

# Smart Speakers and AI



Teacher's Guide

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## Smart Speakers: Project Overview

The Smart Speakers and AI project helps children develop their understanding of data technology and its uses in the everyday world. It also introduces learners to the concepts of artificial intelligence and machine learning. This project comprises 5 lessons linked to a film featuring a family discussing the benefits and potential drawbacks of smart speakers and AI technology.

Lesson 1: What are smart speakers?

Lesson 2: Artificial intelligence (AI) and machine learning

Lesson 3: How smart are smart speakers?

Lesson 4: Communicating with smart speakers?

Lesson 5: Smart speakers and privacy

### Age and stage

The topic is appropriate for P6/7 learners, although it can also be used at the early stages of secondary schools.

### Experiences & Outcomes

The guide relates to the experiences and outcomes within the Scottish Curriculum for Excellence as follows. However, it could be easily adapted for use in other education systems.

#### CfE second level

- I can use digital technologies to search, access and retrieve information and am aware that not all of this information will be credible. TCH 2-02a
- I can investigate how product design and development have been influenced by changing lifestyles. TCH 2-05a
- I can explore online communities demonstrating an understanding of responsible digital behaviour and I'm aware of how to keep myself safe and secure. TCH 2-03a
- I understand how information is stored and how key components of computing technology connect and interact through networks. TCH 2-14b
- When I engage with others, I can respond in ways appropriate to my role, show that I value others' contributions and use these to build on thinking. LIT 2-02a
- I can keep myself safe and secure in online environments and I am aware of the importance and consequences of doing this for myself and others. TCH 3-03a
- LIT 2-29a I can persuade, argue, explore issues or express an opinion using relevant supporting detail and/or evidence.

#### CfE third level

- I understand how scientific and technological developments have contributed to changes in everyday products. TCH 3-05a

- I can explore and use the features of a range of digital technologies, integrated software and online resources to determine the most appropriate to solve problems. TCH 3-01a

## Background information

### Artificial Intelligence (AI)

Artificial Intelligence (AI) is a field of computer science that aims to create machines that can perform tasks that would normally require human intelligence, such as recognising patterns, making decisions, and learning from experience. AI is the underlying technology in all smart speakers.

### Smart speakers

Smart speakers are voice-activated devices designed to perform tasks and provide information in response to user voice commands. These devices typically incorporate a virtual assistant, such as Amazon's Alexa, Google Assistant, Apple's Siri, or Microsoft's Cortana. The technology is an integration of artificial intelligence (AI), natural language processing (NLP), and cloud-based services.

### What can smart speakers do?

- Just by asking a question, users can get weather updates, news briefings, general knowledge, and much more.
- They can play music, podcasts, or audiobooks from various streaming platforms.
- Many can integrate with home automation systems, allowing users to control lights, thermostats, and other connected devices.
- Some speakers allow users to make calls, send messages, or even drop-in on other compatible devices.
- They can set alarms, reminders, or calendar events.

### Potential drawbacks of smart speakers

- Smart speakers are always 'listening' for their wake word, leading to concerns about eavesdropping or misuse of personal data.
- While they are usually reliable, AI can sometimes provide incorrect or misleading information.
- Being largely cloud-based, smart speakers require a stable internet connection. Issues with connectivity can hamper their functionality.

### Applications of AI

One of the most significant developments of AI is the recent emergence of large language models such as Open AI Chat GPT, Microsoft's Azure and Meta's Llama. These are types of artificial intelligence software trained on vast amounts of text from the internet. They're designed to understand and generate human-like language. When asked a question or given a prompt, they produce responses based on the patterns it learned from training data. There are also other programs, such as Dalle2 and Mid Journey that can generate unique, high quality images and graphics. Increasingly these systems will become integrated, for example Chat GPT has its own image generation app called Canva.

## Lesson guides

Each lesson in this guide provides teachers with learning intentions, success criteria, recommended approaches to teaching and learning, classroom activities and links to further resources.

## Lesson 1: What are smart speakers?

### Learning intention

- To understand how smart speakers work and describe some of their main features.

### Success criteria

- I can name different types of smart speaker technology.
- I can describe some of the features of smart speakers.
- I can explain how smart speakers work.
- I can work well in groups.

**Activity 1:** Start by showing a picture of a smart speaker. In groups, children discuss the following questions.

1. What are smart speakers?
2. Does anyone have a smart speaker at home?
3. What kinds of things can smart speakers do?
4. What are the advantages of having a smart speaker in your home?

