Deliverable C.1

Date: 5/24/2020

GNG 2101

Presented to:
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By:
Group Z11

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Functional decomposition

Design Criteria

1. Provide an introduction to soldering tools and steps
    - Needs to introduce the basics of soldering in an easy to understand tutorial/explanation
    - Needs to identify and explain the tools
    - Needs to go over all of the important safety details
2. Online solution simulates accurate real-world soldering
    - Needs to have high fidelity
3. Students attending the workshop will spend a maximum of $20 on the tutorial
    - Price cannot exceed 20$
4. Open source tutorial
    - Available to a large number of students
    - Easily obtainable
5. The tutorial answers common questions
    - FAQ sections will be a part of the tutorial
6. The tutorial contains steps of the real workshop
    - Needs to include concrete examples of soldering
    - Needs to include safety details
7. The tutorial includes a hands-on section
    - Needs to have a section where the user can interact with soldering
8. The online workshop will be around 90 minutes

Tasks

1. Introduction
2. Hazards (Possibly part of introduction)
3. Soldering Practice
4. FaQ
5. Test
6. Distribution

Ideation

Daniel:

- Evolution: Based on previous soldering courses, develop a program that is capable of interactive soldering experiments and enhancing the idea of real-life soldering.
- Synthesis: Based on online soldering courses and online chem labs develop a game of both teaching and interacting environments for soldering.
- Morphological: Use existed online courses about soldering to morph a better online course, with real-life hands-on or virtually hands-on software to enhance the idea.

Shivam:

- AR/VR-based app for soldering where the user can do some lessons at their own leisure (Can guess google cardboard).
- Interactive online tutorial (Play a video and the user must answer questions), Similar to the prelab videos for this course.
- 20 dollar kit which has a soldering iron, solder, and some wires along-side tutorial videos (Youtube). The user can follow along as the youtube video progresses

Jacob:

- VR based game (somewhat interactive AR/VR game/simulation to learn the basics of soldering)
- An interactive computer game where lots of smaller levels/games are used to teach the user the basics of soldering one concept at a time
- Interactive video tutorials (guided online tutorial, the user answers questions and makes decisions, preset videos will play depending on answers and decisions, etc)

Viktor:

- SCAMPER: Create a virtual game that follows real-life physics for soldering so that the player may interact with soldering in a semi-realistic way.
- Evolution: Create Soldering kits that contain replicates of real soldering equipment made out of cheap material that has sensors built in to simulate soldering in a specifically made program. In summary, the replicates act as a sort of controller to the program.
- Evolution: A program that recognizes hand movements that can tell if the user is soldering a certain object correctly.
- SCAMPER: A mini-game compilation where each small game represents an important soldering technique. This can be demonstrated in the game series Wario-Ware.
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Parva:

- Watching Someone solder through their POV and choosing what they do, explain if it was the right or wrong choice and why
- Basics of soldering video which lets you click through the different parts of it, similar to the online modules we use with a quiz game
- Soldering simulator game that takes you through the process of soldering a circuit onto a board

Praise:

- A detailed video with a chat section for the viewer can comfortably ask questions
- A VR game that lets you have a bit of experience as to what soldering feels like. Probably, lets you use a smartpen or a something similar to visualize soldering
- Online tutorials that teach you in different learning stages and the user can also ask questions.

Analysis

Names	Idea's	Pros	Cons
Shivam	VR/AR	Provides a virtual sand-space which is interactive and intuitive	External hardware is required
	Interactive Video	Cheap, easy to make and provides an adequate amount of education	Do not provide hands-on practice
	Soldering Kit	Hands on practice with real solder	Costs 20 dollar
Daniel	Program	effective	Storage
	Online course	Effective, easy to make, open-source	Would be costly
	Game	Fun, interactive	Requires extra work
Jacob	VR/AR	Fairly accurate and effective compared to real workshop	Difficult to design, much less accessible to most users due to the hardware required
	Interactive Game	Fun and simple way to have an interactive learning experience	Difficult to make, not very accurate to real soldering
	Interactive video tutorial	East to make, effective and information-dense	Is not nearly as accurate or efficient compared to real soldering; doesn't transfer the same information
Viktor	Game	Fun and interactive	Fidelity compromised Not very professional

	Physical kit	High fidelity	Cost Difficult distribution
	Camera A/R	High fidelity Interactive and novel	Hard to make New technology
Parva	POV Soldering	Make mistakes and learn, Looks like real soldering	Not much fun
	Video + Quiz	Information dense, allow us to control time	Not very interactive, not like real soldering
	Soldering Sim	Fun to play, effective, accurate to real soldering	Hard to make, short
Praise	Video with a chat section	Interactive	No hands-on experience
	VR game with pen simulation	Real hands-on effect	High cost of production
	Online tutorials	Effective, cost-free	Could get boring

