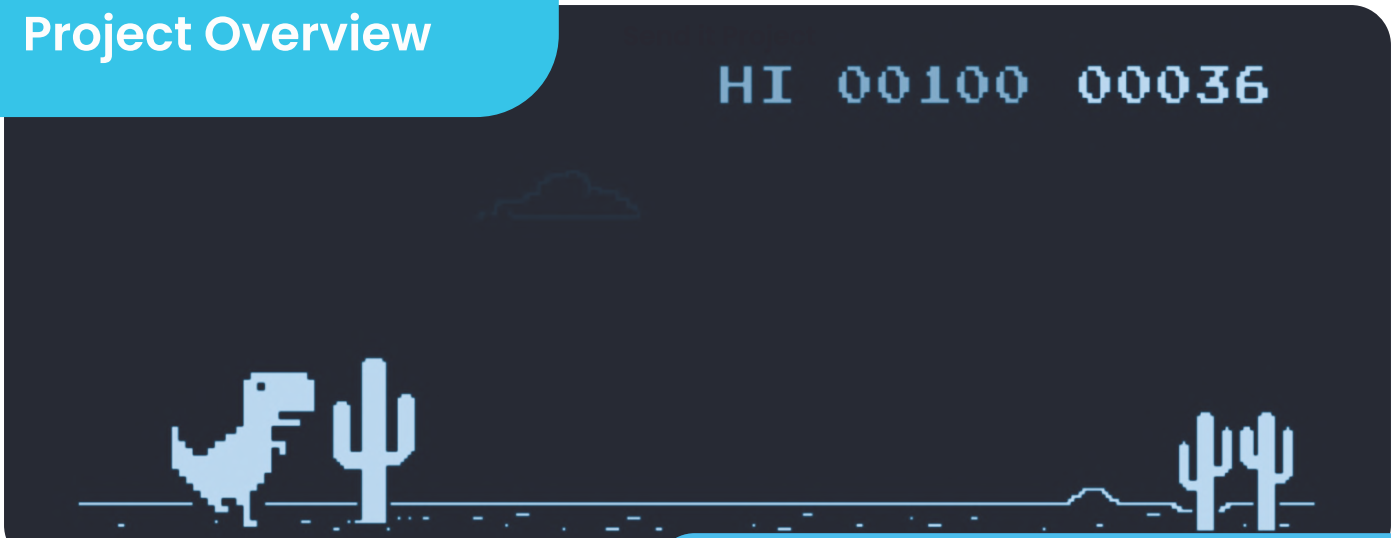
CreateBase

Educator Guide

Send It

Project Overview



"Dinosaur Game" - by Google

Background

In a jumping game, like Temple Run or Google Chrome's Dinosaur Game, a character is endlessly running at an infinite amount of obstacles. The player must decide when the character jumps to avoid running into an obstacle for as long as possible.

Synopsis

In this project, users will be aiming to automate our version of this game by creating an "AI" (Artificial intelligence) that can exceed human capabilities and achieve as high of a score as possible. This AI will be controlling a robot to deliver a package as fast as possible, automatically jumping over any obstacles that get in its way.

Themes of this Project include **automation** and **algorithms**, including thinking about potential use-cases and moral dilemmas.

Sub-themes also include congestion and the delivery of goods using autonomous robots.

This project is divided into six lesson plans

01. Let learners **Imagine** the situation by playing and discussing a situation video. Learners will work in groups to explore the Project theme to accurately **Define** the situation.

02. Facilitate a class discussion around the topics and questions that your learners previously covered in **Define**. This lesson will end with an explicit definition of the problem and the tools available to solve it.

03. Learners will get a chance to **Research** the tools available on our platform that they will use to construct their solution. This lesson will end with a session where learners will **Plan** how they will build their solutions.

04. Learners will use our platform to **Create** and test their solutions to the problem inside our simulated environment.

05. Learners will use our platform to **Improve** upon their previous solutions, applying the skills they have learnt and the knowledge they have gained to solve more advanced problems.

06. Learners will continue using our platform to **Improve** upon their solutions, before taking the time to **Review** their entire work on the Project.

Project Overview

Subject Areas

- Technology
- Engineering
- Computer Science
- Automation
- Artificial Intelligence (AI)
- Ethics

Learning Outcomes

In this Project, **learners** will:

1. Learn how to convert their internal logic into code to allow them to automate a task they would normally do manually.
2. Learn how to use flow control/ branching (If, else, else if) to write code that can make decisions.
3. Learn how to use comparison blocks (<, >, <=, >, ==) to inform decisions making by comparing two different values.
4. Learn how to read and act on sensor data returned by a robotic system (distance to next obstacle, height of next obstacle, obstacle type, obstacle velocity etc).

Equipment List

Learners require:

- Access to our online platform through a Chromebook, laptop or PC
- Access to our learning journal through either Google docs or Microsoft Word

Educators require:

- Situation video (link included in lesson plan)
- Access to this lesson plan, either printed or digitally
- Easy access to the answer document, printed or digitally (file included in lesson plan)

Table of Contents

Project Overview

Adapting the lessons

The times given for each step of the Creation Process are only there to give you an estimate for how long they could take. You have the final say on how long to spend on each activity, depending on how much time you have available and how in-depth you want to discuss each topic. We recommend using the times as a minimum estimate to help you with your own planning. You are free and encouraged to adjust, skip and/or repeat steps depending on the engagement and aptitude of your class and your desired goals for the lesson.

