So we developed new ways of working and communicating to meet the requirements of this task.

Managing our Challenges: Expectations

One of the first things we had to get used to was the balance of the expectations of the sponsors, the advisors, and our fellow team members. We were used to having a single course professor give us his or her rubric and then decide how to fulfill those criteria to be successful. In the IQP we needed to create a product that would serve the sponsor's purpose; follow the form, guidance and expectations of the advisors, and determine how to do all of that and add

our own ideas as a team. There was no predetermined or external rubric. At first we found ourselves confused about what specifically was being asked of us, but soon realized that we in part had the responsibility and freedom to determine the goals and nature of the project ourselves. The dynamic and larger number of people in the IQP was made to mimic a “real-world” project situation, such as one in which a team of workers in a company work for a client. This project helped prepare us for those situations in future careers.

Managing our Challenges: Time Management

The biggest problem to the IQP turned out to be a matter of timing. We knew that all our big due dates would have to line up with the ends and middles of our classes. What we couldn't understand however was how much strain that would put on us. Trying to do well in our courses as well as the IQP often proved problematic and would sometimes mean that we would have to give up something. Usually we would give up breaks or free time to try and complete aspects of the project we had put off to finish up school work.

Because of the large time allotment for the project, creating a timeline for our work was daunting. Time management is one of the major life-skills students are required to develop in college due to all of the unstructured and unsupervised time for learning and practicing class material and completing assignments. This project took our time management planning to the next level. We had to decide for ourselves how much we could complete in three terms and how long each step would take us. We did this by discussing as a team and writing down deadlines for every half term, and leaving some room to adjust as we progressed and saw the rate at which we would realistically work.

Managing our Challenges: Writing the Report & Skill Management

The report portion of the project contained its own challenges. The reports we read of previous IQP teams were long and completing one seemed an insurmountable task. Each of the team members had different past experiences writing reports: some of us had tried to do all the research before beginning to write or other methods. With the guidance of our advisors, we learned to research a breadth of topics, write some, narrow our topic, and research again. We developed the skills to research effectively for this kind of paper.

Before we started work on the website we already noticed one fact which could have presented an issue; there was no one who specialized in what we needed. The team consisted of people who were each enrolled in a different field, but no one was focused on computer science or developing websites. To deal with this issue the team decided to divide up the work based upon similar strengths. Those of us who were better with computers and whose major involved more computer programming work would deal with the more technical aspects of the work. Because those students would be doing more technical work the other would take on the more of the paper and setting up workload to compensate.

Although each of us had had some experience with universal learning beforehand we did not know much about it or even the specifics of what would make something qualify under the banner of universal learning. So before we started the project we had to do research on the concept of Universal learning. This made the project more challenging when combined with the fact that we could find no websites trying to accomplish the same goal as us. This meant that we had to examine a lot of similar universal learning websites, then try, and convert aspects of these sites into useful aspects of our own site.

Lessons Learned

Although there were various struggles during our project work, our team understands the value that the opportunity of the IQP has for our skills as workers, collaborators, and people. Whether it's working in a group, for a company or on independent projects where we need to design our own goals, we know there will be many times in our lives when our experiences in this project will help us. The past three and a half terms has been a learning experience for all of us. We learned that working as a team, balancing IQP and other commitments, and creating a product for a customer (our sponsors) are all vital skills. However, each of us individually gained something different from the project. In the following section we discuss this in greater detail.

Robert Fleming

Through the IQP, the skill that I had to put the most effort into was that of time management. I frequently overestimated the amount of time I need to complete a task or the level of difficulty the task would represent. It also didn't help that I had a lot of other things going on in my life, which could cause me to have to forgo work to deal with them, often unexpectedly. As time went on I got better at dealing with these sudden changes by budgeting my time more for mistakes and inconveniences. I still have sudden problems arise but they no longer hamper me as much because I have time set for later so that I can use instead if I need it. I still am trying to get better at this skill but it has become the most valuable skill for long-term big projects and small tasks.