Global concepts

Online Course (Videos + Soldering kit + possible lab)

Introduction: what's soldering, what's the tools that are required, what different types of solder exist and how does it affect the soldering process, how to create a solid soldering joint.
Videos: Showing how soldering is done correctly, and a few examples.
Game: An online game that provides tools that can be used to do soldering.
Or
Soldering kit: We would create a soldering kit under 20 dollars which would have a cheap soldering iron that has variable temperature, the kit will also include solder (Lead-free and flux infused solder) as well as a desoldering pump and steel wool. The set could also include some wire (Stranded or Regular) and a wire stripper.
Videos: Showing how soldering is done correctly, and a few examples.

VR (Videos + Labs)

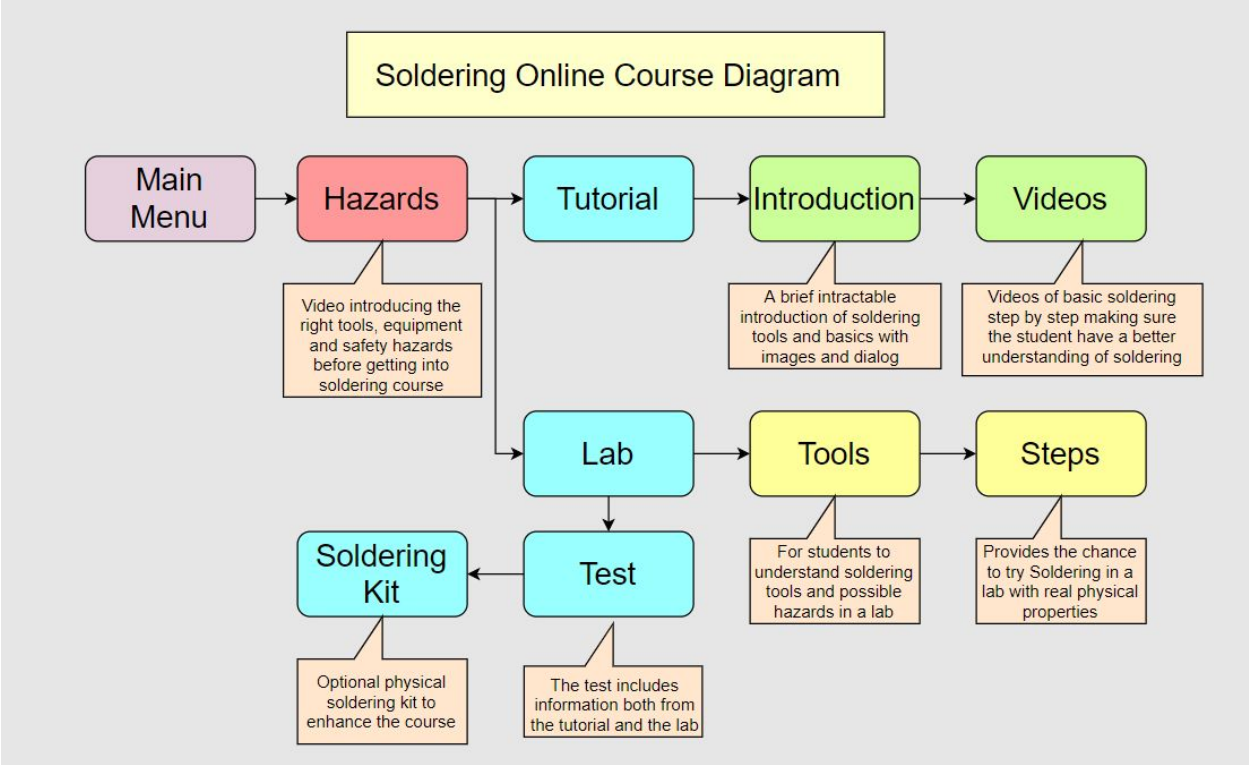
Introduction: what's soldering, what's the tools that are required, what different types of solder exist and how does it affect the soldering process, how to create a solid soldering joint.
Videos: Showing how soldering is done correctly, and a few examples.
Game: A virtual environment that provides tools that can be used to do soldering, and provides real world physical property to enhance realism.

