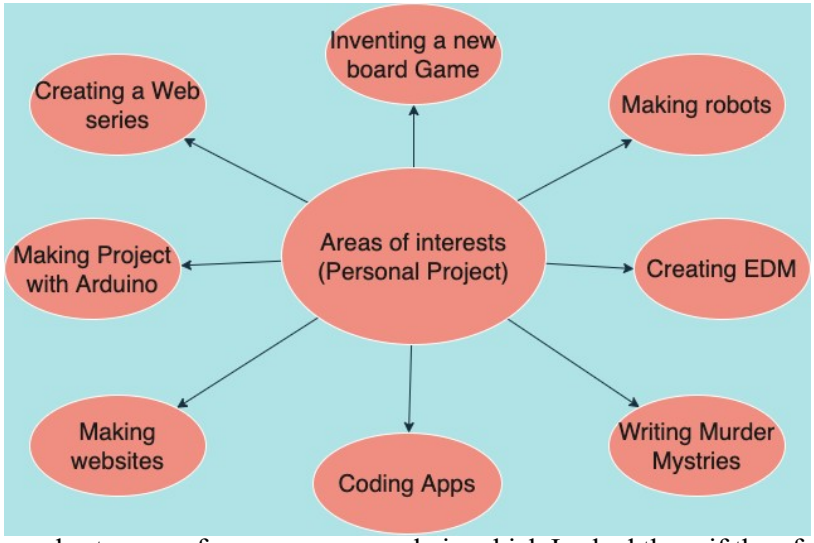
MYP PERSONAL PROJECT- CREATING A HOME SECURITY SYSTEM

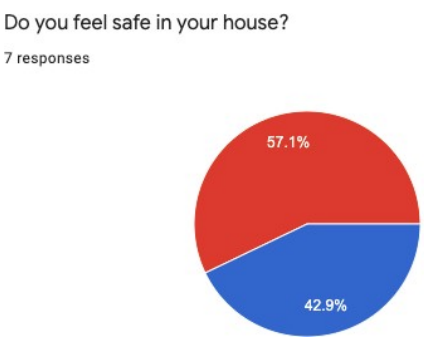
Criterion A- Planning:

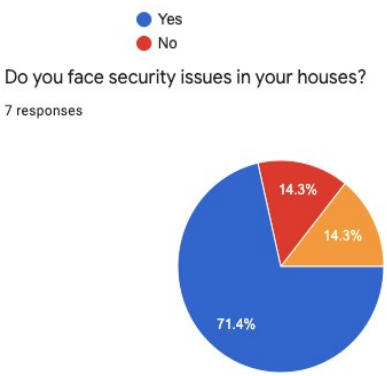


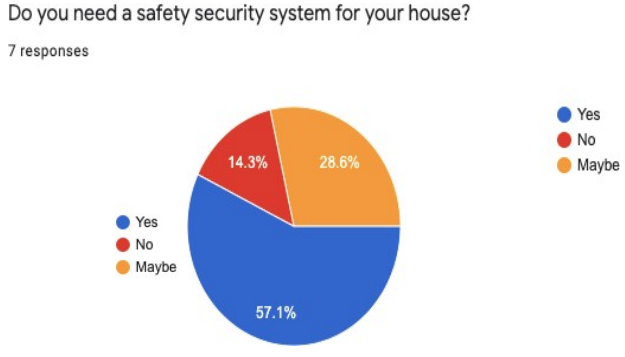
When I was thinking about topics for my Personal Project, I had a few ideas which popped up in my head, they were all related to my hobbies and everything I was interested in. I had ideas which mainly were related to computers, AI and automation. I have been interested in computers since I was 10 years old, I have created various websites and apps. I have learnt and tried many microcontrollers throughout the past 5 years, but one which I really enjoyed was Arduino. I spend a lot of time researching on different microcontrollers and try out new online software's to learn about the microcontroller. I have built many online circuits in different hackathons for solving problems throughout the lockdown. I took a short survey from a group people in which I asked them if they feel safe in their house, if they face security issues and if they need a safety security system for their house. From this survey I found out that 71.4% of the total people do face security issues in their houses. 57.1% of the total people do not feel safe in their own house and finally 57.1% of the people need a good security system for their houses. This gives my product another need to be made. I have past experience with Arduino. In the VEX Stem challenge 2019-2020, I created a hand controlled by a glove for the disabled. People with one hand could use this other hand for tasks, which are hard to perform with one hand. After conducting this survey, I decided to choose what I wanted to do for my personal project. The product which I'll be creating has coding, uses Arduino and is a microcontroller robot. I will be creating a home security system, using Arduino. I have decided to make a robot as it the most feasible idea in the limited time I have, and it is not only beneficial for me but also for the people around me. It is an idea which is required to be developed and made brought out to the public to ensure safety. In India it is estimated that every 3 minutes, there is a burglary, robbery or a break in. which gives my product a need to be made.

Image Source: YouTube. (2017). Arduino Project: Robotic Hand. YouTube. https://www.youtube.com/watch?v=mnurLBNWIdc.

Excerpt from the survey







My learning goal: Throughout this journey I want to learn about the coding language of Arduino. I am familiar with it, but I haven't used it in a long time I have forgotten a lot of it. With that, I would also want to learn advanced modules in Arduino such as the Liquid Crystal library which is used for LCDs and the keypad library which will be used while coding my product's keyboard. These are all software related concepts, when talking about the hardware, I want to learn about the new equipment which I'm not familiar of, such as the active, passive and flame buzzers.

My Product Goal: My product goal is to reduce the rates of these crimes. I will be making a prototype of a security house lock for safety reasons. As soon as a person walks into their house, he/she will have 30 seconds and 4 trials to fill in the password/ scan his/ her fingerprint or else the buzzer will go off and notify the whole neighborhood. Along with my product, I hope my learning goal will help me gain more skills to making more mechanical experiments as well as an open exposure to a new language of coding, Arduino. After making this experiment, I hope that in evaluation I will be able to develop a more secure and safe environment for all, of course this Idea will only be a prototype but if it works completely, I will work on making a proper secured professional home security system.