Briana Huie

This project taught me many unexpected skills. Through the experience I gained an appreciation for the amount of work and collaboration that goes into “real world” projects. I learned that communication and planning are key to completing a goal in a group setting. Based on trial and error our team learned an efficient way for everyone to be updated on progress, give, and respond to feedback. We connected our computers to a shared drive that everyone could access and then emailed a group email address or the relevant individuals when we uploaded documents. This method will be useful for future group work. Our advisors and sponsors showed us the standardized way in which notes are recorded for company meetings. I realized the importance of keeping all of our documentation organized since the project was more than just designing and creating the website but also recording the process. Before working on this project I was not at all familiar with the learning technologies that we featured on the website. By researching them I discovered what great products there really are to aid learning and started using some of them myself, such as Natural Reader. The most important thing I learned over the course of this project was the importance of being flexible. I realized that there would be many times in life where compromising with those around me, recovering from unexpected situations and deadlines will be necessary. Gathering and implementing the ideas necessary for this project in a timely way required much of that, from accommodating all group members’ working style preferences to not knowing exactly what our final product would look like as we worked toward it, and for this practice I am grateful.

Max Merlin

One thing that I definitely learned over the course of this project is HTML and website design. I had never worked on a website before, so it was a little difficult to learn the language and satisfy the needs of my team. I also learned the value of communication among my teammates and I. Sometimes it was difficult to find times where everyone was able to meet. There was also compartmentalization of work, where some team members specialized in certain tasks. Another difficulty was setting deadlines. It would often take the team longer than we planned to finish certain aspects of the project, so it was important to set reasonable deadlines and stick to them. Again, communication among the team was crucial for making sure that we were working together, not just separately but all on the same project.

Mark Swanson

The main thing that this Interactive Qualifying Project taught me was flexibility. When we entered B term I had a very clear idea of what I felt the website should ultimately look like. I presented my idea to the group, and while it was favored for a period of time, it was not the design that we settled on. In fact none of the original designs we made translated directly into the final website, instead we compromised and used different aspects from a few of the designs. When you aren't working independently the most important thing to do in order to be productive is let go of your opinions. Allow for compromise and the project will move much more quickly and efficiently. This is a valuable skill that I can apply in many other aspects of my life.

Recommendations for Future Projects

Although we completed our goal, there were some ideas and plans that we came up with that were outside the scope of our project. We would like to recommend that future IQP groups try to implement the following:

- A rating system

We think it would be beneficial for users to be able to give feedback on the programs they have used. Ideally users would be able to rate the program on a known scale and leave a testimonial to better help future users. We imagine it similar to the rating systems on Amazon.com or Yelp.com. It would need to be moderated, but we feel that this would be a helpful feature.

Specialized learning style test

This was one of the earliest ideas we had, and was based on some of our experiences freshman year. For some of us, it was difficult to identify where specifically we were having trouble. It is difficult to address a problem if you don't know what it is. A finalized learning style test would be a short series of questions about the user's experiences and problems. At the end it would identify the users learning style and identify programs that might be more helpful and suited to people with that style. While the website does direct users to a learning style test, it does not relate back to the website or programs in any way.

- Broader range of content

From our sponsors we received sixteen programs that they felt should be implemented in the first iteration of the website. At the time of the writing of this section we have implemented them all. However, this is too few for the website to be as useful a resource as we would like it

to be. Future IQP groups should gather as many useful programs as possible and add them to the website.

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APPENDIX A: KEENE STATE UDL TECHNOLOGY WEBSITE

Home Page <http://ods.keene.edu/index.html>

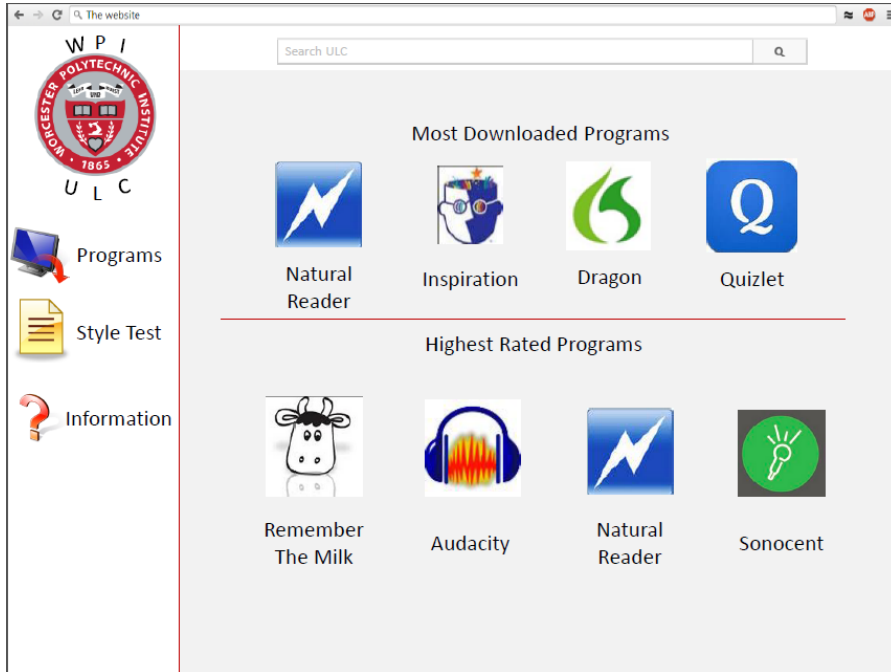
The screenshot shows the home page of the Keene State Office of Disability Services. The browser address bar displays "ods.keene.edu/index.html". The page features a navigation menu with "Home", "Assistive Technology", and "Contact Us". A sidebar on the left lists categories under "Free/Low Cost Assistive Technology" (Reading, Writing, Vision, Hearing, Fine Motor/Dexterity, Communication, Digital Text Support, Study Aids) and "Web Browser Accessibility Extensions" (Google Chrome, Firefox). The main content area includes a welcome message, a "What is Assistive Technology?" section with a photo of students, and a "Why research this site?" section. A copyright notice at the bottom reads "Copyright © 2012. All Rights Reserved."