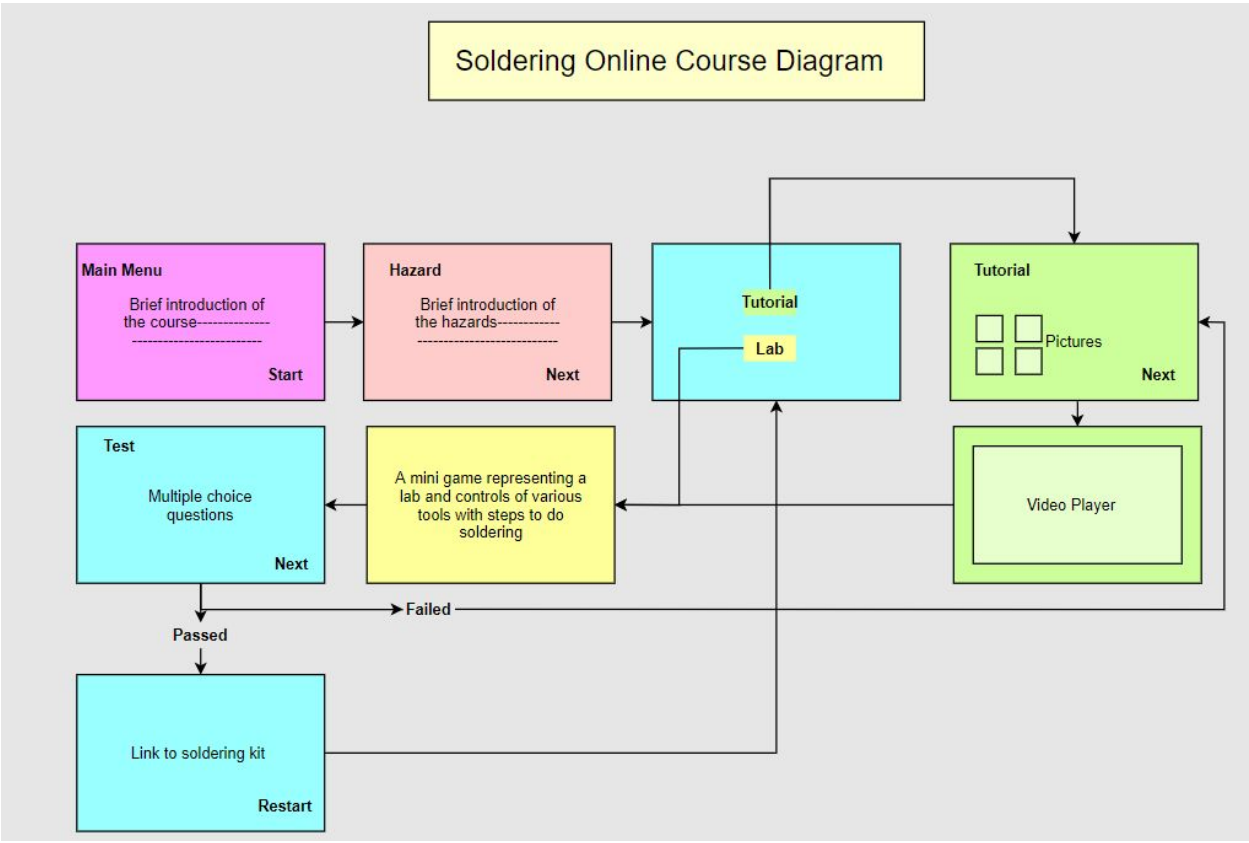
Screening

Online Course (Videos + Soldering kit + possible lab)