Groups feedback on their discussion about smart speakers. Teacher notes and collates responses.

**Activity 2:** Play the opening scene from University of Edinburgh video about smart speakers (4 minutes duration). Link here: [https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1).

**Activity 3:** Class discussion about Scene 1 using following question prompts.

Questions	Suggested response
1. How would you describe the opinions of Dad and Grandad to smart speakers and AI?	Dad and Grandad don't know very much about smart speakers and what they can do. Grandad is suspicious about AI and don't trust new technology. He believes that artificial intelligence is about robots.
2. What examples do Fiona and Alastair give to show the benefits of smart speakers?	Asking general knowledge questions – eg, the capital of Sweden. Checking the weather. Finding recipes. Playing favourite music tracks.
3. Apart from Alexa, can you name other smart speaker assistants that can help you?	<ul style="list-style-type: none"><li>• Google's Assistant</li><li>• Apple's Siri</li><li>• Microsoft's Cortana</li></ul>
4. Apart from Amazon Echo, can you name 2 other brands of smart speaker?	<ul style="list-style-type: none"><li>• Google Nest</li><li>• Apple Home Pod</li><li>• Sonos One</li><li>• Bose Home System</li></ul>
5. Dad thinks that smart speakers learn by someone telling them all the facts and information. Is he correct?	No, that's not correct. Smart speakers are connected to the internet, just like a phone or laptop. When you ask it a question, it sends that query up to powerful computer servers in the "cloud." These servers search vast databases

	for the answer, then send the info back down to your speaker in seconds.
6. Grandad believes that robots will take over the world. Do you agree with this?	<ul style="list-style-type: none"> <li>• Robots don't have desires or emotions. They just follow their programming.</li> <li>• Robots can't think or feel like humans. They're just tools, not beings.</li> <li>• Although robots are used to carry out work in factories and some of them can do housework, they are not likely to take over the world anytime soon.</li> </ul>
7. How do smart speakers make use of artificial intelligence?	When you ask the speaker a question, AI helps it understand what you're saying. It's like when you type into Google, but instead, you're speaking. The AI then quickly works out the best answer or action and replies back.
8. Are the answers given by smart speaker always correct?	Yes, mostly they are accurate, but it might not always give you the right answer. Because AI is searching on the Internet, its answers might be inaccurate or out of date.
9. How is human intelligence different from smart speaker intelligence?	Humans are intelligent in a different way from smart speakers. We are creative, we can find new ways to solve problems, or understand how facts fit together. Smart speakers might seem "smart" because they can find information quickly, but they're not smart in the same way humans are.
10. What other examples of AI does the expert talk about in the video?	<ul style="list-style-type: none"> <li>• AI technology can help doctors make a better and faster diagnosis when we are ill.</li> <li>• It can translate sentences from other languages in a few seconds.</li> <li>• AI technology can look at an image of a plant and recognise the species.</li> </ul>

**Activity 4:** Group activities or think/pair/share.

Activity	Menu of possible responses
a) From what you have learned today, make a list of different ways that smart speakers can help people.	<ul style="list-style-type: none"> <li>• Give instant answers to questions, from weather forecasts to cooking recipes.</li> <li>• Manage smart devices at home like lights, thermostats, and locks with voice commands.</li> <li>• Stream music tracks, podcasts, or audiobooks.</li> <li>• Make voice or video calls, or send messages.</li> <li>• Set alarms, timers, and reminders.</li> <li>• Add items to shopping lists.</li> <li>• Check appointments and events in linked calendars.</li> <li>• Get daily news updates, or sports scores.</li> </ul>

	<ul style="list-style-type: none"> <li>• Provide information about nearby services.</li> <li>• Tell stories and jokes and fun facts.</li> </ul>
b) With a partner, discuss whether AI technology can ever be as smart as or smarter than humans.	<ul style="list-style-type: none"> <li>• The advances in AI mean that technology is getting smarter all the time.</li> <li>• Learners debate whether artificial intelligence can surpass human intelligence.</li> <li>• Learners may discuss the nature of 'intelligence'.</li> <li>• Learners should justify their conclusions.</li> </ul>
c) From what you've learned today, what did you find most surprising?	Groups feedback surprising aspects of their learning.
d) What more might you like to find out about smart speakers or AI?	Groups feedback what they would like to learn.