The content included in each lesson plan serves as an example of how you could deliver the Project contents to your learners. It is your choice whether you want to follow it to the letter, use it as a rough guide or do your own thing. You may also want to allow excelling learners to move fowards at a faster pace and start working on the (nearly endless) Improve step before the other learners.

Online learning

These lesson plans can be used for online learning.

If your school runs lessons through video meeting platforms, we recommend using breakout rooms for class discussions. All other tasks can be completed in the lesson as per the lesson plan or as homework activities.

If an individual learner needs additional help or guidance, you can ask them to temporarily share their screen (potentially in a breakout room) so that you can see what they are doing and guide them more closely.

Suppose under special circumstances, such as during a lockdown, it becomes difficult for students to have regular attendance. In that case, you can skip over the class discussion parts of the lesson plans and assign learners individual tasks (e.g. complete the first subsystem in the Create step individually by DD/MM/YYYY).

We recommend that you use the learning journal with checkpoints to set completion targets for your class. Have them share their progress with you by making their learning journals available through email or Google Classroom.

1

Overview

Define (15 mins)

Introduce and discuss the Project with your learners with a video that showcases the situation before defining the problem.

Imagine Part I (30 mins)

Let your learners work in groups to explore the Project theme and start to imagine how they might solve the problem.

Lesson Resources

Situation video

Presentation slides (Imagine)

Glossary

1. **Artificial intelligence (AI):** Broadly speaking, artificial intelligence (AI) is all about creating programs and machines that can carry out human behaviours like critical thinking and decision making. Generally, the quality of an AI is based on the complexity and the accuracy of the tasks it can complete.

   E.g. AI can be as simple as an automatic light switch or as complex as responsive conversation software like Siri.

2. **Automation:** Automation is all about using technology to carry out tasks that a human would have traditionally carried out. Examples include robots in car manufacturing assembly lines and self-driving trains. Humans are good at critical thinking, whereas most technology is great at repeatedly performing the exact same action. This is why routine tasks (tasks that involve performing the same action repeatedly) are usually the first to be automated as little or no critical thinking is needed.

   E.g. robots in car manufacturing assembly lines and self-driving trains.

3. **Ethics:** Ethics are all about how a person determines which actions are good and bad. What is the reasoning behind their decision? There is not always a right and a wrong answer regarding ethics, as different people place different amounts of value on different concepts. Ethics are important as they can help us understand why other people make and justify their decisions and understand ourselves.

   E.g. "Would you lie to convict a criminal that you know is guilty?" Whether or not a person values truth or justice more is likely to influence their answer to this question.

4. **Congestion:** Congestion occurs when a location is so crowded that it becomes difficult to move. This normally happens when a large amount of something is trying to move through a small opening.

   E.g. Cars on a motorway or water down a drain.

Lesson 1 •

Define 15 mins

1

Use these steps for guidance

1. Bring all of your learners to the front of the class if possible.

2. Welcome the class, for example, by telling them that they will be completing a **Project** over the following six lessons where they will get to plan, build, test, and improve a solution to a problem.

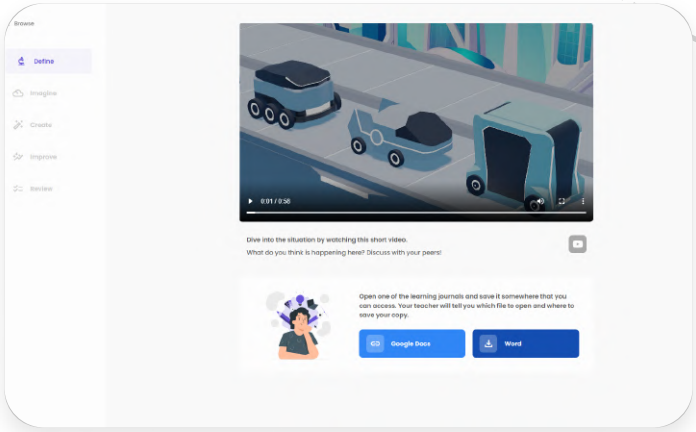
3. Tell the class that we will begin by playing a video of the situation to set the scene. You can then play the 58-second video on a projector for the class to watch. Access the video through the link on the right or the lesson resource.

4. Discuss with the class what happened in the video.

   Discussion points could be based on:

   - What the main character is doing
   - The problem they encounter
   - What they are trying to get the robot to do

If they understand the problem, you might want to ask learners what they would do in the same situation.



https://app.createbase.co.nz/project/send-it/define

Tips for Educators

For your reference, here is a quick explanation of what is happening in the video:

- On route for package delivery, there are major delays during transit.
- To ensure that the package arrives in time, you resort to sending out your delivery robot to beat the traffic.
- In a rush, you must code the robot to navigate the obstacles before it gets hit and loses the package.

Helpful Examples

If you are finding it difficult to get your class to talk about it, replay the video to the class with pauses and ask questions about what is happening in specific scenes.

Here are some example discussion points to get you started:

0:00-0:05 seconds

Q "What do you think is happening here?"

A Cars stuck in traffic.

Q "What can cause a traffic jam?"

A An accident, lots of cars on the road at once, cars changing lanes too often, traffic light malfunction etc.

0:14 seconds

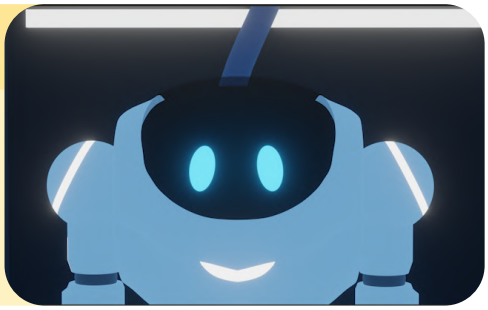
Q "What information can we gather from the screen in the character's car?"