Project Success Criterion: To consider my success criterions, I will need to draw back to my goals and purpose for my project. I wanted to use my skill of software and hardware developing to make a change and improve society. I started off with researching on successful projects made with Arduino which have helped solving problems. I came through a few different problems solved robots such as a **Safe distance alarming and automobile and a braking system for automobiles** and **A home lighting system controlled by a smart device.** (automation). These were profession products and looking at these, I set a few more realistic goals which are hard to reach but not impossible.

Product Success Criterion	Details
Functionality/ Output: **1. The security system works completely works**	It is really important that my security system functions completely or else there will be no point for making this system. I want to be sure that this security system functions fully. I will measure that this system functions fully by testing it a lot of times, and asking others to test it as well.
Safety: **2. There are no wires out of place and the circuit is safe.**	In my prototype, it is important to make all the wires hidden and not seen or else it can be messed up easily and it will also remove the elegance of the design and product. I will measure this by reassuring that all the wires are well hidden and I'll insert a small box on the wall for fixing the wires, if anything messed up and for changing the batteries.
Aesthetics: **3. The box created keep the wires safe should be well designed**	There will be a box on the wall to make sure the wires are hidden and safe, that box should be well designed and looks appealing. I will measure this by asking my Visual Art's teacher on how much he can rate it and ask for feedback on what all could be improved.
Content: **4. The display of the message which needs to be shown is clearly readable**	I will be using an LCD to show the message "Enter the password" and a seven-segment display show what the user has inputted on the keypad. I will measure and ensure that both my LCD and the seven-segment display is working while testing the system.
Content **5. There will be a timer to remind the person that he is running out of time.**	I will add a timer to the circuit which will tense and stress the burglar that he has limited time, so he better run away. I will measure and ensure that my timer is working while testing the system.
Technical Skills:	I will be coding on Arduino's software. The language which I will learn is linked to C++, and after learning, while coding, I'll insert comment's in the

6. I will make sure my code is neat and easily understandable for everyone.	code to help me understand what I have done in each line so whenever I make a mistake, it will be easy to fix. I will measure that my code is easy to understand by asking someone who is unfamiliar of the language and him/her if they understand what I coded.
Technical Skills: **7. I will use many different sensors to trigger different function.**	Then the door opens, an LED will start flashing and when the LED Flashes, the Ultrasonic sensor will sense that someone is coming and will start the timer. I will measure and ensure that my timer is working while testing the system.
Maintenance: **8. Changing the battery every 4 months**	To make the security system made by Arduino functional, the battery must be changed every 4 months. It's important to maintain the security system for it work properly.
Time/ Deadline **9. I want my security system to be completed by the end of October with all the feedback collected.**	I must complete my personal project product which is a security system made using Arduino by the end of October 2021, so I get enough time to write my final report and take feedback from an expert, my target audience and my supervisor.

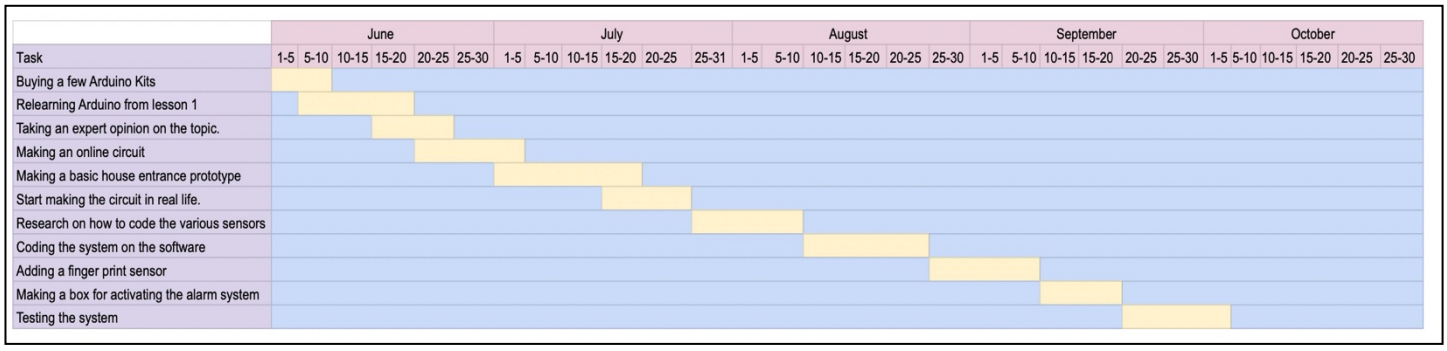
1-2	3-4	5-6	7-8
Aesthetics			
Minimal aesthetics have been used; a basic room was made with no creativity.	Basic aesthetics have been used; a basic room was made with low level of creativity.	Satisfactory level of aesthetics has been used, an advanced decorated room was made with satisfactory level of creativity.	High level of aesthetics has been used; an advanced decorated room was made with high level of creativity and an amazing design
Content			
Minimal content has been provided; a basic buzzer is being used for incorrect attempts of the password.	Basic content has been provided; a basic buzzer is being used for incorrect attempts of the password and an LCD display is being used for displaying a message.	Satisfactory content has been provided; a buzzer is being used for incorrect attempts of the password and an LCD display is being used for displaying a message as well as a Red LED for each wrong attempt.	High level content has been displayed; a basic buzzer is being used for incorrect attempts of the password and an LCD display is being used for displaying a message as well as a Red LED for each wrong attempt. Lastly there is a timer for each wrong attempt.
Technical skills			
The code is untidy and not understandable.	The code is untidy, but comments have been used in some places.	The code is tidy, and comments have been used in the whole code to explain each line.	The code is tidy with intents used as well as comments to explain the whole code, line by line.
Safety			
There are bare wires, all over the room and the circuit can easily be messed up with.	There are plastic coated wires, all over the room and the circuit can easily be messed up with.	There are plastic coated wires, on the walls of the room but are visible.	There are plastic coated wires, which are barely visible and cannot be messed with.
Functionality			
The security system does not function. None of the sensors work.	The security system barely functions are most sensors are faulty.	The security system is functional, but some sensors are faulty.	The security system completely functions, including all sensors.
Timeline			
I complete the project in January.	I complete the project in December.	I complete the project in November.	I complete the project in October or before.

