CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	Tree Hardy Farley Borthwick
Project title	Project Oversight

ntroduction

You can use this workbook to plan, record and evaluate your project. Fill in the sections as you complete your project. If you are filling the workbook in electronically, all the boxes should expand so that you can add as much detail as you would like. If you are filling it in by hand, feel free to add extra sheets if you don't have enough room.

All scientists and engineers are creative. They use scientific and technical knowledge, make decisions, solve problems, evaluate and communicate their work. Throughout your CREST project you'll need to use and show these skills too.

1 – Planning your project: Set an aim for your project, and come up with ideas about the best way to achieve that aim.

2 – Throughout your project: Tell us about what you did, how you organised the project and what you found out.

3 – Finalising your project: These questions help you think about what you've done and learned during your project.

Top tips!

- Record what you do in each session. This will help you to talk about your project with your teacher and keep track of your progress.
- If you don't understand something or your project isn't going the way you planned, ask your teacher or project lead for help.
- It doesn't matter whether your project idea 'works' or not – but it does matter that you can explain why it did or didn't work.
- **Do not** upload documents or images that could be used to identify yourself e.g. photos of you or your classmates, personal contact details etc.

Managed by: BRITISH SCIENCE ASSOCIATION

Supported by: urenco The Energy to Succeed; UK Research and Innovation

1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project?

Not hit into objects. We will do this by changing the robots direction whenever it gets close to an object. ~~We~~ we aim to code our robot to avoid foreign objects that will be randomly placed.

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know?

This technology could be used for things such as ~~automated vacuumes~~ industrial automation or agricultural robotics.

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

LOOP

We ~~will~~ will not move our robot at full speed so its battery is conserved.	We will make multiple paper obstacles	If it gets close to an object it stops for ~~seconds~~ several seconds
Arduino gets close to another object	write your aim here To create a robot that avoids foreign objects.	After it ~~stops~~ stops, the Arduino will rotate slightly
The Arduino then continues to move forward ~~but it is facing another object. Then it will proceed to repeat~~	This process loops until the Arduino is NOT facing an object	The Arduino will ~~scan~~ measure its distance again and if it's close to the object it will turn again (slightly)

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
I ~~found out that~~ can find out if an Arduino can map / detect objects, changing its direction in the process.	We gathered our information from a wide range of trustworthy websites.

1.5 Which of your ideas is the best way to achieve your aim?

will we use our best ideas to ~~achieve~~ achieve our aim. ~~Our best~~ Our best ideas within our ~~circumstances~~ circumstances are:

- we will use C++ to ~~design~~ program how our Arduino acts.
- we will use an ultrasound sensor to detect when ~~the~~ the Arduino comes close to a wall.

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

We chose to approach ~~our~~ our ideas in this way as we were limited to the amount of space on our chase. ~~Our~~

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
How the Arduino reacts to an obstacle course / obstacles in its path.	Make the Arduino detect objects close to it and make it turn.	We will keep a constant measurements for distance
How well our code works with the Arduino.	We will upload our code to our Arduino and see how well it performs.	We will keep the same speed for both wheels. We will keep a save for our code
The Arduino's capabilities	We will subject it to a series of complex tasks	Same Arduino Same type of code (C++).

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

Live wires, we ensure to not mess on will our wires and play will any circuits. This will minimise the risks of any type of electrical damage (e.g. electrocution).

2 - Throughout your project

Now you have planned your project, it's a good idea to break the project into tasks that will need doing and organise:

- When each task needs to be completed by
- Who does each task (if working in a team) and if others may need to help you
- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished ?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February* ~~[illegible]~~	*Feb 5th*
Coding / programming	Hardy	Help from NCO, team and internet	ChatGPT, Teamwork	21m 21st April	
Testing the Arduino	Farley	Free space / set-up	Teamwork Arduino's code working.	21m 21st April	
Notes; planning and organisation	Tree	Help from NCO, Notes	Teamwork paper	21m 21st April	
Arduino's layout / design	Borthwick	Internet Notes	Teamwork Internet Layout preview	21M 21st April	
Research	Everyone (whole Team)	The internet / websites	Google, ChatGPT,	21M 21st April	
Construction of obstacles	Tree Hardy	NCO	Paper or objects around the room	21M 21st April	

2.2 Record what you do as you carry out your project - This might include records of more detailed research, diagrams, descriptions of methods used, photos/videos or even weblinks for blogs. Think about any decisions you had to make, maybe to overcome a problem, and record how you came to your decision.