A Package to deliver but delays due to traffic mean that we can't deliver it on time.

0:32-0:39 seconds

Q "What is this thing in the back of the character's car?"

A A humanoid robot/delivery bot.



Helpful Examples

0:40-0:46 seconds

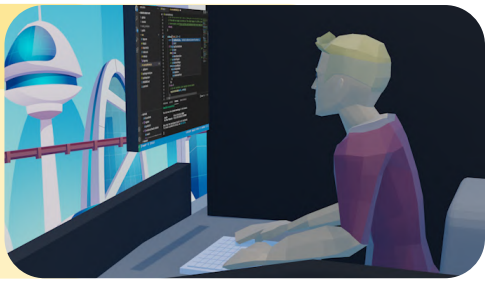
Q "What is the character doing?"

A Putting the package inside the robot.

0:47-0:49 seconds

Q "What is the character doing now?"

A Writing some code and uploading it to their robot.



Summarise the video

Q What has happened?

A The human character is stuck in traffic, so they can't deliver a package in time. Luckily, they have a humanoid robot that they can program to deliver their parcel.

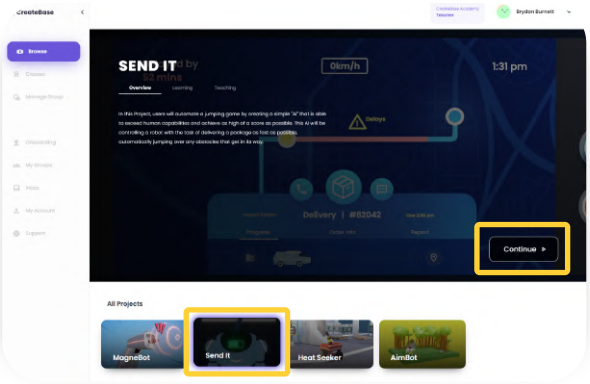
Tips for Educators

Feel free to move on to Imagine once you are satisfied that your class understands this Project's background.

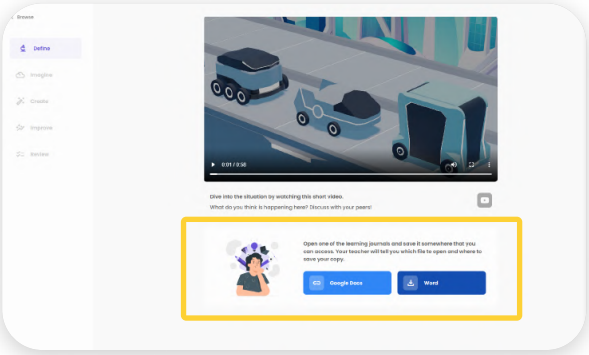
Imagine Part I 30 mins

Now that you have watched the video with your class and are happy that they understand what has happened, your learners will have an opportunity to explore some of the broader topics that could stem from an autonomous delivery robot.

1. To get started, create small groups of 3-4 students. And send them to their computers. Students should be seated next to their group members.

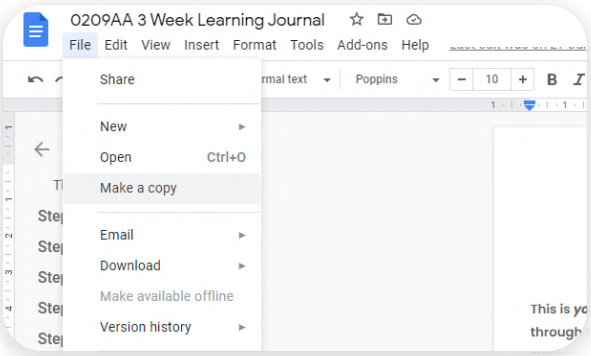


2. Tell your learners to go to https://app.createbase.co.nz/browse/send-it and click continue.



3. Ask them to rewatch the video in Define and tell them to download either the Google Docs or Microsoft Word **learning journal**.

   If you want your students to work from Google Docs, they must choose the Google Docs option and then click ***File*** -> ***Make a copy*** and save it somewhere that they can access.



4. Once downloaded, your students should fill out their names. Before moving on to Imagine, you may want your students to answer the Define questions in their learning journals.