Plan/ Process for achieving the product: All projects necessitate the development of a plan to attain their objectives. The success criteria were a key aspect of my strategy for achieving my objectives since they provided me with clear specifications for my final products. Likewise, I created an action plan that included a brief explanation of each activity I expected to do during the course of my project at a given time. The tasks on my action plan were mostly centered on the making of my security system as well as achieving the learning goal I had set for myself. My action plan is a simple table which has a brief description of my task, how long it will take to achieve the task as well as what the task is. This action plan has helped me in completing my product in a specific time span and not delaying tasks. I had also used the reminders app on my laptop for making sure that all the tasks were done in time.

S. No.	Task	Description	Time Required (Estimated)	Time Required (Actual days)	Progress	Justification of changes made	Relevant Success Criterion
1	Buying a few Arduino Kits	I will research on different Arduino kits and find out which is the best one for me to buy with the sensors I require to have.	5-6 Days (depends on delivery date)	8 Days	Done	No changes made.	None
2	Relearning Arduino from lesson 1	I will revise and relearn Arduino through a few videos and PDF's through scratch as it has been a few years and I've forgotten a lot about Arduino.	10/12 days	22 Days	Done	No changes made.	Technical
3	Taking an expert opinion on the topic.	I will take an interview with a technical expert on his view of my idea before taking it foreword so that he/she can guide me and give a few tips on how to go about my product.	1/2 days	3 Days	Done	No changes made.	None
3	Making an online circuit	I will start off my project with making a simple online circuit which will be a basic wireframe of my final product. I will add all the sensors on the wireframe to help me with the final products wiring and it will also tell me if I require more sensors, so I'll order them in time.	3/4 days	2 Days	Done	No changes made.	Functionality/ Output
4	Making a basic house entrance prototype	I will be making a mini-room with cardboard in which I will put my prototype security system for testing	6/7 Days	14 Days	Done	No changes made.	Aesthetics
5	Start making the circuit in real life.	I will start the wiring of all sensors to the breadboard and to the Arduino UNO board	2/3 days	1 Day	Done	No changes made.	Technical, functionality, content

6	Research on how to code the various sensors	Some of the sensors will be very new to me so I will require to research on how to code them, I'll learn that from Google and YouTube.	2 days	4 Days	Done	No changes made.	Technical
7	Coding the system on the software	I will start coding the final system on the Software.	6/7 days	15 Days	Done	No changes made.	Technical
8	Adding a fingerprint sensor	I will add an additional fingerprint sensor on the alarm system so that it won't annoy the house owner, he/ she can directly enter if the fingerprint matches	5/6 day	Was removed	Not done	Removed the figure print scanner as the required resources for adding the scanner were not available.	Technical
9	Making a box for activating the alarm system	Similar to a switch board, this system will also have its own operating board in case any wire gets moved and also, to change the battery.	2/3 days	1 Day	Done	No changes made.	Aesthetics, safety
10	Testing the system	I will test the security system to make sure it works, and I'll take random tests, sometimes after 30mins, sometimes after 3 hours, etc. to make sure it's working and realizable.	1 day	1 Day	Done	No changes made.	Functionality

Grant Chart (Made with google sheets) of estimated time required



Criterion B- Applying Skills

I began my project by making a research plan to help me arrange the information I needed to collect. The research was aimed at determining how I could ensure that I met my learning goals of Learning the basic concepts and language of Arduino, then using its concepts to make a home security system.

Research Plan

My learning goal: Learning the basic concepts and language of Arduino, then using its concepts to make a home security system.
Research question: What all must a person know to learn Arduino and then make a security system from it?
Complementary Questions: **Arduino (Success Criteria – Technical Skills) (Primary and Secondary Research both)** - Which language is used to write codes for Arduino? - How to run the Arduino IDE on Mac? - How to use the Arduino board? - How to make a circuit using Arduino? - How to connect different wires to the Arduino board? - How to make a buzzer work using Arduino? - How to connect the Computer with the Arduino board? - What all functions are used in the Arduino programming language? - How are Arduino circuit diagrams created? - How to connect the buzzer with the coding?

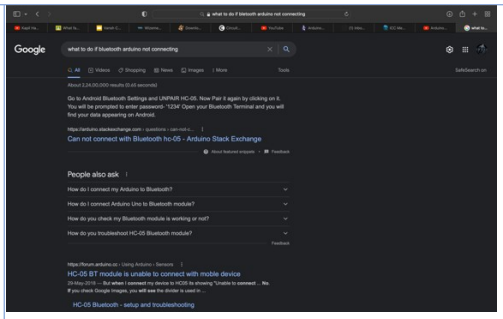
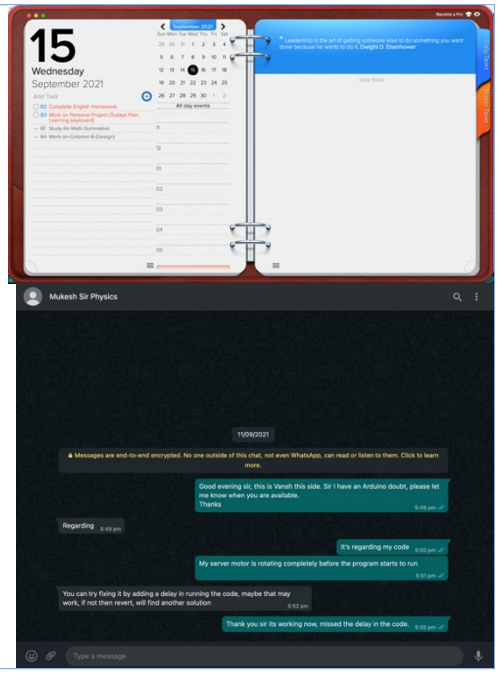
Sources used:

Learning goal: Learning the basic concepts of Arduino, then using its concepts to make a home security system.		
Product: Creating a prototype of a security lock for system reasons using Arduino.		
1. Learning goal:		
Sources Used	Description	Link to success criteria
Source #1: https://quadstore.in/wp-content/uploads/2020/04/SUPER_STARTER_KIT.zip	A booklet and source code for the fundamentals of Arduino programming and hardware. It has both the circuit diagram as well as the source code provided and a helpful explanation of the what the written code it. It has also a helpful explanation of what is the purpose of all the pins in the microcontroller. Alongside this, the booklet also explains all the parts which I will need in my final product, it explains all the coding and wiring of all the elements which I will use for my final product.	Technical skills
Source #2: https://youtu.be/zJ-LqeX_fLU?t=6409	A video tutorial that explains the fundamentals of Arduino programming and hardware. The video's narrator explains everything while live-streaming examples of projects; he program's and builds them, and I make the projects alongside with him. Basic Arduino variables, constants, functions, structures, buttons, and properties are covered in this video. This tutorial is designed for newcomers for this language and who are learning it for the first time.	Technical skills
Source #3: https://www.arduino.cc/en/Tutorial/HomePage	A website that includes lessons, examples, and explanations for all aspects of Arduino. Everything is explained step-by-step on the website, from the simplest to the most difficult topics. The website covers subjects such as "if statements," "loops," and "operators," and many others. These are the basic aspects and functionalities of the Arduino programming language, which may be used to create any product using its microcontroller.	Technical skills
1. Product goal:		
Sources Used	Description	Link to success criteria
Source #4: https://www.circuito.io/app?components=512,11021	This is website through which I made my circuit for my final product, this website has also helped me in giving me the basic idea for what the source code of my final product will be like. It not only helped me with the code, but it was also very resourceful hardware wise and it helped me make sure my wiring was correct.	Technical Skills
Source #5: https://www.youtube.com/watch?v=1LUj7gRxcqU&t=5s	This video was a similar product to my final product, I analysis this video and look all the what the video creator has done to make this product and started off similar to this video, but then I changed the whole design and	Technical Skills

	added my own components which had messed up the whole coding and because of that many such errors occurred.	
Source #6: https://techtotinker.blogspot.com/2020/07/project-idea-door-lock-security-arduino.html	This website was a similar product to my final product, I analysis this website and looked at what the code diagram as well as the circuit diagram for reference, this website was really helpful me as it had explained more about my project and it taught me more about all the components which I will use for making my final product.	Technical Skills

Evaluation of Research Plan: My research plan was extremely helpful. With the help of my research plan, I was able to answer most of the Research questions. From the research plan, I had found out that Arduino is a language which is very similar to C++. I can make both online and offline circuits of Arduino. The online circuits can be made on websites such as circuit.io and offline circuits with a brought Arduino kit. The online circuit can code itself as we wire the elements but the coding of the circuit when done on an offline Arduino, has many bugs. I had also learnt about how to make a buzzer work. While researching on how to make a buzzer work, I learnt on the different pins on the microcontroller and what the purpose of each pin id. I got to know that the 5V pin is the positive terminal of the microcontroller while the GND (ground) is the negative terminal of the microcontroller. The challenges faced while researching was, that I was having many problems with the circuit of the LCD where 16 wires were being used along with a potentiometer, but then I took advice from an expert who helped me by introducing me to an I2C module which converts al the 16 wires into 4. Another challenge which I was having was coding the servo motor, it kept on rotating even if I had filled in the wrong password, for that I had gone and researched and watched different videos on how to work with the "if" statement. From overcoming my challenges, I developed communication skills as I had talked to an expert for help on my problems which I was facing. I used 2 different methods to analyze some resources which I used. I used both CRAAP (Currency, Relevance, Authority, Accuracy, and Purpose) and OPVL (Origin, purpose, value, and Limitation) methods as not all sources can be reliable, so analyzing them is a necessity, or else I'll end up using unreliable sources. Through analyzing the different sources, I developed research skills and critical thinking skills. Research skills were used as I surfed the website to find information off of the website, as well as thinking skills to find out how reliable the sources are by comparing the limitations of the website.

ATL Plan for Learning goal			
What do I need to do?	ATL Category and cluster	ATL Strategy	ATL Statement
Make reminders to stay on track.	**Self- management skills: organization skills**	-Keep and use a weekly planner for assignments	I set multiple reminders to remind me to focus on learning the coding language to attain my learning goal. These reminders assisted me in achieving my learning objective. As a result, I've improved my self-management and organizational skills.
Find resources and courses related to Arduino.	**Research skills: Information literacy**	- Collect, record, and verify data	To attain my learning goal of learning the Arduino programming language, I utilized Google to search up numerous topics that I didn't understand. As a result, I've improved my research skills.
Receiving feedback on my product idea.	Communication skills:	- Give and receive meaningful feedback	I used to consult a technical expert when I couldn't discover a solution to my problem on the web. This technical expert is also my Physics teacher in school My social skills improved because of this. This helped me in achieving my learning goals.
Reflecting and managing my time deadlines so that I don't get stressed.	**Self- Management skills: Affective skills**	-Practice strategies to reduce stress and anxiety	In the end of the day, I always reflect in my personal journal the tasks I completed and the tasks which are pending as well as what went well and what didn't go that well. This journal has helped me in reflecting back and helped me in knowing where I struggle in Arduino and where I can improve. Reflection has helped me in achieving my learning goals.

