

GNG 2101

Deliverable J

User Manual

Team #Z09

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Abstract

We have been contacted by the Center for Entrepreneurship and Engineering Design (CEED) to create an online learning platform. In consequence, the university had to adapt to new circumstances created by the COVID-19 pandemic, which limited in-person training. We had been tasked to create an online platform for a beginner Arduino workshop. This beginner arduino website offers a high tech solution to the University's problem of being able to educate students without in person lectures. The website provides the knowledge base necessary to understand the course curriculum as well as the intractability of an in class lecture. Website comprises an intuitive user interface that offers a plethora of features. Those features include custom made video tutorials explaining the concept as well as ways to test said concepts. Another feature includes being able to participate in quizzes that track the students progress. The website also has multiple ways of contacting the course administrators and professors in order to clarify further questions from students. Due to this, our work is both creative and relatively easy to use.

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A screen capture of the live chat feature

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A screen capture of the provided link for software that will be used during the workshop and also includes the access link at the bottom of figure 8

List of Tables

Table 1: Interpreted need analysis

Customer statements	Interpreted Need	Importance
Create an online workshop and training for students	New way to educate students from a distance	5
Training must be as interactive as possible	Make the experience interesting	5
Experience must be doable at home	Users can go through the experience with minimal help	5
Must get across the same learning outcome	Same level of education as in-person training	4
The user experience can't cost them more than 20\$	Minimal equipment required for the experience	4
Introduce Arduino for beginners	Introduce what it is, how to use it, what to use it for, how to use the software/hardware, different capabilities/components	5
Solutions to common user problems have to be available	Integrate troubleshooting measures to provide users proper guidance during a problem encountered in the experience	5

Table 2: Benchmarking

	Core electronics	Arduino Workshop	Arduino Online Workshop	Udemy Arduino workshop
Description	YouTube Videos	A Hands-On Introduction with 65 Projects by John Boxall (book)	Open-source electronic prototyping platform enabling users to create interactive electronic objects.	Free or paid online video course taught By expert instructors.
Access links	Core Electronics	Books.Google.com	Workshops	Free Arduino Tutorial
Customer expense	\$0	\$0 - \$31.95	N/A	\$0-\$44
Duration of workshop	~ 4hrs	~ 10hrs	~ 7hrs	~ 5hrs
Interactivity (online)	Yes	No	No	Yes
Troubleshooting measures	Yes	N/A	Yes	Yes

Table 3: Metrics

#	Metric	Imp	Unit
1	Cost	4	\$
2	Customer expense	4	\$
3	Duration of Workshop	4	hrs

Table 4: Target specifications

#	Target Specifications	Units	Marginal Value	Ideal values	Verification Method
1	Cost	\$	≤ 100	≤ 50	Estimate, final check
2	Customer expense	\$	≤ 20	0	Estimate, final check
3	Duration	hrs	3	≤ 1.5	Test

Table 5: Bill of Material

Part name	Description	Quantity	Unit Costs	Extended Cost
Domain registry	License that allows websites to be published	1	\$29/Mo	\$29/Mo

Table 6: Decision Matrix

	Concept	Lab Manual	Video Series	Website	Mobile App	Live-stream Tutorial
Team Member	H	A, B, H, L	A, H, P	A, B, L, P	B, L	
Criteria	Weight					
Affordability	0.1	5 0.5	5 0.5	1 0.1	3 0.3	4 0.4
Simplicity to Create	0.2	1 0.2	4 0.8	1 0.2	1 0.2	4 0.8
Ease of Use	0.3	1 0.3	2 0.6	5 1.5	2 0.6	3 0.9
Ability to Answer User Questions	0.2	1 0.2	2 0.4	5 1.0	1 0.2	5 1.0
Depth of Training	0.2	1 0.2	2 0.4	5 1.0	4 0.8	1 0.2

	Total	1.4	2.7	3.8	2.1	3.3
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Table 7: 3-year Income statement