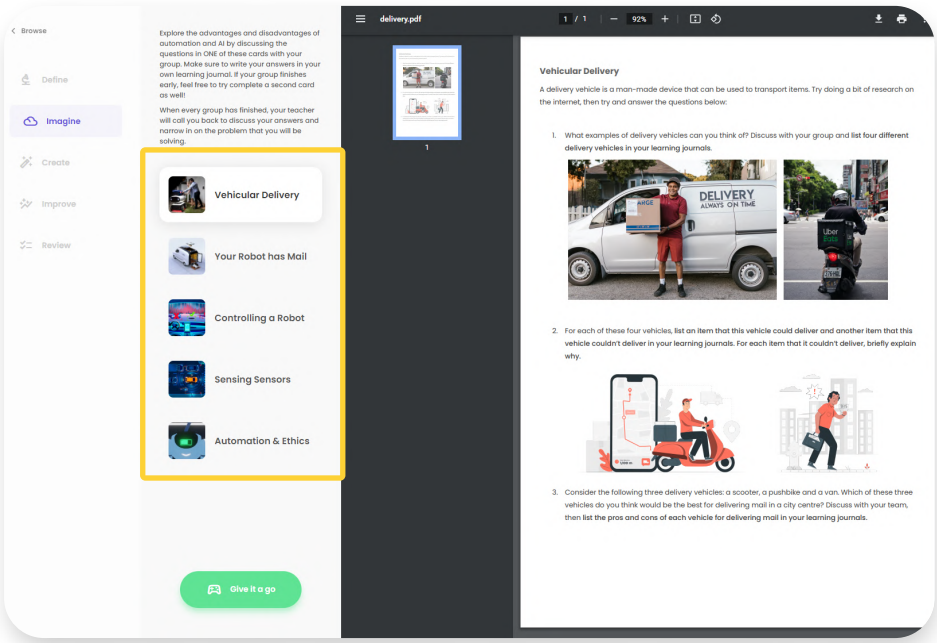
Tips for Educators

To reduce confusion, it is recommended that you tell your learners exactly where to save their files. If you want to access these files later to check on their progress, ask them to save them in a location that you can also access.

Imagine Part I 30 mins

5. Once in the Imagine step, **as a group**, tell them to select any one of the cards and discuss the questions contained within. For each question, each student needs to write an answer in their learning journal. Wander the room while this is happening and ask learners questions to help them start thinking.

   If a group finishes early, let them answer additional cards. You can spend additional time here by adding your own activites or asking your students to complete every card.



6. With 5-10 minutes to go, remind the class that they must have answers for every question in at least one card in their individual learning journals by the end of the lesson.

7. At the end of the lesson, make sure that each learner has their copy of the **learning journal** saved somewhere that they can easily access at the start of the next class.

Homework

For homework, inform each learner that if they haven't already done so, they must have answers for every question in at least one of the Imagine cards written out in their individual learning journals by the start of the next class. This is because they will be used in the next lesson.

Overview

Imagine Part II (45 mins)

Facilitate a class discussion around the topics and questions that your learners covered as groups in Imagine Part I. learners will get a chance to share their opinions about the topics that they covered and also hear the views of others. End the lesson by explicitly stating the problem and the tools that learners can use to solve it.

Glossary

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Lesson Resources

Presentation slides (Imagine)

3. **Ethics:** Ethics are all about how a person determines which actions are good and bad. What is the reasoning behind their decision? There is not always a right and a wrong answer regarding ethics, as different people place different amounts of value on different concepts. Ethics are important as they can help us understand why other people make and justify their decisions and understand ourselves.

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   E.g. Cars on a motorway or water down a drain.

Imagine Part II 45 mins

Now that your learners have had a chance to discuss some of the broader topics that could stem from an autonomous delivery robot in groups, discuss the same or similar topics as a class.

If each group in **Imagine Part I** chose different topics, you should now have a range of "experts" in each topic that you can call upon for their opinions.

The direction of this discussion should be dynamic and driven by learners' curiosity. Make sure to ask follow up questions, and if the learners lead you away from the prompts below, then **don't be afraid to go off-script!**

1. Introduce your class to today's lesson, saying that now we have a bunch of subject matter experts, we will be having a class discussion on the Imagine themes. It is important that everyone shares their knowledge and opinions to fully understand our problem from different perspectives.

2. You may wish to have each student open their **learning journals** for reference or instead stay off their device for the entire lesson, depending on the dynamics of your class.

3. You now want to discuss as a whole class the themes raised in some of the Imagine cards. Try and get every learner thinking and participating, even if they were not in a group that discussed the particular topic you are currently on.

Tips for Educators

This section of the Project is the best place for you to inject your own educational content or activities depending on what topics you want to focus on.

Tips for Educators

To get started, try using this premade structure (with examples) for the discussion over the next five pages. You can also find a slideshow attached as a lesson resource.

Delivery Robots

a. Ask learners to provide examples of delivery robots, vehicles and other devices. Examples include bicycles, quad-bikes, self-driving cars, aircraft, small drones, line-following vehicles, humanoid delivery robots, transportation tubes and the internet (delivers information).

b. For each of these robots/vehicles, you could ask to follow up questions along the lines of:

> "What types of goods does this device currently deliver? Can you think of any other goods that it could be used for (that it is currently not being used to deliver)?"

If multiple suggestions are similar, ask the learners to compare the devices by listing their pros and cons.

> "Compared to a self-driving truck, would a drone be better or worse for delivering mail in a city CBD? Why? - a drone could get to the building faster, but where will it drop the package off?"

c. Now that learners have a good variety of examples of delivery robots, you can now ask them to start thinking about the environment they operate in and how this might affect the design of each robot and which one will be optimal in each situation.

Example questions might include (where X could be anything, like mail):

- "What types of obstacles might X delivery robot encounter?"
- "How would robot X detect and avoid these obstacles?"
- "When the robot does detect one of these obstacles, what should it do?"
- "What design features, like sensors, transportation mode and shape, would the robot need if it was instead used in environment Y or to deliver item Z?"

Artificial intelligence (AI)

a. With learners understanding how the environment affects a robot's design, you can now ask them how these robots should be controlled.

Ask questions that make learners think about human-controlled delivery robots vs AI-controlled robots.

"If I told you to run in front of a car, would you do it? No, you would decide that my instruction was bad and ignore it. What would happen if I programmed a robot to do the same thing?"

A big difference between a robot and a human is that a human can reject instructions and make its own decisions. A robot does exactly what it is told to do, every time. This can be good (e.g. quality control in a manufacturing line) and bad (if something goes wrong, the robot can't change its action unless it has been programmed to).

b. Explain what an AI is using the glossary as assistance.