Evidence	  

CRAAP Evaluation of Sources:

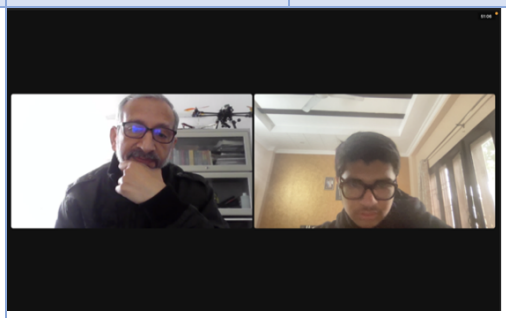
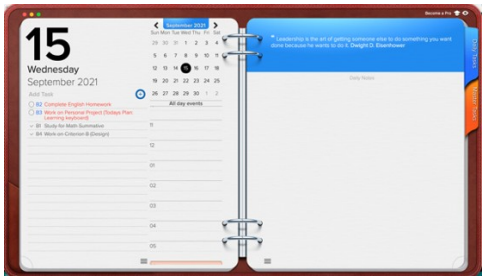
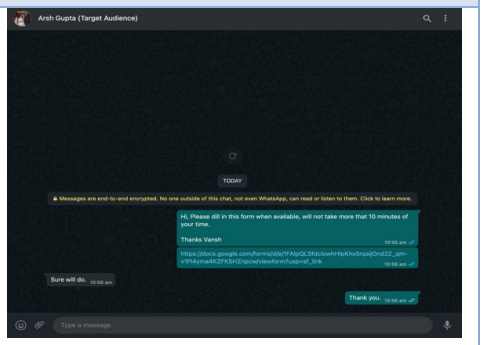
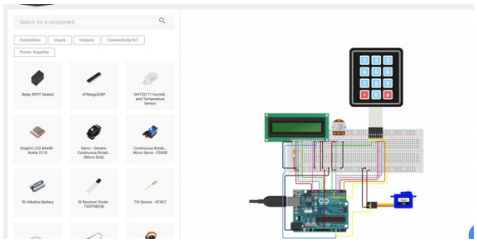
CRAAP Evaluation of Sources: [Source#7: https://www.exploringarduino.com/content1/ch1/](https://www.exploringarduino.com/content1/ch1/)	
Currency	This website was published on the 2nd of Jan in 2011. It gets updated every time there is a new lesson ready to be uploaded. My topic required this information as it is helping me achieve my learning goal of learning a new language as well as my product goal, as a few chapters of this guide can help me such as the LCD chapter. Furthermore, the links in this website are all completely functional
Relevance	The information on the website relates to my topic as it helps me learn about the programming language of Arduino which is my learning goal. The target audience of this webpage are the people who are learning Arduino such as myself. I've seen many different sources before determining this is the one, I think this one is best as it has the source code provided as well as a tutorial video. This is different from all other sources because not all sources have both a tutorial video and source code provided. This source would not be very hard to cite, as it is a webpage.
Authority	The author and publisher of this page is Jeremy Blum who is currently the Senior Vice President of Engineering and Principal Electrical Engineer at Shaper. Jeremy received his master's and Bachelor's degrees in Electrical and Computer Engineering from Cornell University. The author qualified to write on the topic as his qualifications say that he is an electrical and computer engineer. The author has embedded all his social media links through which he can be contacted as well as there is also a contact-us page on the website. The URL gives information that it's a commercial website hosted worldwide as .com is used worldwide
Accuracy	This information has been used by many people as the person's YouTube video has one million + views and 14K+ likes on his video. You can verify this source from another source as there are many similar sources like this on the programming language of Arduino. This is a tutorial-based website which makes it unbiased towards anything. It's just there to shade knowledge on the topic. There is no grammatical and spelling mistake which shows that this is written by a reliable source
Purpose	The purpose of the information provided on this website is to teach and share a bit of knowledge the publisher has on Arduino. The author does make his intention clear of teaching about the programming language of Arduino. Finally, the information in this website is fact based.

OPVL Analysis of Sources:

OPVL Analysis of Sources:

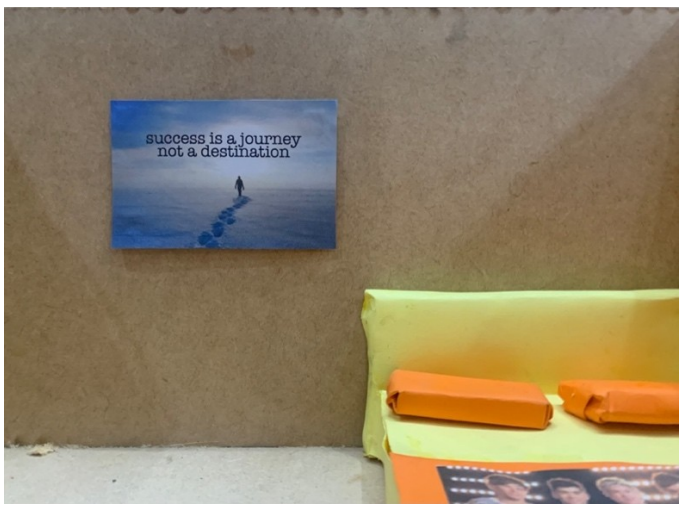
Source#8: https://www.youtube.com/watch?v=d8_xXNcGYgo&list=PLGs0VKk2DiYx6CMdOQR_hmJ2NbB4mZQn-	
Origin	This source is from YouTube. This video was published on the 27th of June 2014. The author of this video is Paul McWhorter. The author's credentials and qualification are mentioned on his website link given in the bio of this video. This makes the source reliable as it brings more assurity to the source, not just that, the views of this video is past 1 million and the comment section is very positive.
Purpose	The purpose of this video is to educate people about Arduino. The purpose is very clear as the video maker had taken us on how to code an LED step by step which made the video and my understanding very clear. The information in the video is fact based. Furthermore, this video may be objective as the person is sharing his point of view on teaching Arduino, using personal experiences as a motive to share his point. This document exists to help in assisting the target audience on how to use Arduino, it includes both the software and hardware requirements and instructions on how to use Arduino. The author creates this to help all people learning Arduino, and makes this video a resource to reference, if stuck. He chose to create a video as a video is the most convenient way to explain what the code is and what the wiring should be like as he is performing it right. The intended audience for this video is all people learning Arduino from lesson one.
Value	From this source, we can say that this author is credible as he is a verified profile on YouTube as well as he has past experience in Arduino. This source was published in 2014 which indicates that the information presented in the video might be a bit outdated. This source was created to help beginners learn how Arduino works. The author doesn't represent any particular side of a controversy or event in this source. It's a fact-based video. This source is very useful as it explains how Arduino works in detail in simple words. The author also teaches both hardware and coding aspects of Arduino. This can be applied to my personal project as it is helping me achieve my learning goal which is learning about how Arduino works and its programming language. The information in the source can be verified by going to another source with the same topic and checking if it includes the same type of information like in this source.
Link	This is a very realizable source, looking at its likes, channel subscribers, views and comments. This is a partly subjective and party objective source, as it completely based on personal experiences and it's a person experimenting his/her opinion live, as well as it is objective where he mentions facts such as "GND is ground where negative supply of power is given to the circuit.