We made a couple diagrams to show/plan out how the Arduinos ultrasound sensors will correspond with its surroundings. We used a wide-variety of websites for a collection of useful information and research. We had several 10 minute group discussions. We overcame the problem of choosing our initial project by collectively weighing up the options and carefully and diplomatically selecting the option.

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

Test was a success, however, the ultrasound distance changes and a much better turn

Test was a great success, however it didn't hit the wall and it was not driving straight

Test went badly, the robot started to go into the chair and went in circle

3 – Finalising your project

An important part of CREST projects is thinking about what you've done. At the end of your project, use these questions to help you reflect on what you did. Remember it's OK to say you didn't get something

3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

Our ~~we~~ project was partially successful. This was because we ran out of time and had to ~~a~~ slightly tweak the code so it could avoid walls.

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

Our project could have a good impact on other people as it could be used in agricultural purposes.

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

We could have spaced out our time & to ~~do~~ have completed anything more efficiently.

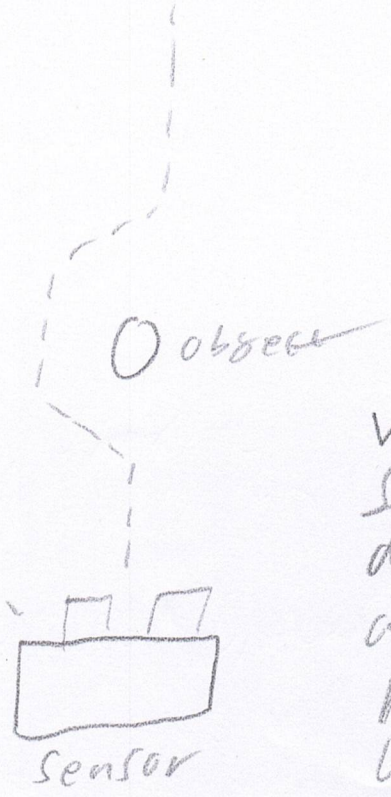
3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

Coding radio signals is harder than previously thought.

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

We presented it to the group.

Space for further notes/ drawings/ reflections (optional)...



When the sensor detects an object, the motor spin in opposite direction to turn the machine around the object.

CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	Cpl Ethan Norgrove Cdt Kaylem Rose. Cpl Jack Harker Cdt Jake Norman.
Project title	Project Laika

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- Make Arduino car drive around a racetrack.
- Make a remote control car that a team member can drive around a track.
  ↳ developing the hardware of our car to make it RC.
  → Planning code that we can rely on to drive car.

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know?

- Developing teamwork skills → problem solving.
- Strengthening our cognative thinking.
- Building projects from the ground up and fitting individual parts of research together.

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

• If we cant use the tranceivers then we can connect the thumbstick directly to the car with wires.	• Program the exact route that we want our robot to take. ↳ autonamously. or	• Use ~~transceivers~~ transciever to send and recieve a radio frequency.
	write your aim here • Make RC car drive around a racetrack.	• Plot a track using a rope that we can get our robot to follow. - impossible, robot wouldn't detect rope
		Thumbstick used for directional inputs. ↳ X and Y axis.

U.S Sensor can only 'see' distances
not ideal for control

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
• Transciever has a range of 100m • Tranciever Moduele = nRF24L01 • X any Y signal can be sent which allows us to use two different directions of motion. • Code to make the robot do basic movements can be reused.	How to Mechatronics (Google) Arduino website. Arduino IDE → code software.

1.5 Which of your ideas is the best way to achieve your aim?

• Using a Tranciever moduele (nRF24L01) and Arduino thumbstick to make an RC car.

↳ Researching how each individual component works then piece them together.

↳ use the code that we have already created in the IDE to aid with the basic movements.

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

• Helps to simplify the process as much as we can.

• Have a more in depth understanding of the components if we research them individually.

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
• Test the communication between the two Arduinos.	• Making a basic code that sends something from one to another.	• Same amount of power as sending and recieving module.
• Inputs from the thumbstick.	• use code from research to set up the arduino ~~[illegible]~~ thumbstick so it can print out inputs.	• Make sure they are on the same system. • They all have the same power supply.
• Converting thumbstick input into an output.	• Combine code of both previous tests.	• Make sure that all of the systems have the same power.