	Year 1	Year 2	Year 3
Enrollment Revenue	249,750	499,500	749,250
Gross Profit	249,750	499,500	749,250
Operating expenses:N			
Marketing	60,000	50,000	50,000
Wix Membership	468	468	468
WHOIS privacy	9.90	9.90	9.90
Domain registry	0	14.95	14.95
Salary	190,000	320,000	380,000
Total Operating Expenses	250,477.90	380492.85	430492.85
Operating Income	-727.9	119,070.15	318,757.15

Table 8: NPV Analysis

Discount Rate = 10%

Year	Cash Flow (\$)	Net Present Value (NPV) (\$)	Cumulative NPV (\$)
0	-250,477.90	-250,477.90	-250,477.90
1	249,750.00	227,045.45	-23,432.45
2	119,070.15	98,404.96	74,972.51
3	318,757.15	239,486.96	314,459.47

Table 9: Business Model Canvas

What's Your Business: Advertising

<p><u>Key Partners</u></p> <p>Training video</p> <p>Chart box</p> <p>Online quiz</p>	<p><u>Key Activities</u></p> <p>Basic training</p> <p>Question-solving</p>	<p><u>Value Proposition</u></p> <p>long-distance training</p> <p>Get people's interest</p> <p>Easy to use</p> <p>Value comments</p>	<p><u>Customer relationship</u></p> <p>Visiter can communicate and solving questions for each other</p>	<p><u>Customer Segments</u></p> <p>Internet users</p> <p>People who interest in Arduino</p>
	<p><u>Key resources</u></p> <p>Arduino training materials</p> <p>Arduino training videos</p>		<p><u>Channels</u></p> <p>website</p>	
<p><u>Cost structure</u></p> <p>Web Hosting cost \$29/Mo(no Ad)</p> <p>Free Web Hosting cost (with Wix Ad)</p>		<p><u>Revenue stream</u></p> <p>Display-based advertising(\$ 0 from Wix)</p>		

1.0 Introduction

1.1 The problem

At the beginning of the course GNG 2101, the Centre for Entrepreneurship and Engineering Design (CEED) approached our class with a challenge to design an online platform for CEED workshops. This project is derived from the pandemic COVID-19 which led to extreme measures of lockdowns and social distancing practices. Due to this fact, all University classes and facilities have moved online for the summer semester.. Therefore, CEED is preparing to evolve online content for workshops and training that were earlier offered in-person to enhance students' learning. Following the client meeting and a period of questioning, we have listed the design problem we have to answer. The problem statement is; The Centre for Entrepreneurship and Engineering Design (CEED) is in need of an online workshop/training that is interactive, accessible, educational and affordable that gives the ideal experience of the use of arduino. It is critical to solve this problem for many reasons. First of all, it is important to resolve this problem in order to properly satisfy our clients needs. The client's satisfaction ensures that they would come back to us with more projects to resolve in the future. In addition, CEED training is an essential part of an engineers progression through their degree to further develop their knowledge of their field of work.

1.2 User requirements

During the course of many client meetings and the questions asked, a list of the fundamental needs and requirements was created. This list permits this team to keep on track during the course of this project. In addition, those lists provide guidance to properly conceptualize the online platform for our client. *See List of Tables, Table 1, Table 3 and Table 4* to see the complete list of user requirements.

1.3 Our Design

In our design, we decided to converge towards a simple yet effective online learning platform for Arduino. The simplicity of our product permits us to have a very low cost and have its usability high. Our product consists of a website built by the wix website building platform which allows us to fully customize our product. Our approach to our design is to concentrate on the fluidity and accessibility of our website. We have done this by giving an array of features that will help users through the workshop, such as; a forum page, Live chat, quizzes, users individual progress tracking and the proper links to free software like TinkerCAD, Arduino IDE, etc. The way this workshop was designed is that users would access this workshop and follow the set chapters where a video would be presented to them to follow. Once this was completed, examples and exercises would be provided to help expand their horizons on that subject with the help of TinkerCad and Arduino IDE. Also, support would be one click away with the many ways the users can contact others for help. Once the chapter is completed, we provide a quiz on the subject seen to test their newly found knowledge. In summary, our product is the best since its key factors are simplicity, usability, accessibility and low cost for use and maintenance.