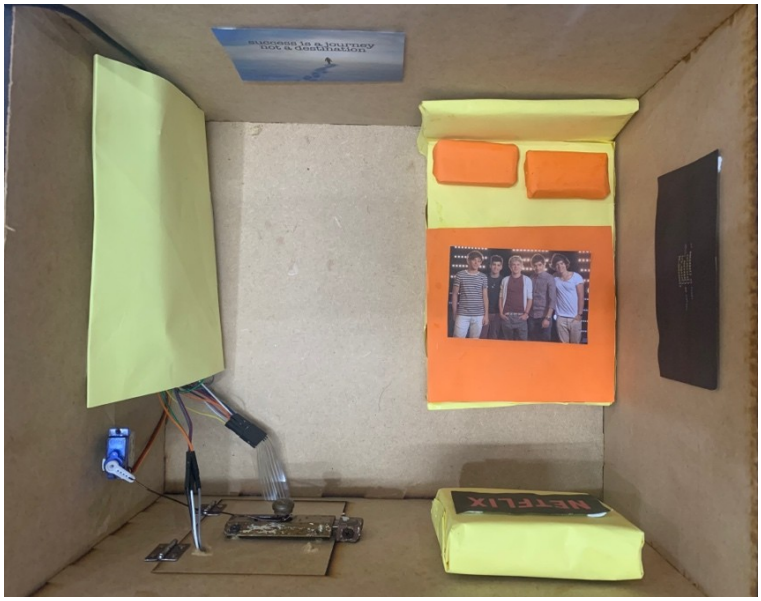
ATL Plan for Product goal			
What do I need to do?	ATL Category and cluster	ATL Strategy	ATL Statement
Collaborate with technical expert, receive feedback on my circuit diagram and edit all changes to be made.	**Communication skills (primary research)**	- Collaborate with peers and experts using a variety of digital environments and media	I have shared my circuit with an Arduino expert for him to share his opinion on my project and since it was online, through zoom, it was hard to communicate, but it helped me in developing my communication skills.
Create a form for target audience, justifying the need of this product.	**Communication skills (primary research)**	- Use and interpret a range of discipline-specific terms and symbols	I improved my communication skills while asking my target audience to fill in my form. I used different techniques so that I would get more responses. I added that it would take very little time of theirs to reply, which persuaded me to get more responses. My communication skills have helped me in getting responses for making my product.
Creating a circuit diagram with all the feedback implemented.	**Thinking Skill: Critical thinking skills**	- Use models and simulations to explore complex systems and issues	I used circuit.io to create the final product's circuit/design idea before coding it. This was quite helpful in achieving my product goal since it showed me precisely what I needed to code on Arduino and reminded me of which components I already had and which I needed to purchase.

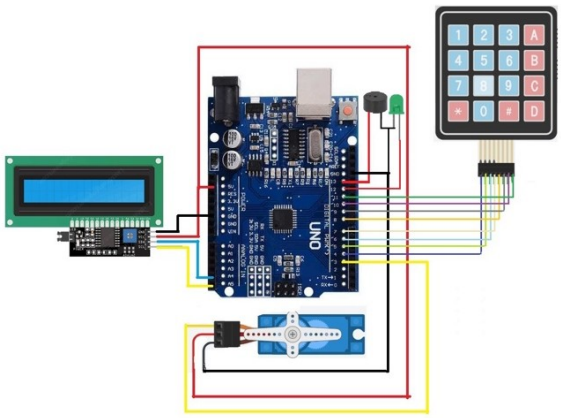
Managing all deadlines, summative and all projects together with a daily journal	Self- management skills: organisation skills	-Keep and use a weekly planner for assignments	The dates of making my product were crashing with my summative and assignment submission dates, so I started keeping a journal in which I wrote all the to-do tasks I planned for the day, and this developed my self-management skills as well as my organisation skills because I started organising my tasks as per their priorities and their submission dates.
Evidence	 		 

