Primary OTS Masterclass: Inclusive Technology

Thank you very much for leading this Masterclass. We hope that you enjoy working with this material as much as we enjoyed putting the activities together. We do appreciate all the effort that our volunteers put into bringing inspirational Computer Science Masterclasses to students around the country.

Inspiration for this topic:

In this session, students will explore how technology can make people be more included in life, and how we can make technology even better to make sure everyone is included. By becoming technology designers themselves, they will design their own inclusive game controller, then train their own AI model to control an online video game using only their movements.

Overview of Activities:

1. Introduction to inclusive technology
2. Name writing challenge
3. Discussion – what does inclusive mean
4. How inclusive tech helps people – role models
5. Worksheet 1 – Inclusive Tech Match-up
6. Worksheet 2 – Design an inclusive game controller
7. Activity - Control a game using your own movements
8. Extension activities – searching to speak

General Masterclass resources needed:

- Register of children
- Consent forms and emergency information to hand
- Stickers and markers for name badges
- Adult register
- Ri child protection policy
- Paper and pencils
- 2 different coloured post-it notepads (for feedback at the end)
- Drinks and biscuits

Specific resources needed (tailor to the number of students attending):

- 1 copy of Worksheets 1 and 2 per student
- Laptops, computers, or tablets with internet access and a webcam (Google Chrome and Safari are currently both supported), 1 per student ideally
- 1 blank sheet of paper and pencil per student – for write your own name challenge
  Optional:
- 1 copy of Guide to building an AI controlled game per pair of students

Support resources:

- PowerPoint slides
- Session Script

Things to prepare in advance

- Gather the complete list of resources as detailed above
- Print worksheets, additional information, and any other resources as needed
- You may wish to set the following webpages to be bookmarked on the students' devices or have the links easily accessible for the students. Alternatively, the instructions for accessing these webpages are in the Guide to building an AI controlled game document:
  - https://scratch.mit.edu/projects/1208597798/
  - https://teachablemachine.withgoogle.com/train
  - https://playground.raise.mit.edu/create/
- You may wish to have a pencil and piece of paper on the desk for each student.

Ask the Ri

Don't forget to collect any questions which arise, and email them to the Masterclass team at the Royal Institution: masterclasses@ri.ac.uk

Feedback

We would very much welcome your feedback on this session. If you have time, please collect feedback from the students at the end of the Masterclass and send it through to us. We would also appreciate feedback on how you have used the session, what you think worked well and what improvements would be useful.

Time plan of Masterclass:

Slides & Time	Overview	Activity (see script for further details)
Slide 1 5 minutes (5)	**Inclusive Technology** Introduction	Welcome students to the Masterclass. Begin the session by asking students what piece of technology they use every day, and how they would feel it they could not use that technology anymore. Ask the students to share their thoughts and explain that today they will be exploring how technology helps include people in life.
Slide 2 10 minutes (15)	**What would you do?** Name writing challenge	Show the video game controller to the students and identify that one of the buttons is missing. Ask the students what they would do if a button on a game controller suddenly stopped working. Explain that people may face these challenges, not because the technology is broken, but because it has not been designed with them in mind in the first place. Give each student a scrap of paper and a pencil. Explain that they have 30 seconds to write their name without using their hands, not even to pick up their pencil. After the 30 seconds is up, ask how they felt not being able to use their hands to write their name. Explain that for some people this is what it feels like to perform everyday tasks. Explain that in today's Masterclass we will be making our own inclusive technology to allow more people to play games. Ask if the students know what the word inclusive means.
Slide 3 5 minutes (20)	**What does inclusive mean?**	Discuss with the students what it means to be inclusive and explain what inclusive technology is - technology that everyone can use and that can be used by people with different needs and ways of living, no matter how they think, see, hear, move, or communicate. Ask the students why they think it is important that everyone is included, and able to use technology. Discuss how technology is important in our day-to-day lives and that if technology is not inclusive it may lead to the exclusion of people. Introduce that they will be now seeing some examples of people who use technology in amazing ways.
Slides 4-6 5 minutes (25)	**How inclusive tech helps people**	Go to slide 4 and introduce Steve Saylor, known as the blind gamer. Explain that Steve Saylor uses specific settings to play games and help game developers make their games more accessible for people with disabilities. Go to slide 5 and introduce Ade Adepitan, a paralympic wheelchair basketball gold medallist and a TV presenter. Play the video of Ade talking about how a recent addition to his wheelchair helped to make him faster and stronger. Link to short video: https://www.instagram.com/reel/DNsCrbR0LhV/ Link to longer video: https://www.facebook.com/ade.adepitan/videos/wheelchair-add-ons-that-actually-make-a-difference-/744046028790714/