2.0 Our Product

2.1 Features

- **Accessibility**
We offer many different services to ease the students experience
- **Price**
A free online workshop
- **Usability**
User accounts
- **Simplicity**
Simple layout design
- **Experience**
Virtual arduino simulator

2.2 Functions

- **Home page**
 - Introduction of workshop
 - Chapter list
 - Contact
 - Question box
- **Courses**
 - Chapters
 - Video information
 - Training video
 - Content
 - Comment
 - Try yourself
- **Quiz**
 - Quiz questions
 - Quiz answers

- Member
 - Member Setting
- Living Chat

2.3 Capabilities

- Designed for use with a real Arduino or an online simulator giving the users a choice
- Providing the same in depth training as in person CEED workshop
- Free range is given to students in regards that they can freely go through every chapter without restrictions meaning they would not get stuck on specific problem

3.0 Prototype Details

3.1 Prototype construction and how it work

Start with the home page, there are 5 blocks : page menu, About the workshop, Curriculum, Chapter list, Contact. Page menu linked to 4 different main pages, you can use it for a quick jump. The chapter list leads to chapter pages (you can also use the page menu) which have training video, content and comments block where you can leave your questions or anything you want. There are quizzes after each chapter you can access by clicking the quiz button(also the page menu) on the top left corner. once you finished the quiz you can check answers for correction. Also, if you want to test what you learned, there is a try yourself button which will lead you to links for TinkerCAD, Arduino IDE download and Arduino project. Last is the member page. It will allow you to edit your personal information and check your comments. by the way there is a live chat on each page for communication with anyone online.

Makerepo link: <https://makerepo.com/LingyunLou/arduino-online-workshop>

4.0 Maintenance Instructions

To begin, maintenance on our product is very cost effective since its a website built on a website builder that helps reduce most related issues related to bugs and glitches within the site, To maintain the website's infrastructure first you need to make sure the subscription is up to date every year. Furthermore, the domain fee per year will also have to be maintained in order to keep the website on the internet as well as a WHOIS privacy query to ensure that the users information is kept private, although most domain registry fee also include a WHOIS is it essential to make sure that is kept up to date. Moreover, for general errors with buttons or functions within the website, this type of maintenance will only require your time to access the wix builder editor to either replace or reprogram the button/feature to the correct purpose it was originally intended for. To reprogram a function you can use the code supplied by wix editor to fix these issues

4.1 Troubleshoot instructions

From the administrators side if the site fails, they should check the WIX technical difficulties site and follow their instructions on how to fix the issue. The site has almost all the errors that one would run into during troubleshooting and maintenance.

WIX technical Difficulties site: <https://support.wix.com/en/technical-difficulties/live-site-issues>

If you are a student experiencing a technical difficulty, they should contact their professors and the site administrators immediately.

5.0 Conclusions and Recommendations for Future Works

In conclusion, a website is a cost effective and easy to maintain solution. It is accessible by thousands of users and can offer a high quality educational experience. The most important lesson we learned is about proper communication. Not only does proper communication help in solving problems faster but also equally dividing up the workload. We recommend that users practise their understanding of arduino by looking at sample programs already available in the arduino IDE. For future works sticking to the Arduino Uno is still recommended as it is sufficient for intermediate and some advanced projects. A lot of projects involving arduino is in robotics. So learning robotics and electronics might be your next Step!