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

- Use reduced power to keep the batteies at a safe temperature.
- Ask staff to check our wiring for our circuit to ensure that there is no short circuts.

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- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished ?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February*	*Feb 5th*
Administration of workbook.	Cdt Rose	Advice from team on their views of project.	Feedback from team. pen Notebook.	21/04/24	21/4/24
Hardwore and wiring of components.	Cdt Norman.	Making sure that everything is safe to be used.	Wires Arduinos Circut components. Safety equipment.	21/4/24	21/4/24
Coding the RC car in the software.	Cpl Harker	Researcher to find code structure and example codes.	IDE code software. laptop.	21/4/24	21/4/24
Researcher of ideas for the coder and hardwore.	Cpl Nargrove	Direction from team as to what they need to know.	Access to internet and existing code.	21/4/24	21/4/24

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- We assembled a robotic car using the electrical components that we were provided with for our project.
- Used the IDE software to construct a code that would instruct our robot to move in basic motions. We got help with this from the instructors on the course.
- We directly wired the thumbstick to the Arduino circuit board to act like a wired remote control.
- As a team, we then made a code that would work with the thumbstick

- After trying to use the tranceivers to make a wireless controller, we decided that it was not possible in the time that we had left for our project. We then rethought and came up with the tethered remote idea.

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

- After testing the connection between the tranceivers, we thought that it would not be possible to innovate our ideas into something that would make them work.
- We then wired the thumbstick to a seperate Arduino to test the inputs that we were making on the thumbstick.
- We had success with the thumbstick inputs so we hardwired it into the original Arduino board on our car.
- We then made some code that would react to the basic inputs on the thumbstick.
- This makes the robot move and do what we expected it to do.

3 – Finalising your project

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3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

Yes, We managed to make an RC car that moves under our direction. However, this did not happen until we rethought ~~out~~ our idea as it was not possible to configure the car with the trancievers in the time scale that was given.

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

- It could interest others to have an interest for STEM → eg. via social media or being told on squadron.
- It could give people new ideas and broaden their horizons as to what kind of ~~careers~~ careers they could take.

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

If we were going to do this project again, we would use more simple components so that we could make the radio control more effective. We would also do more reserch during the project about coding and the different components that we would be using in the project.

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

- Learned the C++ coding language on the IDE software.
- How to wire a circuit and ~~download code~~ download code from the software onto the hardware.
- Working together as a team to complete a goal without expeience

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

At the end of the project we will communicate our project to other cadets on the course via a presentation with a demonstration of what our car does and how it works. We will discuss what challenges we have fared and how we have overcome them. We can also share what we have done on social media to advertise our project.

Space for further notes/ drawings/ reflections (optional)...

CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	CPl Gordon, CDt Marshall, Cpl Sale CPl McCully
Project title	Operation "The horse"

Introduction

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Top tips!

- Record what you do in each session. This will help you to talk about your project with your teacher and keep track of your progress.
- If you don't understand something or your project isn't going the way you planned, ask your teacher or project lead for help.
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1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project?

R.C. car with parking sensor
↳ coding buzzer to link with ultrasonic sensor
↳ distance changes buzz frequency
↳ coding different functions
↳ forward, backward, turn left, turn right
link to remote control

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know? Because we want to push and test our own skills and improve while working

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

transmitter transceiver thumbstick Arduino	reciever transceiver NRF 24L01	thumbstick coding different directions as different functions
	write your aim here R.C. car with Parking sensor	car servo motors Motor drivers Arduino wheels
Remote coding transmitter → reciever motor drivers ← Arduino servo motors	remote transmitter reciever	car coding servo motors → Motor driver → Arduino

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
how to ~~setup~~ wire in the transmitter how to wirein the reciever	

1.5 Which of your ideas is the best way to achieve your aim?

figure out thumbsticks
then sort the transceivers
figure out how to code the recieving transceiver to the motors

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

it is the most straightforward approach to complete and achieve our aims.

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
the transmission and reception of the thumbstick	Have the ~~carson~~ thumbstick connected to the monitor to show the input directions	some directions tested Same thumbstick used Same battery used.