"An AI bridges the gap between a human and a robot by allowing them to "think" and make their own decisions."

c. What are the pros and cons of controlling a vehicle using a person compared to an AI?

Things to consider include:

- **Cost** (humans have to be trained and then paid, AI need to be purchased and maintained: AI are likely to have a higher upfront cost but less cost over time)
- **Size** (an AI's computer takes up less space in a vehicle than a human, so the vehicle can be smaller and/or have more space for goods)
- **Risk** (the cost of human life is much more than an AI, so AI might be better for high-risk scenarios)
- **Accuracy & precision** (would an AI or a human be more accurate? why?)

Sensing Sensors

It is important for learners to understand what a sensor is and be able to draw parallels between man-made sensors like thermometers and natural sensors like human eyes. This will be useful during the Plan step. Students will identify the information they are using to make decisions when manually playing the game and convert that into an algorithm.

To get started, try having a class discussion using the following questions:

1. "How can robots react to a changing environment?"

This is usually done using sensor information to drive decisions made in the robot's code.

2. "How is this similar to how humans operate?"

Humans use their sense of Touch + Heat (sensors) to tell how hot an object is. When your fingers sense a very hot object, the brain (controller) tells your muscles to immediately remove your hand away from that object.

3. "What is a sensor?"

A sensor is a device that measures a property of its surroundings.

4. "What are some examples of sensors?"

Thermometer (measures temperature), Fire alarms (detects smoke), speedometer (measures speed), odometer (measures distance).

Ethics & Automation

a. Explain the concept of automation to the class:
The dictionary defines automation as “the technique of making an apparatus, a process, or a system operate automatically.”

b. Ask the class if they can explain what ethics means. If not, explain the concept to the class: The dictionary defines ethics as “moral principles that govern a person's behaviour or the conducting of an activity.”

Reminder: Ethics are how a person decides which actions are good and which actions are bad.

c. Have a conversation with the class about the ethics of automation.

Example prompts include:

“If an automated robot causes some damage, who is responsible? The robot (it only did what it was programmed to do)? The programmer? The company who sold the robot?”

“If we replace a delivery driver with an autonomous robot, what happens to the driver? They may lose their job and their income. Is this worth it if it improves delivery times? What support systems can we put in place to help support this person who has lost their job due to automation?”

Imagine Part II 45 mins

Ethics & Automation

Optional: discuss the trolley problem with learners.

Situation

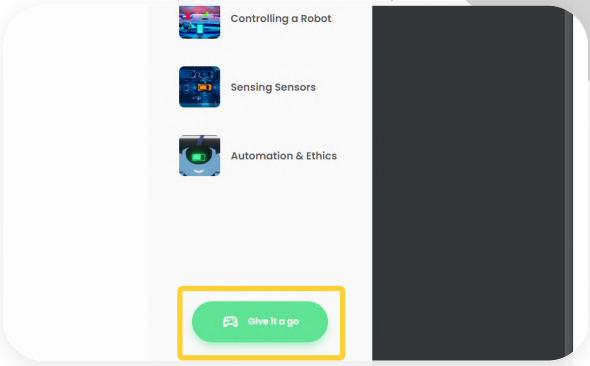
A train is approaching a junction at high speed. Shockingly, a villian has tied five people to the tracks! You have a lever that you could pull to divert the train to another track, however the villian has also tied one person to this track. Assuming that the train is not able to stop in time, would you pull the lever to divert the train?

These thought experiments can be fun activities to get learners to think critically and explore different outcomes about a hypothetical situation.

- Explain your thought process. Do your personal values influence your decision?
- What should an AI with no intrinsic morality do in the same situation?
- What if you were a doctor with five patients in need of life-saving transplants. An oblivious healthy patient walks into your practice. Would you harm one patient to save five?
- Are there any inconsistencies in these answers? If so, why do we feel different about each situation? (maybe it is due to directly vs indirectly causing harm) One moral solution is to prioritise not killing people first and saving people second.
- If AI becomes common, there will inevitably become a situation where an AI needs to decide between two or more groups of people to harm. How do you think AI should make this decision? What variables will they need to take into account? For example, should the AI value the safety of the car's occupants more, or less, than that of potential victims outside the vehicle?

Imagine Part II 45 mins

4. When you are happy that your sudents have finished with Imagine, ask them to spend some time manually controlling the robot using the “Give it a go” button on the Imagine page. Tell them to think about the information they are processing when playing the game and how they are using this information to make decisions. How could the robot gather this information and use it to make its own decisions?



5. Bring the discussion to a close by linking it back to the situation video. State the problem that the learners will be solving for the remainder of the Project:

> “In this Project, your task is to create a basic AI that will tell the humanoid delivery robot in the situation cutscene what action to take when it approaches an obstacle.”

6. State the functionalities of the robotic system:

> “Your robot has a sensor that detects how far away the nearest object is in front of it. You can also give the robot commands to both jump and slide.”

Homework

Homework is optional for this lesson, but it may include asking your students to perform some research on their own about any of the topics covered in the lesson. You may ask them to write a short report that summarises any articles or videos they have found.

3

Overview

Research (25 mins)

Learners will get a chance to research the tools available on our platform that they will need to use to construct their solution.

Plan (20 mins)

This lesson will end with a session where learners will plan how to construct their solutions, either as a class, in groups or as individuals.

Lesson Resources

Presentation slides (Imagine)

Glossary

1. **Algorithm:**
   An algorithm is a sequence of rules or instructions. Computers usually follow algorithms to perform a calculation or make a decision. Good algorithms are well-defined, meaning that they have a rule or an instruction for every relevant possibility.