6.0 Bibliography

GNG 2101 - Lab Manual

Appendices

Figure 1

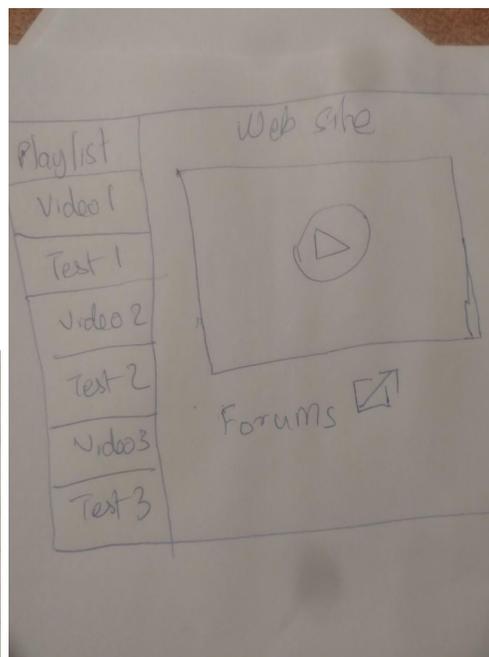
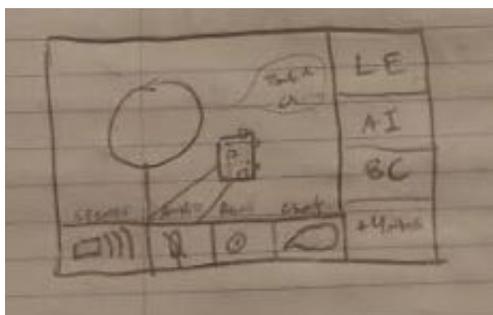
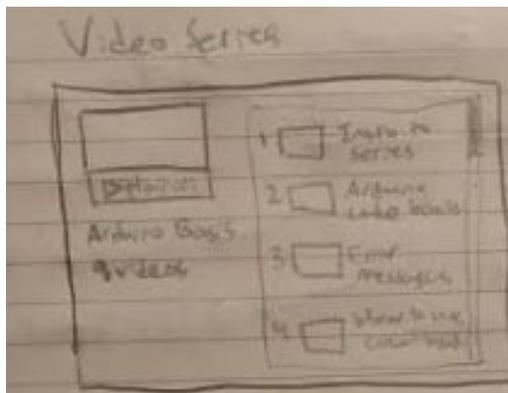
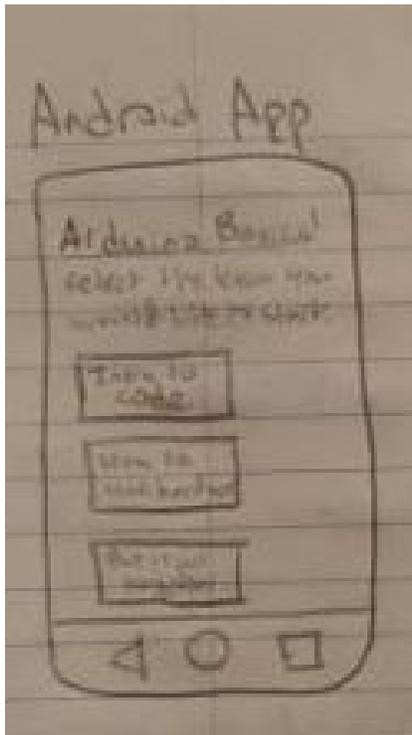