### Plenary

- Groups share their responses and answers with the class.
- Revisit learning intentions and success criteria.

### Additional resources

Notes for teachers about smart speakers and AI.

<https://dataschools.education/wp-content/uploads/2023/10/UnderstandingSmartSpeakersForTeachers.pdf>



## Lesson 2: Artificial Intelligence (AI) and Machine Learning (ML)

### Learning intention

- To understand how artificial intelligence helps us in our day-to-day lives.
- To know the meaning of machine learning.

### Success criteria

- I can describe ways that AI helps us in everyday life.
- I can explain how AI uses patterns in data to make decisions.
- I can give examples of limitations of AI.
- I can explain how AI uses machine learning.
- I can work well in groups.

**Activity 1:** Play the scene “Can Smart Speakers Think Like Us?” from the video. Learners should discuss the main points arising from the McMurdo’s discussion. Link here:

[https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1) . Timing: 4.04 to 6.44.

Questions	Suggested response
Like Dad in the McMurdo video, some people might think that smart speakers are human-like. Why might this be?	<ul style="list-style-type: none"><li>• They have human voices which speak to us.</li><li>• We give them names, like Alexa and Siri.</li><li>• They answer our questions and even make jokes.</li><li>• They remember things about us, our likes and preferences.</li><li>• They can hold conversations with us so they feel like our companions.</li><li>• Some advanced devices can detect how we feel from voice commands, for example if we are happy, sad or frustrated.</li></ul>
Explain how smart speakers are able to understand what we say to them.	<ul style="list-style-type: none"><li>• The smart speaker waits for you to say a special wake word like "Alexa" or "Hey Siri" to start listening closely.</li><li>• The recorded voice command is then converted into text.</li><li>• The speaker uses AI to look for patterns in the text so that it can work out what you are asking it to do. Just like how we learn to understand sentences by recognising familiar words and phrases, the speaker does the same but with computer code.</li><li>• Once it understands the command, the speaker either provides an answer, plays a song, sets a reminder, etc.</li><li>• Over time, smart speakers learn and adapt to better understand your voice, accent, and common commands, so it becomes more accurate.</li></ul>
What is artificial intelligence?	Artificial Intelligence is used in computer programs allows digital devices to think, learn, and make decisions in a similar way to humans. Instead of just following a set of specific instructions, AI-powered machines can learn to

	recognise patterns, make decisions, and learn from experience so that it gets smarter over time.
Suggest 3 things that AI can do really well, and 1 thing that it can't.	<p><u>Examples of things AI can do really well:</u></p> <ul style="list-style-type: none"> <li>• Voice recognition and assistance (like in smart speakers).</li> <li>• Recommending content (like movie suggestions, books or music tracks you might like).</li> <li>• Image recognition</li> <li>• Analysing data and spotting patterns</li> <li>• Chatbots – like Chat GPT</li> <li>• Playing complex games (like Chess or Go)</li> <li>• Working out the best way to get somewhere (in navigation apps).</li> <li>• Predictive text and autocorrection (in smartphones and messaging apps).</li> </ul> <p><u>Examples of things AI can't do well:</u></p> <ul style="list-style-type: none"> <li>• Picking the perfect birthday card for a friend.</li> <li>• Truly understanding art or music.</li> <li>• Making moral choices between right and wrong.</li> <li>• Giving genuine emotional support when we need it.</li> </ul>

**Activity 2:** Play video “What is Machine Learning?” (2 minutes), on YouTube:  
[https://www.youtube.com/watch?v=f\\_uwKZIAeM0](https://www.youtube.com/watch?v=f_uwKZIAeM0)

Class discusses the main points to emerge from this video.

Questions	Suggested response
What is machine learning?	Machine Learning is when computers learn and get better at tasks by studying data, so that they can make decisions on their own, instead of being directly told what to do every time.
Computers use algorithms to help perform tasks. What is an algorithm?	An algorithm is like a recipe: it's a set of step-by-step instructions to complete a task or solve a problem. Just as you follow a recipe to bake a cake, computers follow algorithms to perform functions or tasks.
How does AI learn?	AI uses a powerful computing system to learn to recognise patterns in data. This can be images, text, voice recordings, etc. The more data or information AI has, the better it becomes at spotting patterns to predict responses to problems or questions.

**Activity 3:** In groups, learners engage in further investigative learning about AI. They can draw from their own experience or use the Internet.