Category Page Sample

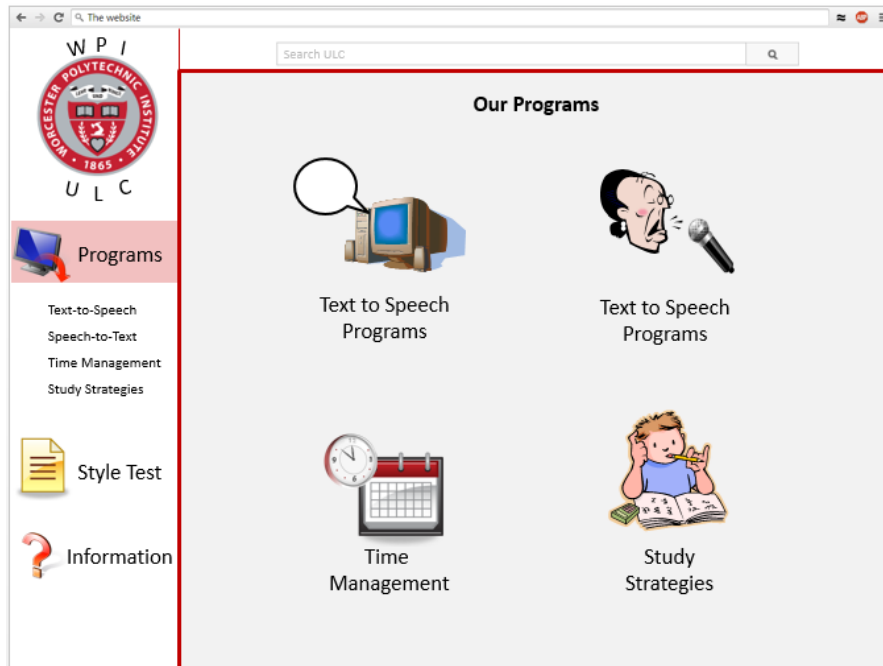
The screenshot shows the "Reading" category page on the Keene State Office of Disability Services website. The browser address bar displays "ods.keene.edu/at/reading.html". The page features a navigation menu with "Home", "Assistive Technology", and "Contact Us". The sidebar on the left lists categories under "Free/Low Cost Assistive Technology" (Reading, Writing, Vision, Hearing, Fine Motor/Dexterity, Communication, Digital Text Support, Study Aids) and "Web Browser Accessibility Extensions" (Google Chrome, Firefox). The main content area is titled "Reading" and lists three products: "Voice Dream Reader" (cost: \$99), "NaturalReader" (cost: Free), and "ClaroPDF". Each product includes a brief description, a list of features, and a "Learn More" link.