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

standing on the components — go into an empty room
tripping over the robot
electrecution — not wiring things in while powered

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Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished ?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February*	*Feb 5th*
Administration of Workbook	CPI Sale	1 ~~st~~ of materials each person ~~[illegible]~~ day 2	Bolts, screws,	21 April	21 April
Hardware and wiring of connect	CDt Marshall	~~The~~ the other we to the car and the open Relay	Wires	21 April	21 April
Coding the RC in the Software	CPI McCully	He used the Laptop to code the car	Laptop	21 April	21 April
Researcher of ideas for the code and the Hardware	Cdt Gordon	He gave ideas to the coder for the car	~~Arduino~~ cardewino	21 April	21 April

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- we assembled a robotic car using electrical components provided by the wing
- we used C++ to code in an IDE to code the instructions for our arduino UNO
- We connected our thumstick directly to the arduino as we couldnt code the transmitters correctly

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

- During our testing we found that an RC car wouldnt be possible
- This cursed us to switch to the integrated joystick which worked, then didnt, then got fixed
- This allowed us to input basic controls (forward, Back and right)

3 – Finalising your project

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3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

Somewhat successful, we ended with a car with 3 directions of movement

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

· It could inspire other cadets to try out a stem event

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

· We would be less ambitious and try an easier project

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

· We have learned how difficult but fun STEM can be

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

· We are sharing our project through a presentation describing the process we followed

Space for further notes/ drawings/ reflections (optional)...

CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	White, Partoriadel, Short and Lawrence
Project title	Fantabulous 4

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- **Do not** upload documents or images that could be used to identify yourself e.g. photos of you or your classmates, personal contact details etc.

Managed by: BRITISH SCIENCE ASSOCIATION

Supported by: urenco The Energy to Succeed; UK Research and Innovation

1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project? our aim is to make a maze runner that can be both autonomous ~~quote on quote~~ and manual. It could be activated by a 'hand motion'

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know?

It links to problem solving as we try to combine multiple unique ideas at once. It also encourages sociability.

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

~~Have the~~ Have the robot switch to manual or sentry from a hand movement	Have the robot time itself around the maze to see how long it takes to get round	
	write your aim here ~~Manual and sentry maze runner~~ To make a fun maze runner that tests our skills	

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
• There is a maze running competition in japan • Lots of youtube tutorials out there	Google, staff team, other cadets

1.5 Which of your ideas is the best way to achieve your aim?

Our idea for our aim is a maze running robot that can switch from autonomous to manual or vice versa

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

Its more interesting than just a standard maze runner and it requires us to think a bit differently.

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
Testing whether it'll switch from autonomous to manual	Wave our hand in front of the sensor	Exposure of hand
Test the Joystick	Move it around in manual mode	Using fresh batteries
Test the maze running ability	Have the robot roam around the maze	The same maze

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

Make sure staff and our team check if our robot works fine

2 - Throughout your project

Now you have planned your project, it's a good idea to break the project into tasks that will need doing and organise:

- When each task needs to be completed by
- Who does each task (if working in a team) and if others may need to help you
- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished ?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February*	*Feb 5th*
Coding and Software	CPI Lawrence	Staff to help with any error in coding	Access to websites and computers	April 21st	April 21st
Filling out logbook	CDT White	Team members to help answer a question	Access to pen and workbook	April 21st	April 21st
Researching	CDT Partoviadel	Looking up what videos and websites to look up	Access to mobile phone and internet	April 21st	April 21st
Wiring	CPI Short	~~Which~~ Staff to check to see if wiring is correct	Access to cables which connect the arduino board to a device	April 21st	April 21st

2.2 Record what you do as you carry out your project - This might include records of more detailed research, diagrams, descriptions of methods used, photos/videos or even weblinks for blogs. Think about any decisions you had to make, maybe to overcome a problem, and record how you came to your decision.

- Looked up diagrams and youtube videos on how to connect the PS2 arduino joystick
- Also looked up on how to code the joystick on how to make it do what we want it to do

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

- We found out we needed to use a bread board to fit in all the necessary cables to our arduino ~~joys~~ board

3 – Finalising your project

An important part of CREST projects is thinking about what you've done. At the end of your project, use these questions to help you reflect on what you did. Remember it's OK to say you didn't get something

3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

Our project went well but needed improvement in some areas like the wheels as one was getting more power than the other

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

An impact our project has on other people is that cars could take inspiration on it. As autonomous cars are getting popular but you may want to switch auto pilot off

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

One thing we could do better for next time is make the task a bit more within our reach as there was quite a few gaps in our knowledge.

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

We have learned from this project is that ~~getting~~ communicating with your team constantly is key.

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

A presentation to the rest of the course and staff team.