2. **Comparison:**
   In programming, a comparison is a statement where we compare two different values with an operator. The operator determines what characteristic we are comparing and is usually a mathematical symbol like equals, less than or greater than. The statement that we write will always be either TRUE or FALSE. For example, we might write a statement that says, "20 is less than 10." This statement would be FALSE. We might instead write "20 minus 10 equals 10." This statement would be TRUE. Comparisons are important in coding because we can use the TRUE/FALSE result to decide which branch of code we should run next.

3. **Loops:**
   In programming, a loop refers to a piece of code that is run multiple times. The number of times that the code repeats itself depends on how the loop is written.

4. **Flow control/branching:**
   In programming, the flow of code refers to the order in which code is run, and actions are performed.

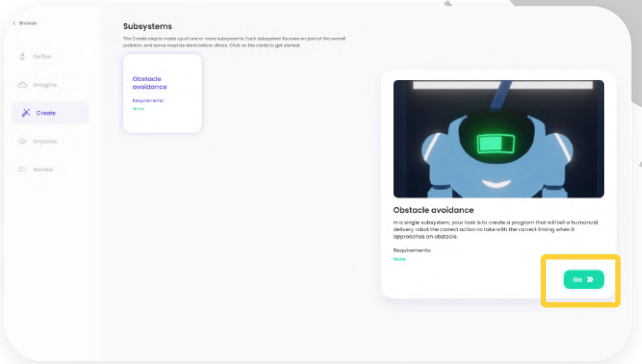
   Think about it like walking down a tile path, where each tile represents a line of code. When you stand on a tile, that line of code is run. By looking ahead at the upcoming tiles, you can see the order that each line of code will be run. If your path splits into two, you can no longer tell exactly which code will be run in advance until you decide which path to walk down. Flow control is all about how we write our code to make these decisions. Branching is the simplest form of flow control, where the code "path" splits into multiple paths.

Lesson 3 •

Research 25 mins

3

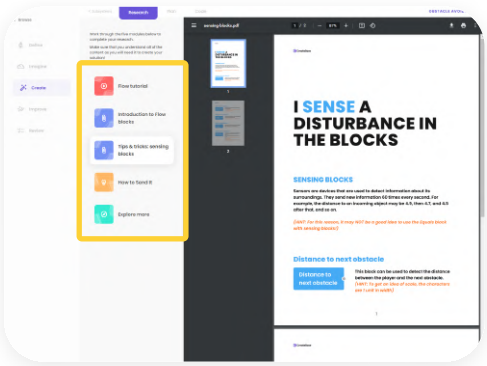
1. Tell your students to visit the Create step, start the first subsystem (Obstacle avoidance), and complete all of the content under the **Research** section. Their learning journals will guide them.



Tips for Educators

In this Project, your learners have the option to code their answers in: a visual programming language called Flow, or a text programming language called JavaScript (JS). The platform contains Research content for both languages, so if you want your learners to code in only one language, you should let them know so that they can skip the Research content for the other language.

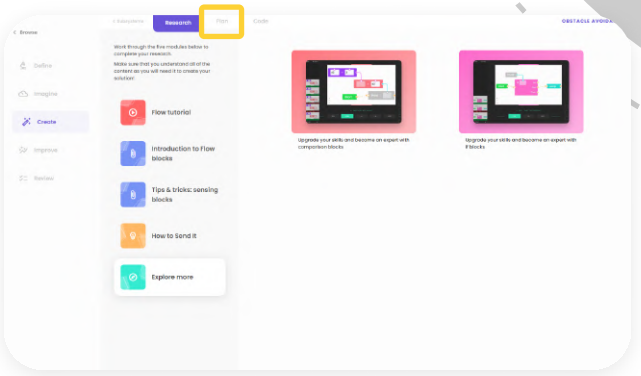
2. Make sure that your students read and try to understand every card. Students should be returning to the Research step later in the Project if they get stuck, but it is still important that they try to understand the content the first time, or at least know what is there, so they know where to go to find the information when they need it.



Rather than letting students read through it themselves, you may instead want to go through it as a class so that you can help explain the content to your students.

Plan 20 mins

1. Once you are confident that every student has read and understands all of the Research content, ask them to move to the **Plan** section on the platform.



2. Tell your learners to read through the Plan step on the platform and then answer the **Plan** questions in their **learning journals**.

3. Bring the learners away from their computers back to the front of the class when they have all finished.

4. Tell the class:

> "Now that we know all of the tools at our disposal and the basics of operating the robotic system, we will now plan how we will utilise these tools to solve the problem."

5. Start by asking learners to talk about how they played the game.

    1. What sensors were they using (eyes), and what information were they collecting (distance between the robot and the incoming cars)?

    2. What decision did you have to make (if the car is within some distance x, press the spacebar, otherwise wait)?

    3. Explain that your brain is using an if statement to decide how to control the robot. We can make a basic AI that does the same thing.

6. Walk through the process of jumping over a few obstacles with the learners, linking information and decisions back to the code blocks that they learnt in **Research**.

7. Conclude the lesson by telling the class to draft their algorithm at home, as starting from the next lesson; they will be coding and testing their solutions!

Homework

Homework is optional for this lesson, but it may include the learners drafting their algorithms at home. If you want to make sure this is completed, tell the learners to write down or draw their thinking process for controlling the robot, ready to present during the next lesson.

4

Overview

Code (45 mins)

Your learners will use our platform to create and test their solutions in our simulation. Your role as an educator will be to guide struggling learners while prompting excelling learners with questions to help them identify areas of improvement.