APPENDIX B: ORIGINAL WEBSITE DESIGNS

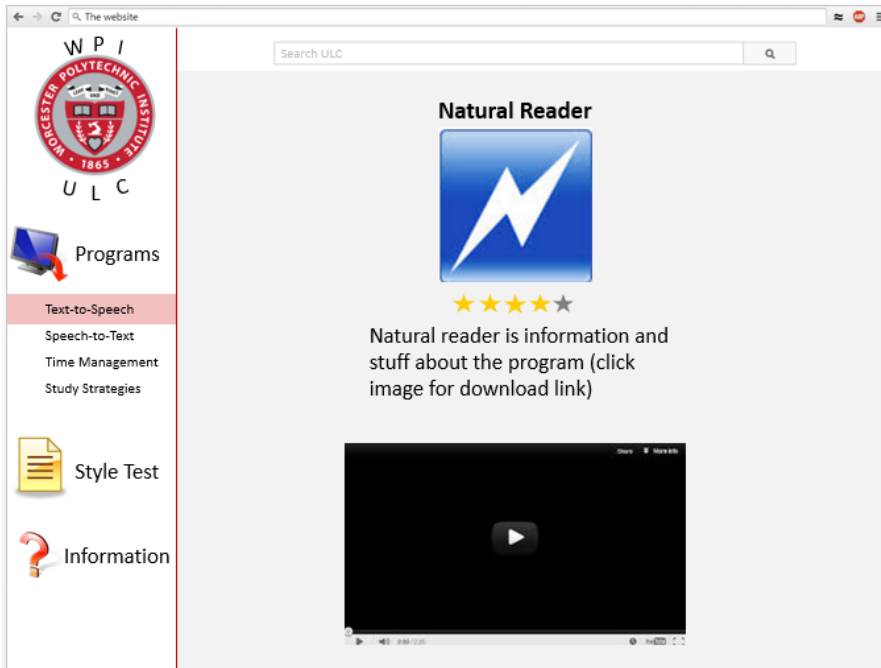
Design 1



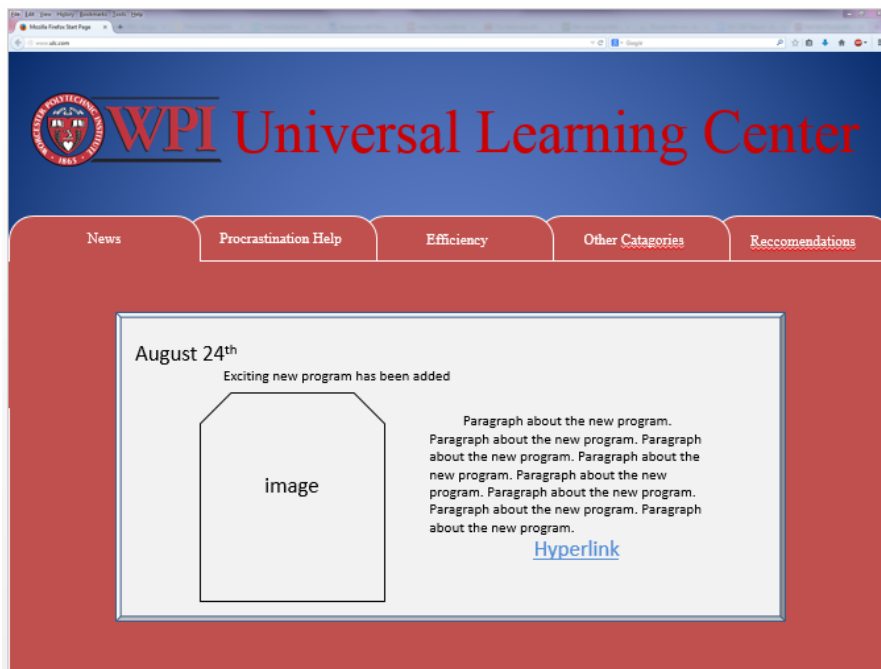
Design 2



Design 3



Design 4



APPENDIX C: FULL WEBSITE SURVEY QUESTIONS

Full Website Survey in Qualtrics

Our IQP team has designed a website to inform all college level students about learning/study/daily life aiding products available for use. Please take a moment to explore the newly developed Universal Learning Center (ULC) website by clicking [HERE](#). The website will open in a different window.

Please return to this window to answer a few questions. You may refer back to the website during the survey. Once you are ready to proceed, please ENTER YOUR FULL NAME below and click "NEXT" to indicate your consent to taking our quick survey. If you have any questions, please contact Prof Djamasbi (djamasbi@wpi.edu).

For each of the following statements regarding the ULC website, indicate your level of agreement. The website was visually appealing.

1. The website was easy to navigate.
2. The website gave me useful information about products I can use.
3. I would recommend this website to friends/other students.
4. What do you like most about the website design?
5. What do you like least about the website design?
6. Did the categories include an aspect of learning/life in which you would like to improve? If yes, which one(s)? If no, what do you think could be added?
7. If you have used any of the programs listed, do you feel that the website provides an accurate description?
8. For the programs that you have not used before, did the information provide help?
9. How often do you think you would use this website?
10. Thank you for your time. Please share with us any additional comments you may have about the website.

We thank you for your time spent taking this survey.
Your response has been recorded.