Space for further notes/ drawings/ reflections (optional)...

CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	Anna Callanan Olivia McHale Alex Rudland
Project title	The Light Road

Introduction

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All scientists and engineers are creative. They use scientific and technical knowledge, make decisions, solve problems, evaluate and communicate their work. Throughout your CREST project you'll need to use and show these skills too.

1 – Planning your project: Set an aim for your project, and come up with ideas about the best way to achieve that aim.

2 – Throughout your project: Tell us about what you did, how you organised the project and what you found out.

3 – Finalising your project: These questions help you think about what you've done and learned during your project.

Top tips!

- Record what you do in each session. This will help you to talk about your project with your teacher and keep track of your progress.
- If you don't understand something or your project isn't going the way you planned, ask your teacher or project lead for help.
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Managed by: BRITISH SCIENCE ASSOCIATION

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1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project?

Make the robot follow a torch light

1) Fitting the light sensors on to the robot
2) Coding the robot to move according to the brightest light
3) Testing

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know?

To gain knowledge on different uses of sensors.

Improve coding and robot.

To help those who can't (clearly) see clearly

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

Knowing limitations with light sensors + equiptment	responding to Problems + coming up with solutions	Fitting sensors without instructions
recording Project findings	write your aim here To make our robot follow the torch light.	Developed team work + programing Skills
Presenting our findings	Researching and referencing	Guide it through the dark using Phone torch.

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

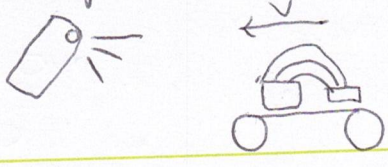
What I found out	Where I got the information from
• no one has done it before • found out the equipment we need. • How it will work.	Google - research that came up with nothing

1.5 Which of your ideas is the best way to achieve your aim?

Using light sensors and breadboards to make the robot car move due to a higher level of light intensity in a specific direction.

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

- We have the equipment available to attach the sensors to our pre-build autonomous car
- We have exsisting knowledge of how to make the car move and turn in different directions and we have found information to use the light sensors to code them and fit them properly.



1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
Test the coding of the light sensors	Serial monitor on the computer	use the same (~~code~~) code
The robot itself	dark room, flash a light a certain (~~dir~~) direction	Same robot, make sure room is dark.
~~Th~~ light sensors being fitted	move the robot around	N/A

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

Check with staff to make sure electricals won't short circuit
Check everything is secure
Don't use all motor power
Don't let batteries touch - unplug batteries when they aren't in use

2 - Throughout your project

Now you have planned your project, it's a good idea to break the project into tasks that will need doing and organise:

- When each task needs to be completed by
- Who does each task (if working in a team) and if others may need to help you
- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February*	*Feb 5th*
Test to make sure light sensors work	Callanan Buckton McHale Rudland	code	IDE	10.00am	10:00 am
code the light sensor and movement	Callanan	code	IDE	10:30 am	
connect sensors	Buckton McHale Rudland	build	Acess to tools/equipment	10:30 am	10:40 am
Booklet fill in	Buckton McHale Rudland Callanan	write	Pen + paper	10:30	12:00
testing the robot	Buckton McHale Rudland Callanan	test	dark room	12:00	12:10
finished product	Buckton Callanan McHale Rudland	done	finished	1:00 pm	1:00 pm 2:15pm

2.2 Record what you do as you carry out your project - This might include records of more detailed research, diagrams, descriptions of methods used, photos/videos or even weblinks for blogs. Think about any decisions you had to make, maybe to overcome a problem, and record how you came to your decision.

In the project we had to overcome the issue of how to attach the bread board to the car* We had issues with the wires coming out and the light sensor falling out, we over came it by using longer wires which fit better. ~~creating a bracket~~.

*We overcame this by using a battery box and zip ties to attach it ~~horizontally~~ vertically on the front

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

We found that our robot was moving towards the light but the sensors weren't picking up all the light not our torch so we tried to solve this by adding dividers and working in a darker room. ~~[illegible]~~

3 – Finalising your project

An important part of CREST projects is thinking about what you've done. At the end of your project, use these questions to help you reflect on what you did. Remember it's OK to say you didn't get something

3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

Yes, we managed to make our robot follow the light and respond accordingly with the movement. We fitted the light sensors and coded the arduino using the IDE.