Glossary

1. **Algorithm:**
   An algorithm is a sequence of rules or instructions. Computers usually follow algorithms to perform a calculation or make a decision. Good algorithms are well-defined, meaning that they have a rule or an instruction for every relevant possibility.

2. **Comparison:**
   In programming, a comparison is a statement where we compare two different values with an operator. The operator determines what characteristic we are comparing and is usually a mathematical symbol like equals, less than or greater than. The statement that we write will always be either TRUE or FALSE. For example, we might write a statement that says, "20 is less than 10." This statement would be FALSE. We might instead write "20 minus 10 equals 10." This statement would be TRUE. Comparisons are important in coding because we can use the TRUE/FALSE result to decide which branch of code we should run next.

Lesson Resources

Answer document

3. **Loops:**
   In programming, a loop refers to a piece of code that is run multiple times. The number of times that the code repeats itself depends on how the loop is written.

4. **Flow control/branching:**
   In programming, the flow of code refers to the order in which code is run, and actions are performed.

   Think about it like walking down a tile path, where each tile represents a line of code. When you stand on a tile, that line of code is run. By looking ahead at the upcoming tiles, you can see the order that each line of code will be run. If your path splits into two, you can no longer tell exactly which code will be run in advance until you decide which path to walk down. Flow control is all about how we write our code to make these decisions. Branching is the simplest form of flow control, where the code "path" splits into multiple paths.

Code

45 mins

4

1. Welcome the class back to the Send It Project. If there has been a significant delay between the current and previous lesson, then you might want to give a quick recap to your learners of what you covered in your class in the last lesson.

2. Tell the class that today they will be building and testing their solutions. If you requested your learners to create a plan for their algorithm between lessons as homework, then perhaps ask a few learners to share with the rest of the class.

3. Briefly explain to the class how the **Code** step will work:

Build
Learners will implement their solution by starting with individual elements and building up to the final solution.

Test
Learners should constantly be testing their code to see how well their individual components or final solution solves the problem.

Iterate
Learners will continue building and testing until the problem has been completely solved.

Share
When learners think that they finished, encourage them to share their solution with other classmates who have finished and/or an educator to get their feedback. Make sure that the learners explain how they arrived at their solution. If necessary, they might need to start iterating again, either because a problem was identified or an educator/classmate gave them an idea for how to improve their solution.

4. Tell your learners to return to the platform and start the **Code** step: http://app.createbase.co.nz/project/send-it/create/Obstacle%20avoidance/code

Tips for Educators

In this Project, your learners have the option to code their answers in a visual programming language called Flow, or a text programming language called JavaScript (JS). Learners can switch between the two languages by clicking on the FLOW and TEXT tabs in the bottom right corner of their screen in the simulation.

When you write code using Flow in the FLOW tab, the text equivalent is automatically generated in the TEXT tab when you click the TO TEXT button (next to the COMPILE button)! This can be a good tool for you to use to help transition your learners from coding with a visual language to a text language.

Tips for Educators

Your learners can save their Flow code using the save icon in the bottom left corner of the Flow editor or the SAVE button in the bottom right corner of the text editor.

If learners save their code before they leave the simulation, they will be able to continue where they left off when they return by pressing the restore icon or RESTORE button for the Flow and text editors respectively.

Tips for Educators

Attached as a lesson resource is an answer sheet with explanations for the educator's viewing only. You can use the help sheet to assist struggling learners and give additional prompts to excelling learners to make them think more about their solution.

5. If any learners finish early and you do not see any more ways for them to work on their solution in the **Code** step, then either ask them to help the other classmates or let them move onto the **Improve** step early.

6. At the end of the lesson, tell the class to wrap up their work by taking a screenshot of their final code and inserting it into their **learning journal** under the **Code** step. They should do this regardless of if they have a working solution or not.

7. Ask any learners who have yet to finish the **Code** step to visit the platform from home and try to get a working solution before the next class.

5

Overview

Improve Part I (45 mins)

Your learners will get a chance to apply the skills they have learnt and the knowledge they have gained to solve more advanced problems. We might adjust the problem parameters or solution constraints to enable new solutions.

Glossary

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Lesson Resources

Answer document

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Improve Part I 45 mins

1. To start the lesson, confirm the number of learners who have completed the **Create** step. Tell all of the learners who have a working solution that their next task is to move on to the **Improve** step.

   a. Explain that during the **Create** step, learners had to successfully deliver the package 1,000m, jumping over cars along the way. In the **Improve** step, they must now try and deliver the package with the highest possible score.
   b. To increase their score, learners can enable ***modifiers*** in the setting menu. Each ***modifier*** adds a new obstacle to overcome; however, they will increase their final score if they can successfully deliver the package.

> Each modifier will require changes to the learner's previous solution, and learners can have as many modifiers active at once as they can handle.

   a. Recommend to your learners that they add ***modifiers*** one at a time, ensuring they have a working solution before adding any more modifiers.

2. If any learners have yet to complete the **Create** step, make sure they complete the **Create** step first and post a screenshot of their now working solution in their **learning journal**.

Every learner working on **Improve** should be able to show and explain to you a working solution for **Create** (as long as their answer works, it is okay, and even encouraged, if it is different from the example solution).

Improve Part I 45 mins

You should prioritise spending your time to help these learners complete the **Create** step so that they also can move on to **Improve**.

3. Let the kids who have finished the **Create** step try to complete the **Improve** step with minimal assistance. The **Improve** step helps reinforce the learners' learning, so be careful not to give the learners the exact answer yourself. Instead, ask questions to struggling learners about their code to help them realise the solutions themselves.