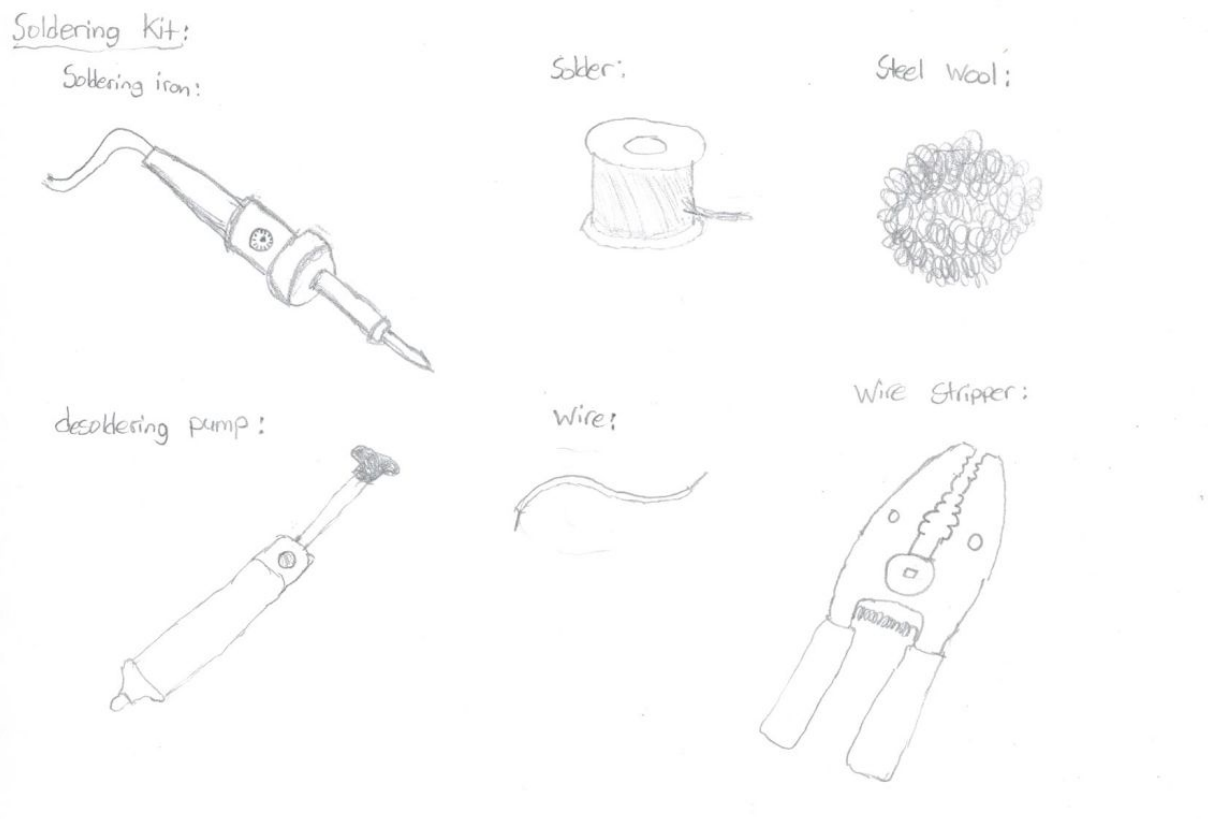
Hazard: Introducing possible hazards that could be caused by soldering tools, and list the equipment that's needed for the soldering lab to prepare students for future labs.
Introduction: what's soldering, what's the tools that are required, what different types of solder exist and how does it affect the soldering process, how to create a solid soldering joint.
Videos: Showing how soldering is done correctly, and a few examples.
Game: An online lab that teaches soldering step by step and provide the tools needed.
Or
Soldering kit: We would create a soldering kit under 20 dollars which would have a cheap soldering iron that has variable temperature, the kit will also include solder (Lead-free and flux infused solder) as well as a desoldering pump and steel wool. The set could also include some wire (Stranded or Regular) and a wire stripper.
Test: At the end of the lab there will be a test for both the informations from the tutorial and the information from the lab to make sure the students are truly ready for the real soldering experience

Visual representation

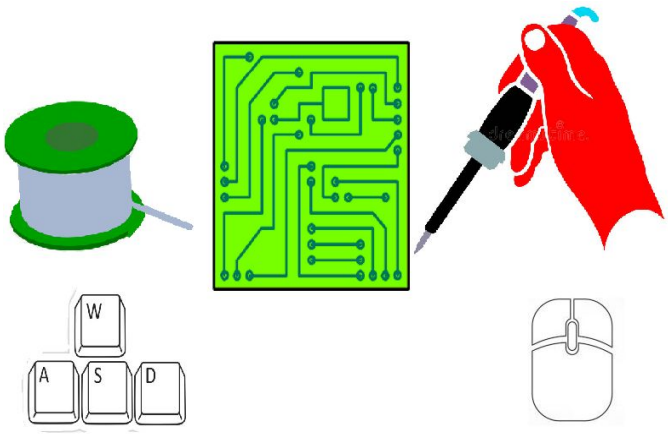




Soldering kit



Game



Target specifications

Metric	Relationship
Time	Our design provided different lengths for different users, Choosing the lab option would greatly reduce the time of the online course, but the tutorial option would provide the students with a far more advanced understanding of soldering. We provided the option to skip the tutorial so that the students who are confident with their own skills can save some time, but if they do not pass the test at the end of the lab, they will be forced to go through the tutorial.
Effectiveness	Compared to other similar products, our design doesn't only provide the students with tutorials and videos, we also provide them with a functional lab to play with. It will greatly enhance the material, and put those skills the students learnt to use. It wouldn't be as time efficient (since the students will have to go through the lab once), but it would improve the quality of the work.
Rating	This metric would be hard to achieve a good score on since students never want to study; however, we will do our best to make the online course an enjoyable and educational memory. Using concepts like games and the soldering kit can improve the students' outlook on tutorial.
Accuracy	We are planning to provide a lab with realistic physics to match with the real world. It would require a lot of work and would not look as real compared to physical products, but it does allow students to get a feel of what soldering would be like in the real world.