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

Instead of having to program robots on a course they could just follow pre set out lights. meaning people would spend less time on code

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

- We would try and be more self-sufficient and rely less upon the staff.
- Use our time more effectively
- We would take more care with fitting wires

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

- Developed my stem skills.
- How to code using the IDE with C++.
- What an arduino is and how to electrically connect it

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

- We will present our findings to the staff with all of us communicating a certain section to finish off our project

Space for further notes/ drawings/ reflections (optional)...

CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	Dodds Bainton Archer kinsopp
Project title	maze runner

Introduction

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2 – Throughout your project: Tell us about what you did, how you organised the project and what you found out.

3 – Finalising your project: These questions help you think about what you've done and learned during your project.

Top tips!

- Record what you do in each session. This will help you to talk about your project with your teacher and keep track of your progress.
- If you don't understand something or your project isn't going the way you planned, ask your teacher or project lead for help.
- It doesn't matter whether your project idea 'works' or not – but it does matter that you can explain why it did or didn't work.
- **Do not** upload documents or images that could be used to identify yourself e.g. photos of you or your classmates, personal contact details etc.

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Supported by: urenco The Energy to Succeed; UK Research and Innovation

1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project? make the robot go through a maze, go forwards, stop rotate 90° left or right, continue pathway. We want to find out how to turn the robot a certain amount of degrees.

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know? To test the capabilities of the robot and allow it to avoid obstacles in the maze. There could be large events within the community with different mazes as challenges. Test our coding skills.

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

plan manually which includes turns and delay	semi-autonomous so it senses a wall and avoids it.	some turns - make it more square so it doesn't get confused.
Create shapes such as a triangle or square to move around.	write your aim here complete a maze.	code so the robot can make the choice of which way to go.
Draw letter P if setup for obstacle course is unavailable.	add obstacles into the maze and code it so the robot avoids it.	make a remote control to control it and work it around the maze.

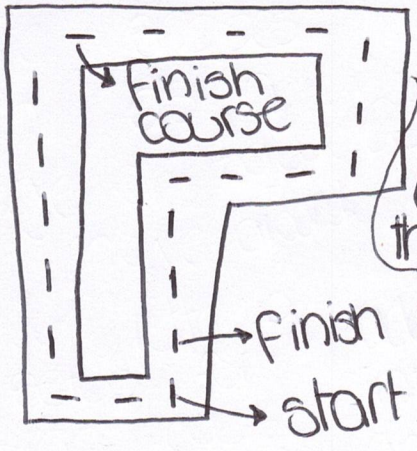
1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
Advantages & limitations of each project idea and how we can implement more detailed ideas into the main project plan.	Google ChatGPT code from yesterday

1.5 Which of your ideas is the best way to achieve your aim?

Fully programmed maze runner. It will be mostly manual but may add some autonomous features like random rotation.

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.



We chose this approach as we can continue to expand on the approach if we want to make it more complex.

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
speed & direction of motors.	We slowed the speed down in the code to ensure it moves in the correct direction.	Same room same obstacles
distance with sensors.	Increase/decrease distance so it stops in time and it doesn't crash.	Same course same speed same rotation.
battery life.	See how long it lasts with the speed of the robot.	same speed

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

Do not short circuit batteries.
Make sure the wires work correctly.
Keep hands away from live electrics.

2 - Throughout your project

Now you have planned your project, it's a good idea to break the project into tasks that will need doing and organise:

- When each task needs to be completed by
- Who does each task (if working in a team) and if others may need to help you
- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished ?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February*	*Feb 5th*
Maze building	Archer Kirsopp	making the walls stay up, reasonable size.	Paper/card. cellotape. stand.	11am	12pm
Coding	Bainton Dodds	google for new commands in C++.	Laptop. Arduino IDE.	~~2pm~~. 1:30pm	1:45pm
Testing	Kirsopp Bainton	Battery charge, change in codes.	Robot Batteries.	2pm.	2:15pm
Evaluation & Checks	Archer Dodds	A change in code, new perspectives.	View of code Wires on robot	After 2:30pm	2:35pm
Amend ideas (if needed)	Archer Dodds	Make idea suitable and successful.	Robot Code Paper.	1pm.	12:30pm

2.2 Record what you do as you carry out your project - This might include records of more detailed research, diagrams, descriptions of methods used, photos/videos or even weblinks for blogs. Think about any decisions you had to make, maybe to overcome a problem, and record how you came to your decision.