Activity	Menu of possible responses
<p>a) Apart from smart speakers, find out about other technologies that use artificial intelligence. Make a list.</p>	<ul style="list-style-type: none"> <li>• Voice recognition/conversational assistant technology can also be used for websites, some apps and smartphones.</li> <li>• Face recognition to unlock devices.</li> <li>• Friend or post suggestions on social media.</li> <li>• Factories use robots to handle tasks that were once done by humans.</li> <li>• Robots assist surgeons with precision tasks.</li> <li>• Some hospitals use robots for delivering medicines or supplies.</li> <li>• Self-driving cars, trucks, and drones are changing how people travel and how goods are delivered.</li> <li>• Chatbots and virtual assistants help to handle customer queries online, rather than humans.</li> <li>• AI is being used to generate music, write film scripts, and even create art, using platforms such as Chat GPT, Dalle2 and Mid Journey.</li> <li>• Netflix/Spotify recommendations.</li> <li>• Chat GPT.</li> </ul>
<p>b) AI systems can be incredibly smart, but are they smarter than humans? Discuss in your group.</p>	<ul style="list-style-type: none"> <li>• Generally speaking, AI is not smarter than humans, but it can depend on what type of activity we're referring to.</li> <li>• AI systems can process and spot patterns in data much faster than the human brain but they are usually specialists at one thing - whether that's predicting what music you want to listen to, or the best move to make in a game in chess.</li> <li>• But as humans, we don't focus on just one thing when we are trying to solve problems or make decisions. We draw upon our own experiences and what we know about the world, and how we feel about things to help us do this.</li> <li>• Currently there aren't AIs that can do all the types of thinking which humans are capable of. So although systems that use artificial intelligence are incredibly smart, AI doesn't truly understand the meaning behind the decisions it makes. That is something only humans can do.</li> <li>• However, in the future, machine learning and AI will become more sophisticated and intelligent and some experts believe AI systems will think more like humans do and even become smarter.</li> </ul>

## Plenary

- Groups share their responses and answers with the class.
- Teacher collates responses and suggestions on Smart Board or screen.
- Revisit learning intentions and success criteria.

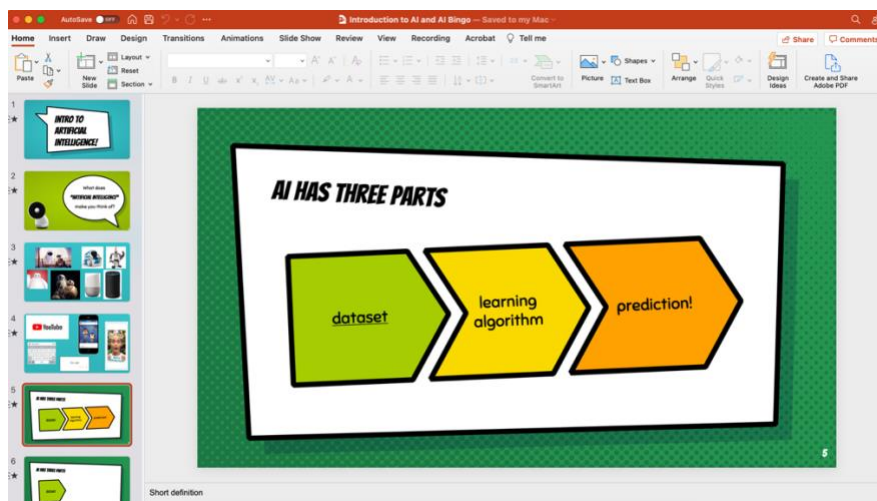
## Additional resources

Notes for teachers about smart speakers and AI.

<https://dataschools.education/wp-content/uploads/2023/07/UnderstandingSmartSpeakersForTeachers.pdf>

If you'd rather give a presentation about AI yourself, there are useful slides here:

<https://raise.mit.edu/daily/supervisedml/>



### Lesson 3: How smart are smart speakers?

#### Learning intention

- To understand the limitations of smart speakers.
- To understand what smart speakers know about us.

#### Success criteria

- I can describe questions/commands that smart speakers are likely to answer accurately.
- I can describe questions/commands that smart speakers would be unable to answer accurately.
- I can say why answers given by smart speaker may not always be trustworthy.
- I can think of good questions to ask about this topic.

**Activity 1:** Play the third scene “Is a Smart Speaker Always Right” from the McMurdo video, where the family discuss how much to trust the responses and information given by smart speakers. Link here: [https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1). Timing: 6.44 – 7.45.