Criterion C- Reflection

My Product: My product is a home security system which has certain features like an LCD display, a buzzer buzzing for every wrong attempt to fill in the password etc. The basic functionality of the product is that a code will be filled with the help of a keypad and if the code is correct, then the servo motor will pull the lock open. The lock and the servo motor are connected to a metal wire so that it is strong enough to be able to pull the lock. The server motor rotates 180 degrees so that it's enough power to pull the lock open. Once there is enough power to unlock the lock, the dock becomes unlocked. If the code filled in is incorrect, then the buzzer starts buzzing. As seen, there is an LCD display which says, please enter the password and as the password is filled in, there are 4 aspheric representing the 4-digit code. Since it is a prototype, I have created a room with wood. The room has a bed to make the product look more aesthetically better. I have also a box to keep all the wires closed and for keeping the circuit safe so that no one will be able to mess with the wiring and try to break by deactivating the buzzer.







```
#include <Keypad.h>
#include <Servo.h>
Servo ServoMotor;
int position = 0;
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27, 16, 2);
const int buzzer=13;
int led=12;
String password="2468";// Change Your Password here
String temppassword="";
const byte ROWS = 4;
const byte COLS = 4;
char keypressed;
char keyMap[ROWS][COLS] = {
  {'1','2','3','A'},
  {'4','5','6','B'},
  {'7','8','9','C'},
  {'*','0','#','D'}
};
byte rowPins[ROWS] = {4, 5, 6, 7};
byte colPins[COLS] = {8, 9, 10, 11};

Keypad customKeypad = Keypad( makeKeymap(keyMap), rowPins, colPins, ROWS, COLS);
```

Impact of the product on me: Making this product had a great impact on me. This journey of personal project itself had a very huge impact on me. I learned a whole new language as well as, I learned how to work with new hardware and new functions and features which I have never used before. I developed many skills such as Self-management skills and organization skills as I set multiple reminders to remind me to focus on learning the coding language to attain my learning goal. These reminders assisted me in achieving my learning objective. Furthermore, I worked on my research skills to attain my learning goal of learning the Arduino programming language, I utilized Google to search up numerous topics that I didn't understand. Moreover, I worked on my social skills and communication skills as I used to consult a technological expert when I couldn't discover a solution to my problem on the web, I went and found out that the Physics teacher in my school was an Arduino expert and I had consulted him, in doing such, it impacted my social and communication skills. Lastly, I had worked on my Thinking skills as I used circuit.io to create the final product's circuit before coding it and making the physical circuit. This was quite helpful in achieving my product goal since it showed me precisely what I needed to code on Arduino and reminded me of which components I already had and which I needed to purchase.

My learning from the product: While making the product, I learned many new skills which will help me for future coding related projects. I learned a whole new language. I learned the language Arduino, which is completely new to me. I didn't just learn about the various functions my product has, but more. I complete a few different crash courses on Arduino just to get familiar with the language. The second skill which I learned was creating online circuits, using circuit.io. This is a very helpful skill which can help me in the future as I will be working more and more on different Arduino projects, so while planning the wiring circuit and the coding, I will have a brief idea of what the final product will be. Lastly, I learned how to convert a complicated 16 wire LCD into a 4 wire LCD. This is a skill which can help me achieve my success criterion of "no wires out of place and the circuit are safe" as less wires are used, then more chances of having a safer circuit as there will be very less chances that my wires will be out of place.

Challenges: The biggest challenge I faced was time management. I kept a day-to-day journal for my daily updates on my project but still I had huge problems managing my time. I think this was because of the errors which I kept on getting. I had huge challenges connecting with my expert as due to Corona Virus, we had to meet virtually, and it is extremely hard to show the circuit wiring online and fine the mistakes. Not just the wiring, but even the code debugging had problem, as physically it is easy to communicate and discuss in-person the problem and what could be the solution. A huge problem and challenge I faced was making the timer as I had spent a whole week on figuring out how the timer would work but I just couldn't debug the code or find out where in the circuit, I had gone wrong.

How will I take this project forward?: I can take this project forward by, making it in real life. For now, this product is only a prototype product, but I can take this forward by making it with more advanced hardware than Arduino as Arduino is only a mini microcontroller, it would be risky to use Arduino for making a real-life home security system. I can take this project forward by using a more advanced microcontroller and I can extend this project by adding a timer which I was unable to the last time I tried.

Product vs Success Criterion: Marked as per level descriptors (self)

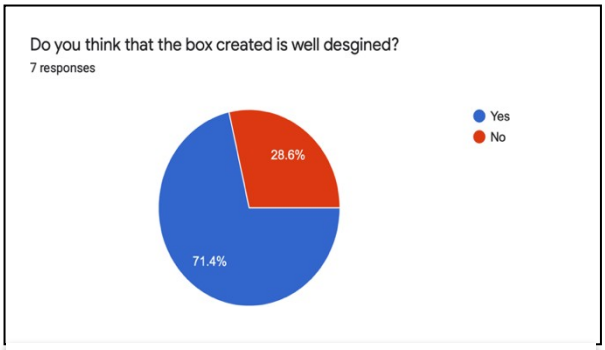
Product Success Criterion	Level descriptor standing
The security system works completely works.	8/8 I have tried using my security system many such times and it works completely works. Not just me, I few people whom I've asked to have all tested my product and it works for them as well.
There are no wires out of place and the circuit is safe.	6/8 I have tried my best to make sure that none of my wires are hanging out bare. All the wires are safe against the wall and all of them are covered with plastic, I've made sure that I didn't use bare copper wires as they will be giving out current, if I use bare copper. A few wires were visible, but there was no other option to hide them.
The box created keep the wires safe should be well designed.	6/8 I have made a box to keep all the circuits and wires covered and it is well designed as I have added patterns to make it aesthetically appealing.
The display of the message which needs to be shown is clearly readable.	7/8 I have added an LCD display which makes it very easy for the security system to make sure that the password he/she is filling in, is being taken in by the system and if in the password is correctly filled in, then the LCD clearly displays Login successful.
There will be a timer to remind the person that he is running out of time.	0/8 I was unable to make the timer, although I did give it a try multiple times, but the timer function was just hard to code. I had tried to code it a few different ways, but it just wasn't working. I had also contacted with an Arduino Expert for the same purpose and tried the different solutioned mentioned, but none of them worked.
I will make sure my code is neat and easily understandable for everyone.	8/8 The code is neat and easily understandable as I have used comments for easier understanding of the code. The code has basically been translated in English. The technical expert had also mentioned that the code was neat and understandable.
I will use many different sensors to trigger different function.	8/8 I have used quite a few different sensors for using different functions. A few of which are the keypad function, the LCD display, the LED, the servo motor and lastly, I added the buzzer. All these different sensors trigger various functions, i.e., the buzzer buzzes when the password inserted is incorrect, the servo motor rotates when the password inserted is correct.
Changing the battery every 4 months.	8/8 I was successful in changing the batteries of the security system every 4 months. It's important for the batteries to be changed in the given period to maintain the product and increase the efficiency of the product.
I want my security system to be completed by the end of October with all the feedback collected.	5/8 I was unable to complete my product by the End of October due to other different actives such as CAS, sports and academics, so an area of development could be my time management skills. Even though I kept a diary for my daily updates, I had many errors so due to debugging those, it took a bit more time than completing by the end of October. I completed the product by the 5^{th} of November.