- Test speed of motors - direction of robots - allow us to observe movements and adapt the code to work better. We do this by using a potentiometer so we can change the speed whilst testing.
- Research on the potentiometer to fix the code.
- Tested to make turns the same angle.
- Speed wasn't matching.
- Removed sensors.

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

- We found out our motors run at slightly different speeds, which makes our robot go in a wavy line. It also started spinning in circles when trying to resolve it.
- Our code wasn't working for the potentiometer so we searched it up as people have most likely have the same issue, so we can resolve it.
- Spun and ended at different angles so we have changed the code for the turn to make sure it turns the correct amount.
- We decreased the delay so the bot still went straight but also reach the right place and not crash.
- Our bot is programmed manually so the sensors aren't needed.

3 – Finalising your project

An important part of CREST projects is thinking about what you've done. At the end of your project, use these questions to help you reflect on what you did. Remember it's OK to say you didn't get something

3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

Yes, we were able to complete our circuit without errors. We met the aim we set at the start as we programmed it manually & it ~~to~~ made the correct shape for the maze

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

Can navigate through a maze, can help those who are visually impaired to be able to do it safely - attach it as a lead and add sound. ~ spark an interest in young people for STEM activities.

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

Better planning & be more organised, to allow the program to be complete faster.

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

Coding and building a robot - being able to make it do what I want it to do.

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

Young people who have an interest in STEM and want to learn how to start building robots.

Space for further notes/ drawings/ reflections (optional)...

CREST AWARDS | BRONZE AWARD Workbook

Student/team members' names	Victoria Pilkowska inaaya Ahmed Shivam Talwar Lewis Steventon Fred Simmonds
Project title	Drawing car → Artistic car

Introduction

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1 - Planning your project

Setting out what you are going to investigate/design

1.1 Set a clear aim for your project – What do you want to do/make/find out? Can you break this down into smaller steps or objectives which will help you to plan your project?

Choose where the components go on the car and evaluate

~~Choose~~ ^ choose the shape, research how to program different ~~shapes~~ shapes and designs, programme / use code, testing, and evaluate. *

→ this should create a robot which can draw when given instructions

*attach components and programme, test and then re evaluate

1.2 Why do you want to do your project? - How does it link to everyday life? Does it affect you or people you might know?

This could relate to people who don't have the creative freedom to draw ~~to~~ due to disabilities that they may have e.g arthiritis or a broken arm

1.3 What are the different ways that you could complete your aim? – Write your aim in the centre below, and put your ideas around the outside. If you want to add extra drawings/diagrams then please include these at the end of the workbook or separately.

Pen can be added by zipties to the chassis	Led's ~~sho~~ could be added so that if light isn't available the robot can still be used in the dark	Using the speaker, we can add a "music" function which can create a more enjoyable experience
Different shapes and designs: circles, ~~ot~~ rectangle	write your aim here to create a robot which can draw on paper	By using an LED screen, the design ~~drawn can be seen prior to it being used~~ can have a face added which improves aesthetic
The programming should work simultaneously to provide a good experience	The pen can be slotted in and out / changed so that you're not limited to one colour	We have a light detecting sensor (LED) so that the light comes on when darkness is detected.

1.4 What can you find out about your project idea? – This will help you decide how to do your project. Has anyone else done a similar project before? If so, what did they do? Where did you find the information?

What I found out	Where I got the information from
• we found out how to allow the Liquid crystal Display to function.	Chat GPT Arduino website
• we researched certain codings for certain shapes	youtube
• we found a kit ~~of~~ which allows you to design your own drawing robot. overall, the components are similar and the only difference found is the size of the components.	~~google~~ google
• we found a ~~ye~~ video which attaches the components and later programmes them to produce the function.	

1.5 Which of your ideas is the best way to achieve your aim?

i think, looking at the ~~youtub~~ youtube video, it ~~is~~ would be best to attach the components initially and then work on programming the components. ~~throughout the~~ each component should be programmed one at a time. throughout this process, ~~at~~ e.g after each programmed component we should test, ~~at~~ and evaluate.

1.6 Why did you choose this idea or approach? You can use diagrams or words to explain.

this approach seems to work best as it allows errors to be corrected and ~~allows~~ is a systematic process which allows for improvements when needed. the youtube video used as reference has a similar outcome to ours and by using this plan, we can ensure our outcome ~~at~~ wanted can be met. (through the systematic approach)

1.7 Whatever kind of project you decide to do, you need to carry out some kind of test or research – This might be a scientific investigation; testing out a design; testing whether a piece of communication works or testing how valid your research is.