Figure 2

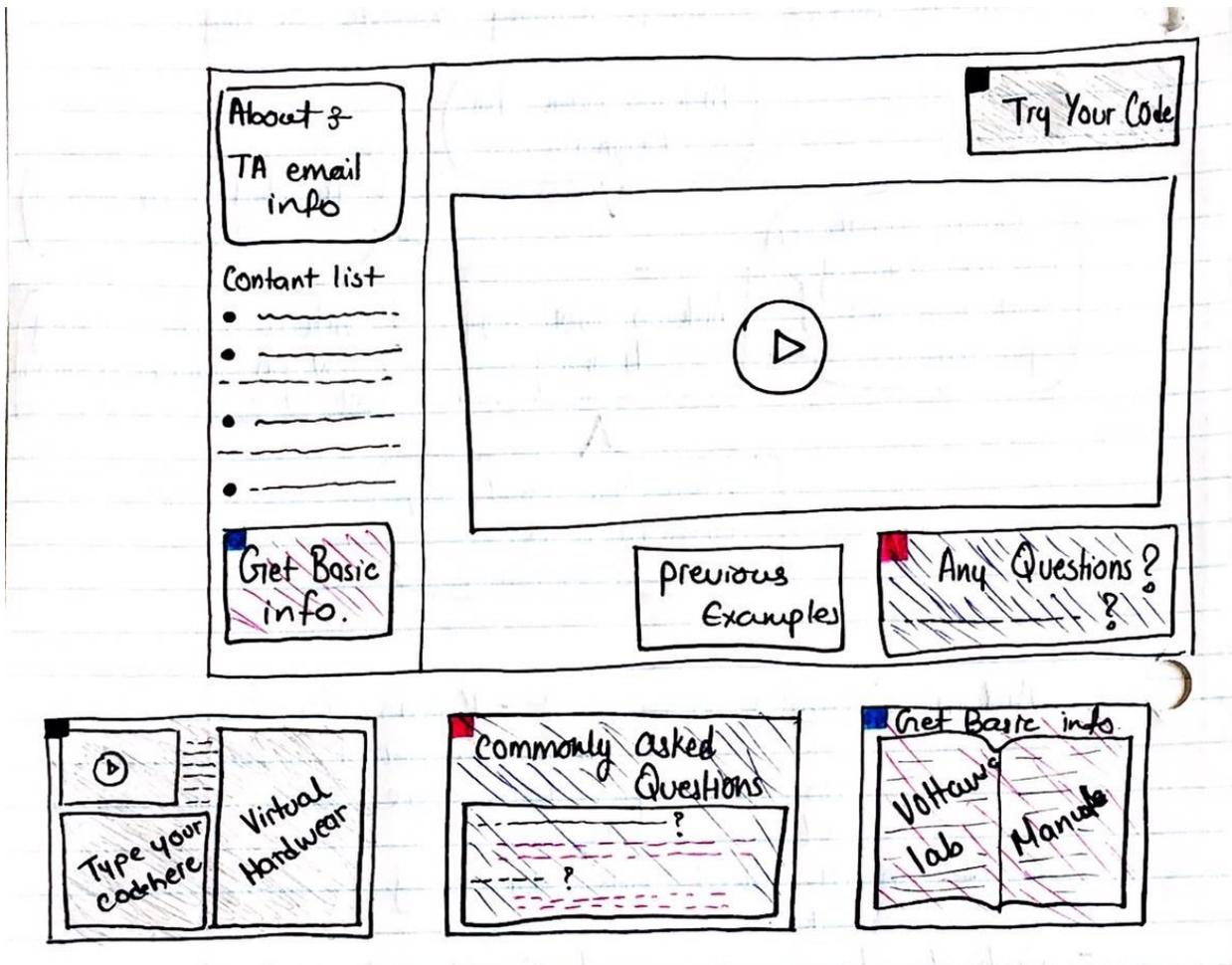


Figure 3

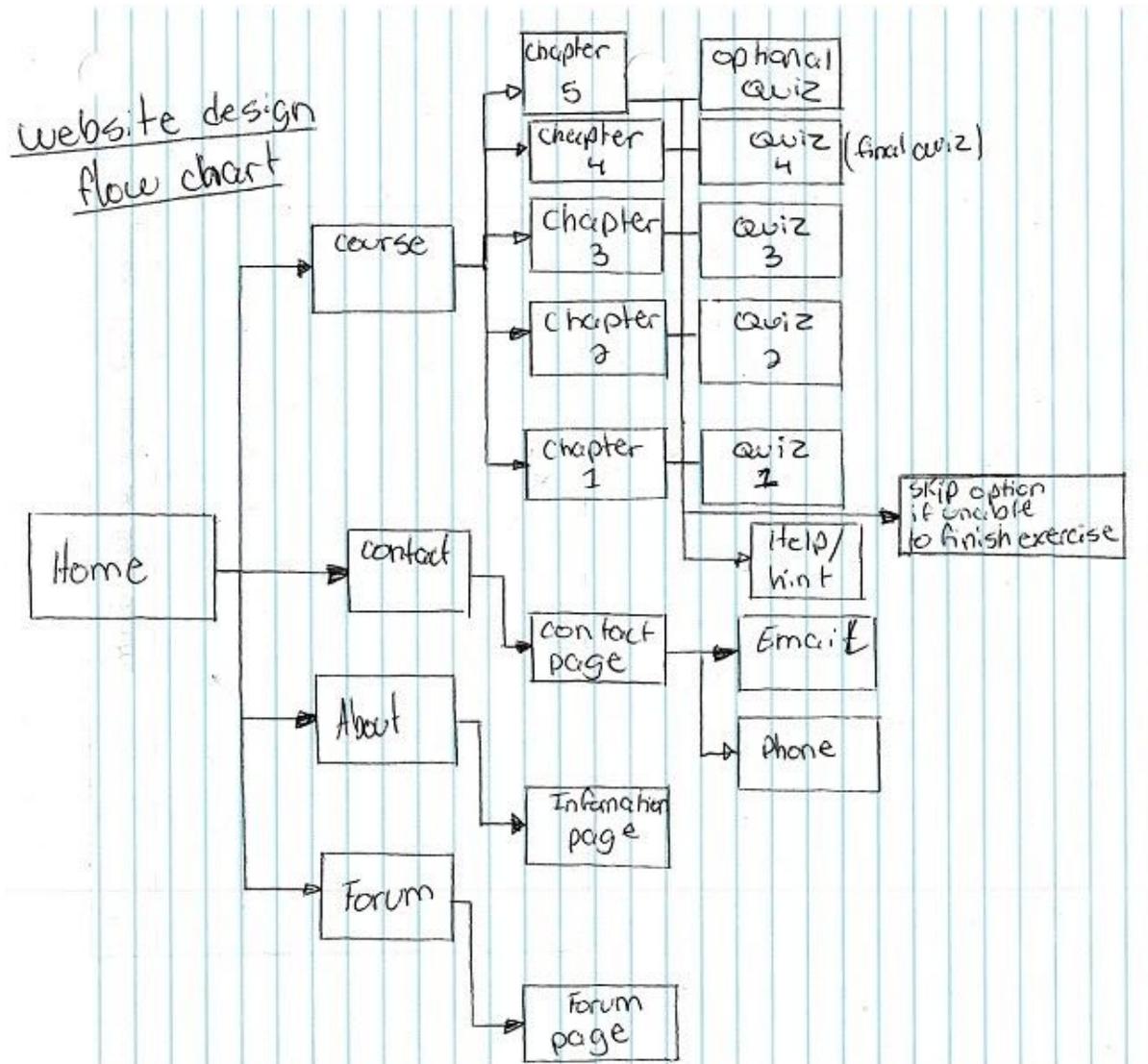


Figure 4

Introduction to Arduino

About Arduino

General information and about the video



From mind to design in minutes

More content

Try yourself

0 comments

Leave a message...

The image shows a video player interface for 'Introduction to Arduino'. The video player is titled 'About Arduino' and contains a video thumbnail with a play button. The video thumbnail shows the GeForce Experience software interface with various settings and a 3D scene. Below the video player is a 'More content' section and a 'Try yourself' button. At the bottom, there is a comment section with '0 comments' and a text input field labeled 'Leave a message...'. The background of the video player is a blue and white striped pattern.