Learners discuss the main points to emerge from the video. Then, as a class or in groups, learners discuss the following questions.

Questions	Suggested response
Give 3 examples of questions you could ask which a smart speaker is almost certain to answer correctly.	<ul style="list-style-type: none"> <li>• “Who painted the Mona Lisa?”</li> <li>• “What is the capital of Sweden?”</li> <li>• “What is the currency of Germany?”</li> <li>• “How do you spell the word separate?”</li> <li>• “What is five hundred divided by 12?”</li> <li>• “What time is it now?”</li> </ul>
Give 3 examples of questions a smart speaker couldn’t answer correctly, or answer at all. Say why.	<ul style="list-style-type: none"> <li>• “Where can you get the best pizza in the world?” A smart speaker couldn’t answer that question. Many pizza places around the world will advertise their pizzas online as being the best, so AI systems cannot easily answer such questions.</li> <li>• For questions such as “How did my Gran’s homemade apple pie taste?” or, “Tell me about a memory from my first day at school,” or, “Which football team should I support?” - smart speakers couldn’t answer these because they have no data upon which to base an answer.</li> </ul>
Give reasons why you shouldn’t always trust the answers given by a smart speaker.	<ul style="list-style-type: none"> <li>• Smart speakers might not have access to the most recent or comprehensive information on the Internet.</li> <li>• They can sometimes misunderstand a question due to the way a person speaks or the command they give.</li> <li>• The data sources on the Internet might contain biases, leading to one-sided answers.</li> </ul>

	<ul style="list-style-type: none"> <li>• Some speakers might rely on specific databases or websites, which might not have the most accurate or updated information.</li> </ul>
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Groups share their responses with the rest of the class. The key teaching point is that learners understand that, while smart speakers are useful tools, it's always a good idea to consult multiple sources or use human judgment when making important decisions based on their answers.

**Activity 2:** Play the fourth scene “Does a Smart Speaker Know Who You Are?” from the McMurdo video, where the family discuss how much the smart speaker in their home knows about them. Link here: [https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1). Timing: 7.45 – 9.09. Learners discuss the main points to emerge from the video. Then, as a class or in groups, learners discuss the following questions.

Questions	Suggested response
What are some of the things that a smart speaker might know about us?	<ul style="list-style-type: none"> <li>• It can recognise individual voices and differentiate it from others in the house.</li> <li>• If you ask it for weather every morning, play specific songs in the evening, or set alarms for certain times, it learns these habits.</li> <li>• Based on your listening history, it can work out your favourite genres, artists, podcasts, etc.</li> <li>• It will remember your search history of questions you asked or the topics you're curious about.</li> <li>• It'll be aware of other smart devices you've linked, such as smart bulbs, thermostats, or security systems.</li> <li>• It may know your home address, especially if you ask for location-specific information like local weather or nearby restaurants.</li> <li>• It can learn your shopping habits, particularly if you buy things or create shopping lists using the speaker.</li> <li>• If you've connected it to your calendar or set reminders, it will know about your scheduled events or tasks.</li> </ul>

### Plenary

- Groups share their responses and answers with the class.
- Teacher collates responses and suggestions on Smart Board or screen.
- Revisit learning intentions and success criteria.

### Additional resources

Notes for teachers about smart speakers and AI.

<https://dataschools.education/wp-content/uploads/2023/07/UnderstandingSmartSpeakersForTeachers.pdf>

## Lesson 4 Communicating with smart speakers

### Learning intention

- To understand the best way to communicate with smart speakers.

### Success criteria

- I can describe problems that prevent a smart speaker from understanding a question or command.
- I can say how engineers are working to overcome problems of language recognition.
- I can explain why smart speakers don't have feelings or emotions.
- I can work well with others.

**Activity 1:** Play the scene “Does a Smart Speaker Always Understand You?” from the McMurdo video, where the family discuss the problems of smart speakers not understanding Grandad’s questions or commands. Link here: [https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1). Timing: 9.09-11.22.

Learners discuss the main points to emerge from the video. Then, as a class or in groups, learners discuss the following questions.