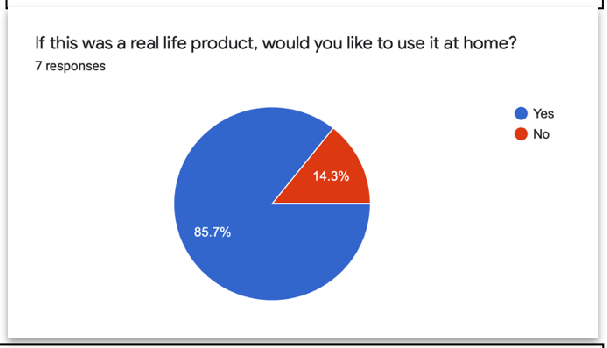
Expert Evaluation

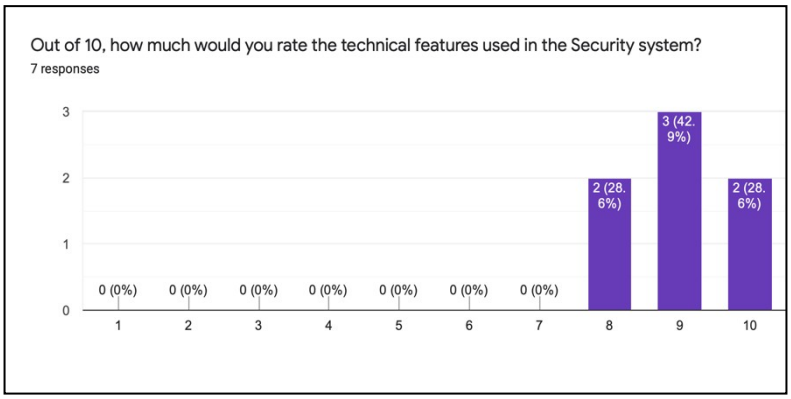
Product Success Criterion	Level descriptor standing
The security system works completely works.	8/8 Through what I could see on an online platform, I could see all the features of the security system function completely.

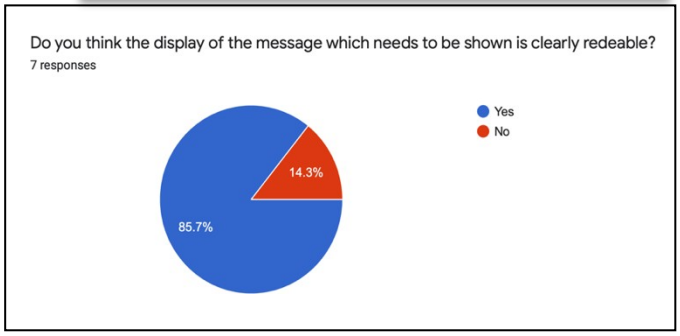
There are no wires out of place and the circuit is safe.	6/8 The circuit is completely safe, and none of the wires are out of place so the circuit cannot be messed with.
The box created keep the wires safe should be well designed.	7/8 There is a box designed for keeping the circuit, and it look aesthetically appealing.
The display of the message which needs to be shown is clearly readable.	6/8 The message is clearly visible on the LCD display, and it is big enough which shows how clearly the message can be read. The brightness of the LCD could have been improved, though most of it was visible.
There will be a timer to remind the person that he is running out of time.	0/8 There is no timer feature added on the security system.
I will make sure my code is neat and easily understandable for everyone.	8/8 As per the code which I saw, it was very neat and even though it doesn't matter much in Arduino, there are intents used which formats the code.
I will use many different sensors to trigger different function.	8/8 There are quite many sensors used in the security system. These sensors are triggering many functions to take place
Changing the battery every 4 months.	8/8 I cannot judge this criterion, but I can see a new battery being used, so I am expecting that the student has followed this success criterion
I want my security system to be completed by the end of October with all the feedback collected.	5/8 The student mentioned that he has not completed the security system by the end of October. This product was completed in the start of November.

Evaluation of the survey: From the survey, it has been found out that 42.9% of the target audience gave my security system a rating of 9/10 in terms of its features. 28.6% of the people gave it a full 10 out of 10 and finally 28.6% of the people gave a rating of 8/10. This means the target audience liked the features of my security system. 71.4% of the people think that the box will well design and created, and 28.6% of the people think that it isn't. This shows that most of the people did like how my security system is designed and created which is a very positive thing. Along with this 85.7% of the target audience think that the display of the message which needs to be shown is clearly visible. However, 14.3% of the target audience think that it is not visible. Finally, 85.7% of the people would use this security system at their home if it was a real-life product and not a prototype and 14.3% of them wont. This shows that the target audience really liked how my product functions and how it can increase safety of various houses. To improve the technical skills in the security system, I will add more features to it such as a feature from which you can create your own password. To improve the design of the box, I can make it aesthetically attractive by adding different designs and colors









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