Figure 5

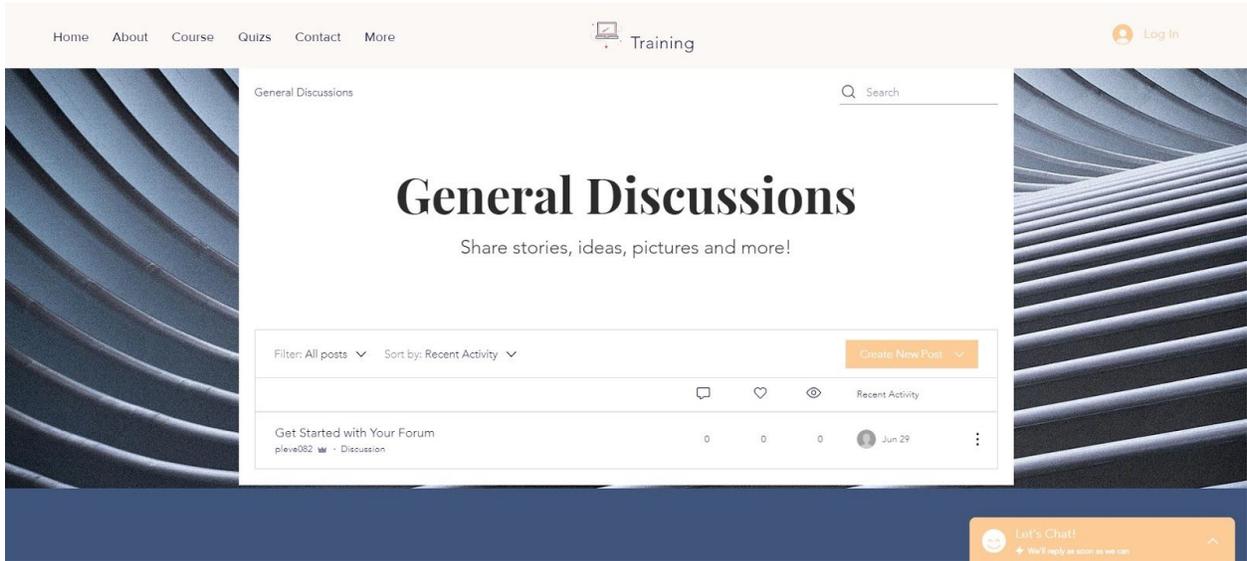


Figure 6

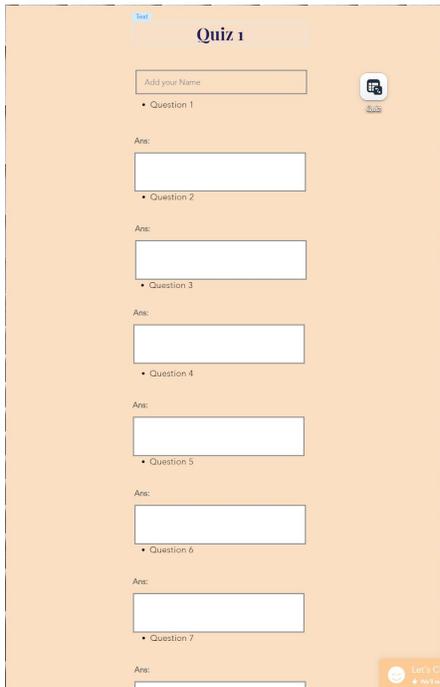


Figure 7

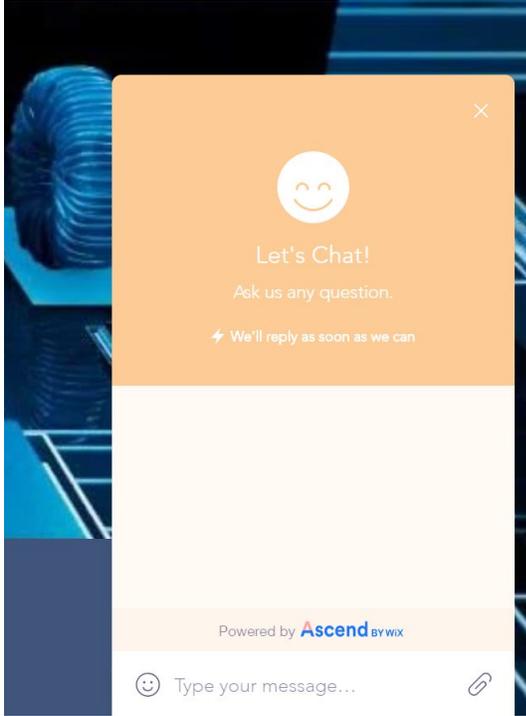
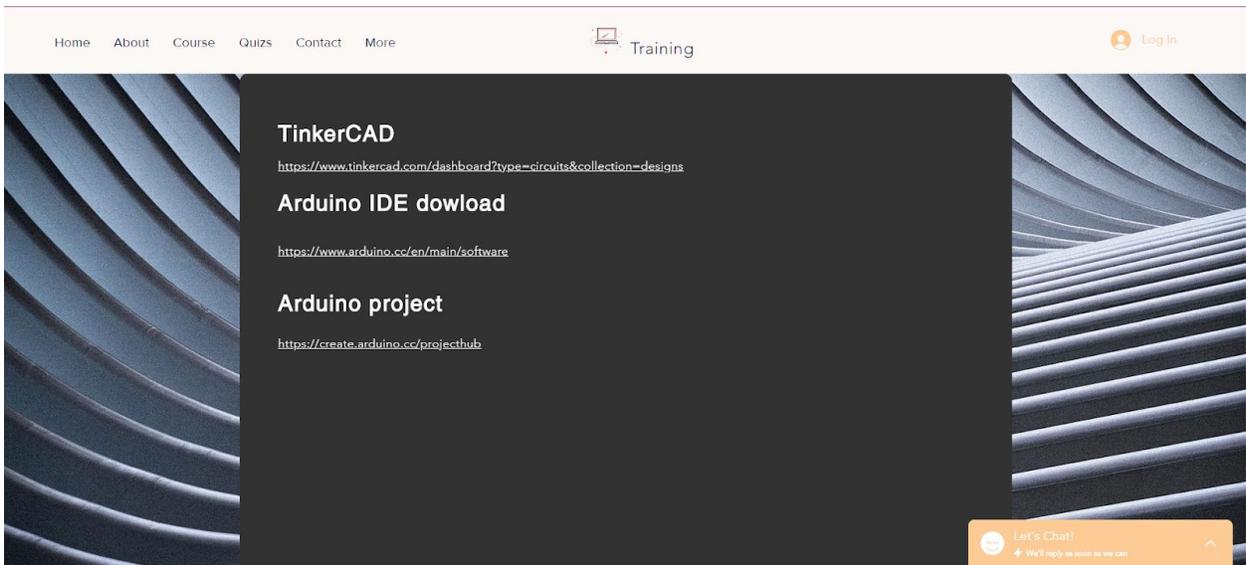


Figure 8



To see full website visit (<https://pleve082.wixsite.com/mysite>)

Quality standard

Regulation

First of all, our online module is built and improved based on client needs, which means once we deeply analyze and understand the client's needs, we will be able to meet the minimum requirements. Also, during the client meeting, we can get the term feedback after we build each term's prototype. Based on the feedback, we can make changes and improvements on our next prototype until it fits the requirements of clients.

Structure & Interface

Yes, the navigation of our website is intuitive, logical, and consistent. We have icons at the top of our website that students can use to navigate through every part of our website except for the quizzes. The quizzes are available after finishing each module. Students can pick which course they want to do. They can also choose to complete the courses in order. If the students are bored in a particular module they can go to the next module this helps keep the students engaged. Active learning is encouraged by giving students the option to test out their designs on tinker cad windows (embedded on the website) or on their own.

Teaching & Learning

The website provides sufficient information on each of the video tutorials. The information includes the list of equipment used, the code that was used to program them and all the instructions needed to replicate the tutorial. With the help of our tutorials the students will gain a strong base on how to use Arduino. This base helps them create new projects that are tailored to their needs.

Technology & Accessibility

The technology that we have integrated into our online module is a video series of the different chapters that allows the users to listen to the lesson if they wish to not read or has special needs. Also, we integrated an online simulator of Arduino to allow students to get "hands-on" experience from their home. With the Arduino simulator it does meet some of the accessibility standards but we are still trying to figure out how our online module can be accessible to everyone with or without special needs.

Assessment

At the end of each chapter, the user completes a quiz based on the information just delivered to them. We will have a record of how the user scores on each assessment, to track the users process through the lessons and to see how much they are taking in on their first, and for some, second attempts.

Support

Our product provides assistance in many different ways to support the user's education. First we have put contact info on the home page that supplies email address and phone numbers. In addition, a live chat box has been created for a quicker response time with a TA to help with any questions the users have. Moreover, a comment section has been created in every lecture to allow students to leave their comments on that lesson and possibly provide other hints to help other students to complete the exercise. Finally, it is similar to the comment section but we have created a forum page to allow users to access a bigger community to communicate on more general subjects about the workshop.