Testing is an important part of the project process and you might decide to change or add to your ideas after you test them out. It's important that your tests are as fair as possible and that you have thought about all the possible variables.

What I will test	How I will test it	How I will control the variables
Example: How the amount of baking soda affects how long a bath bomb fizzes for	*Make bath bombs with different amounts of baking soda and put in water*	*Same size tub for water* *Same volume of water* *Same temperature water* *Same weight of other ingredients*
whether our car responds to the code to draw the shape we want	put down a piece of paper & draw	Same pen same size paper
whether our light (LED) works with the light (LED) sensor	try different approaches in terms of the positions of the LED and sensor on the bread board and chassis	Same LED Same sensor
How to ensure the pen stays on the chassis and has enough pressure to draw on paper	slowly add weights to the pen + try different distances from pen to the paper	• equal amount of weight added each time, (whether increased or decreased) • use the same pen

1.8 Stay safe! – Are there any health and safety risks in what you plan to do? What can you do to minimise the risks? Check your plans with your teacher.

- ensure that when using hook, hands ~~are~~ stay on the handles ☆
- ensure fingers stay away from the ends of exposed wires | handle with care as they are sharp and can cause cuts
☆ this is to ensure the sharp ends of the hook don't snag the skin.
- ensure before testing, it's checked by a member of staff so there's no short circuiting which could cause injury through leaked battery acid.

2 - Throughout your project

Now you have planned your project, it's a good idea to break the project into tasks that will need doing and organise:

- When each task needs to be completed by
- Who does each task (if working in a team) and if others may need to help you
- What resources you might need

If you have a final project deadline (e.g. to enter a competition) then keep this in mind.

2.1 The following table might be useful (the first row is filled in as an example) – You can add to it throughout the project and use it to track when things have been completed. It is a good way to decide if and when you might need help from other people (i.e. a technician, teacher or mentor) so that they can plan their time too.

Task	Who's responsible?	What help might I/we need?	What resources do I/we need?	Completed by when?	Finished ?
Example: Decide what practical tests we want to perform on our product so we can set tests up	*Sarah*	*Teacher to show us what equipment is available*	*Access to the school labs to see equipment*	*Beginning of February*	*Feb 5th*
set up ~~lights~~ LED's on bread board & connect wires	Shiv Inaaya Victoria	CWO helped with wires	· wires · bread board · resistors · LEDs	21.4.24	21.4.24
Set up light sensor	Shiv Inaaya	CWO	· wires · resistor	21.4.24	21.4.24
programmed drawing	Fred Lewis	CWO PO Millburn	· computer · USB-B	21.4.24	21.4.24
installed pen	Shiv Inaaya Victoria Fred Lewis		· zip-tie · sharpie	21.4.24	21.4.24

2.2 Record what you do as you carry out your project - This might include records of more detailed research, diagrams, descriptions of methods used, photos/videos or even weblinks for blogs. Think about any decisions you had to make, maybe to overcome a problem, and record how you came to your decision.

design
program drawing
install LED's
install LDR
install sharpie

2.3 Record what you find out – Record the results of your tests and think about what they tell you. Were the results what you expected? What have you learned from your tests? Also note down if you changed your plans or ideas based on your tests.

it did draw
↳ not the specific shape though

didn't make buzzer work

lights works

pen works

3 – Finalising your project

An important part of CREST projects is thinking about what you've done. At the end of your project, use these questions to help you reflect on what you did. Remember it's OK to say you didn't get something

3.1 Was your project successful? Why? – What went well in your project? Did you meet the aim that you set at the start? How?

teamwork
time management
execution

3.2 What impact could your project have on other people? For example, does it relate to environmental issues or provide a solution that may improve peoples' lives?

people who can't draw can now draw, even in the dark

3.3 What would you do differently if you were doing this project again? Why? – What could you have done to make your project even better?

program so it draws specific things

3.4 What do you think you have learned from doing this project? – What do you know at the end of your project that you didn't know at the start? What can you do now that you couldn't do before? How did learning these things help you with your project?

teamwork
perseverance
coding

3.5 How will you communicate your project? Who to? – Who would be interested in the results of your project? What is the best way to share your work?

presentation (spoken)
↳ with videos

Space for further notes/ drawings/ reflections (optional)...