   An example question would be asking them to step through it one by one with you and explain their reasoning for adding each block.

"Can you show me how you came up with this solution?"

"What does this block do? Why did you place it here?"

4. If any learners can deliver the package with the highest possible score (every modifier enabled at once), ask them to help their struggling peers.

5. At the end of the **Improve** step, tell the class to wrap up their work by taking a screenshot of their final code and inserting it into their learning journal. They should do this regardless of if they have a working solution or not. At the end of this lesson, it is expected that most learners will not have achieved a fully complete solution to Improve.

6

Overview

Improve Part II (30 mins)

Learners will have the opportunity to continue using our platform to Improve upon their solutions.

Review (15 mins)

Learners will then review their work. Options for review include having members of the class share their unique solutions and the decision-making that got them there and/or conducting self-assessments using their learning journal.

Glossary

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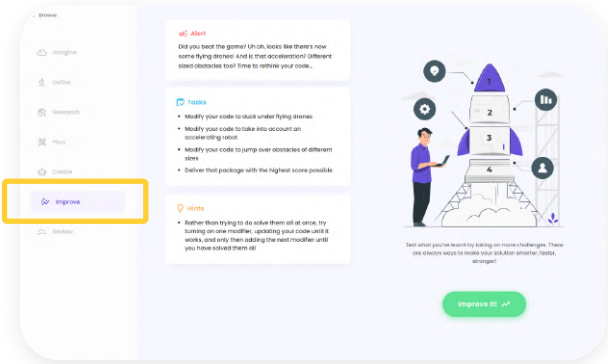
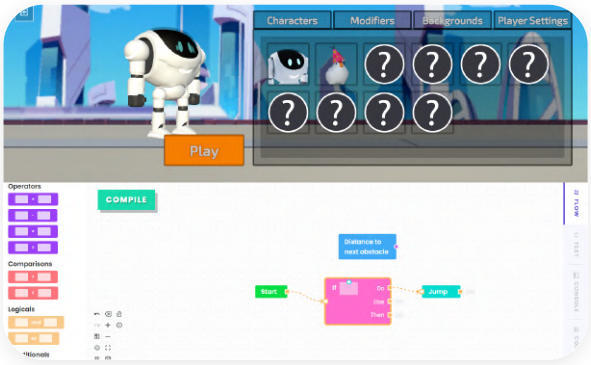
Improve Part II 30 mins

1. At this stage, every learner should have completed the **Create** step and be working on **Improve**. Some learners may have even completed all of the tasks in **Improve** already.

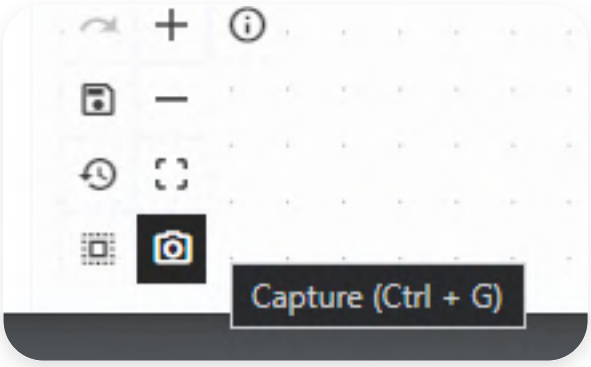
2. You should spend the first half of this lesson letting learners continue working on the **Improve** steps. You may want to instruct any learners who have already completed the **Improve** step to assist their classmates, try and optimise their code solution (for example, by minimising the number of blocks that they use) or just play the game in the **Research** step.



3. At the end of the **Improve** step, ideally, each learner has a solution that works for at least one of the modifiers: it is not expected that every learner will complete it entirely.



4. When you feel like the learners have progressed far enough into **Improve**, ask them to take a screenshot of their best solution or use the “capture” button (Ctrl + G) and insert it into their **learning journal**.



Lesson 6 •

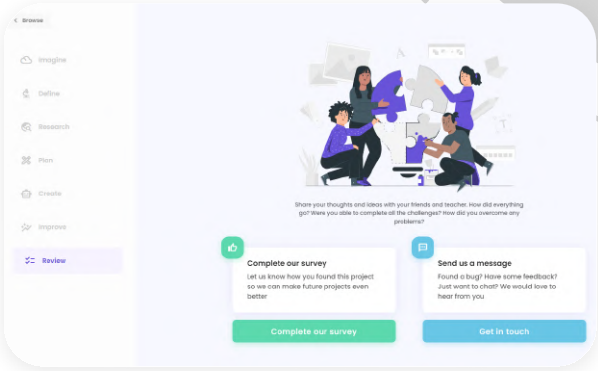
Review 15 mins

6

The final part of this Project is the **Review** step.

As part of the Review process, we provide two suggested options:

Share and **Reflect**. Feel free to do one or the other or both, depending on the time that you have available.



Share

1. Encourage your learners to talk to the person next to them about their final solutions and their decisions at each step to their classmates.

   This helps learners remember what they have done and get new ideas by listening to how others solved the problem differently, which may help with learner reflection in the next task.

2. During this process, walk around the classroom and ask learners who do not have much to say prompts to get them talking.

Reflect

1. Ask your learners to complete the Reflection section of the learning journal.

2. When every learner has completed their learning journal, you could ask some learners to share its contents and ask them questions as they do so.

3. **Optional**: At the end of the lesson, ask each learner to submit their completed learning journals somewhere where you have access in case you want to review them.