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		Go to slide 6 and introduce Haben Girma. Explain that Haben is a lawyer who is both deaf and blind and speaks all over the world about making things more inclusive. Explain that she uses technology like Braille keyboards and screen readers to read and write, and that Braille is a language commonly used by blind people, using patterns of raised dots to represent different letters and numbers. To demonstrate the Braille device, play the first 40 seconds of the video clip found here: https://youtu.be/ZY-xsqTxDlw?feature=shared.
Slides 7-13 15 minutes (40)	**Inclusive Tech Match Up**	**Hand out worksheet 1 –** 1 worksheet per student. Explain that we are about to meet 6 young people who face different challenges in life. Their job is to think like an inclusive designer and choose tools to support each person. They have a worksheet with 8 different tools to choose from, and they must select which they think would support the person in each situation. Move to slide 8 and introduce Lily. Lily has trouble seeing the whiteboard in class. Ask the students to select technology they think will support Lily. Discuss what they have selected and why. Explain that Lily could use something to make the words on the board bigger and identify the magnifying app or the screen reader as support. Move to slide 9 and introduce Max. Max gets tired when walking long distances. After the students have selected and discussed technology they think will support Max, explain that Max could use something to help him move around more easily and identify the electric wheelchair and the automatic door as support. Move to slide 10 and introduce Sofia. Sofia finds it hard to hear her teacher and her friends talk. After the students have selected and discussed technology they think will support Sofia, explain that Sofia could use something to help her hear and identify the hearing aid as support. Ask the students how using this technology might change Sofia's day, and what other place/time this might support Sofia too. Move to slide 11 and introduce Amira. Amira cannot read the labels on her school supplies or her books. After the students have selected and discussed technology they think will support Amira, explain that Amira could use something to make it easier to identify her books and supplies by herself and identify the braille label maker and magnifying glass app as support. Discuss how these technologies might help Amira to become more independent and ask what other technologies might be helpful to Amira in this situation. Move to slide 12 and introduce Ethan. Ethan uses a wheelchair. After the students have selected and discussed technology they think will support Ethan, explain that Ethan could use something to make it easier for him to get around and not rely on other people, and identify the automatic doors as support. Move to Slide 13 and introduce Jaden. Jaden finds it hard to open his lunchbox. After the students have selected and discussed technology they think will support Jaden, explain that Jaden could use something that will make it easier for him to eat, and identify the adaptive cutlery as support. Ask which other challenges Jaden may face and what other technologies might be helpful to make Jaden's life easier. Explain that these technologies are actually useful for everyone. Often, inclusive technology isn't just useful for those who face particular challenges, and that creating inclusive technology makes life better for everyone.

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Slides 14 15 minutes (55)	**Design an inclusive game controller**	**Hand out worksheet 2 –** 1 worksheet per student Explain to the students that some people, like Jaden (from previous activity), cannot use small things very easily and can find it challenging to play video games with his friends, because of all the small buttons on the controller. Ask the students to design an inclusive video game controller that Jaden could use. Using the worksheet as a template or creating their own outline, they should draw and design a games controller that Jaden could use, and ensure they label each part of their controller explaining what it is and how it would help Jaden to play the games. Prompt the students to think about how Jaden will use the controller and what commands the controller will need to have to play different games – think about the games that they play and what kind of commands they use (e.g. to jump, to talk to different characters, to pass the ball in football).
10 minutes (65)	**Break**	**Drinks and biscuits and comfort break.**
Slides 16-25 45 minutes (110)	**Using our own movement** Using your movements to control a video game	Inform the students that they are going to train an AI model to recognise their movements and use them to control a simple video game. For this activity the students will need a laptop with webcam access. Help the students to follow the instruction guidance document to build their AI game control. **Steps 1-3:** They will first need to open the game, at https://scratch.mit.edu/projects/1208597798, then move to Slide 17. Allow students to play the snake game, then ask them how they control the game, and whether they think this would work for everyone. Demonstrate to students how they can download the game, by clicking file, then save to your computer. **Steps 4-11:** Go to slide 18, and ask students to open up Google's Teachable Machine by searching for it in a new tab, or navigating to https://teachablemachine.withgoogle.com/train. Explain that they will need to come up with four different poses the model will use to know which direction to move the snake in, then walk them through the steps of recording each of these Go to slide 19, and once everyone has trained their models and they are happy that they are able to recognise their movements correctly, guide the students to export their model and copy the sharable link. Then, move to slide 20, and ask the students to make sure their webcam has been turned off in Teachable Machine. **Steps 12-18:** Go to slide 21 and ask students to open up Dancing with Ai by searching for it in a new tab, or navigating to https://playground.raise.mit.edu/create. Guide them through how to load the file they downloaded earlier, by selecting File, then Load from your computer. Go to slide 22 and guide students through adding the Teachable Machine extension, then go to slide 23 and guide them through pasting the Teachable Machine sharable link into a new block. Remind them to click the green flag after pasting their link. Go to slide 23,

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		and guide students through how to replace the control blocks with new Teachable Machine control blocks for each direction the snake can move. After completing this step, allow students to test their game out with their new poses, then when students have completed the activity, move to slide 25 for final discussion on the activity. Ask the students how their new controls compared to the original controls, what else they could do to improve the game, or how this control could be used in other technologies. Explain that the next step in the design process would be to get their new controls tested by people who will be using them.
Slide 26 10 mins (120)	Further Activities Feedback, tidy up, questions time Ask the Ri	Thank the students and helpers for joining the session and introduce the extension material – Searching to Speak. Don't forget to collect any questions which arise, and email them to us: masterclasses@ri.ac.uk. We will send you answers as soon as possible. Then these can be reported back to the students at their next Masterclass session. We are also very grateful for any feedback you can provide us on the use of the resources, and we would love to hear your stories of how your Masterclasses went!