Questions	Suggested response
Sometimes a smart speaker can't understand a question or command. Suggest possible reasons for this.	<ul style="list-style-type: none"> <li>Different accents or regional pronunciations can sometimes confuse voice recognition systems (like Grandad McMurdo in the video).</li> <li>Mumbled speech might not be picked up accurately.</li> <li>Background noises, like a TV playing or people talking, can interfere with its ability to hear clearly.</li> <li>If a question or command is phrased in a complicated manner, the speaker might struggle to grasp what is meant.</li> <li>Users may have different ways of asking the same question.</li> <li>Some words or newer slang might not be in its database.</li> <li>If you issue multiple instructions in a single sentence, it might not catch or process all of them.</li> <li>Bugs or glitches in the software can occasionally lead to misinterpretations.</li> </ul>
Sometimes similar sounding words have different meanings which can confuse smart speakers. For example <i>Flour</i> (used in baking) and <i>Flower</i> (a plant).	<ul style="list-style-type: none"> <li>Bare (without covering) vs. Bear (the animal).</li> <li>Two (the number) vs. To (a preposition) vs. Too (also).</li> <li>Knight (a medieval soldier) vs. Night (opposite of day).</li> <li>Break (to shatter) vs. Brake (used to stop a vehicle).</li> <li>Weather (climatic conditions) vs. Whether (choice between alternatives).</li> </ul>

Try to come up with more examples.	<ul style="list-style-type: none"> <li>• Sell (to give something in exchange for money) vs. Cell (a biological unit, or a small room).</li> <li>• Stationary (not moving) vs. Stationery (writing materials).</li> <li>• Waste (discard) vs. Waist (part of the body between the ribs and hips).</li> </ul>
What are software engineers doing to improve the voice recognition features of smart speakers?	<ul style="list-style-type: none"> <li>• Using voice samples from hundreds of different accents and languages to train smart speakers to learn what they sound like.</li> <li>• Using voice samples from people of different ages, accents, and languages.</li> <li>• Developing algorithms to filter out background noises.</li> <li>• Using advanced AI techniques to recognise and predict voice patterns.</li> <li>• Allowing users to correct mistakes, which the system then learns from.</li> <li>• Using better microphones and processors in the speaker itself.</li> </ul>

Groups can share their learning with the class.

**Activity 2:** Play the scene “Do Smart Speakers Have Feelings?” from the McMurdo video, where the family discuss whether a smart speaker has feelings and whether it is important to speak politely. Link here: [https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1). Timing: 11.22 – 15.14.

Learners discuss the main points to emerge from the video. Then, as a class or in groups, learners discuss the following questions.

Questions	Suggested response
Is it true that smart speakers can have feelings or experience emotions?	No, it’s not true. Smart speakers, and AI-supported technologies in general, can’t feel emotions, and they don’t have friends.
Why might some people think that smart speakers have feelings or emotions?	<ul style="list-style-type: none"> <li>• They provide answers using natural-sounding language.</li> <li>• They apologise when they can't fulfil a request, much like a human would.</li> <li>• They respond to user commands, creating a sense of conversation, so they are like our companions.</li> <li>• They can anticipate our needs, making them seem intuitive in the same way as humans would be.</li> <li>• Movies and media often portray AI with emotions.</li> </ul>



**Activity 3:** In groups, learners engage in further investigative learning about AI. They can draw from their own experience or research using the Internet.

Activity	Menu of possible responses
<p>Some films or TV programmes have AI characters with human qualities. For example, "Wall-E" is a film about a small robot that shows a range of emotions, from loneliness to love.</p> <p>In your group, come up with more examples of films where AI has human qualities.</p>	<ul style="list-style-type: none"> <li>• <b>Big Hero 6</b> featuring Baymax, a healthcare companion robot who, while originally programmed for medical assistance, begins to show signs of empathy and understanding as he bonds with the main character.</li> <li>• <b>The Iron Giant</b> The tale of a giant robot from space who befriends a young boy and displays feelings of friendship, fear, and self-sacrifice.</li> <li>• <b>Robots</b> An animated film that follows the adventures of a young robot who displays a wide range of human-like emotions.</li> <li>• <b>A.I. Artificial Intelligence</b> A film about a robot boy who desires to be human to be loved by his human mother.</li> <li>• <b>I, Robot</b> A film about robots developing emotions and understanding of human values.</li> <li>• <b>Ex Machina</b> A movie about a humanoid robot with complex emotions and self-awareness.</li> <li>• <b>Blade Runner</b> A film that revolve around synthetic beings called "replicants" that have emotions indistinguishable from humans.</li> </ul>

Groups can share their learning with the rest of the class.

**Activity 4:** In the scene, the McMurdo family discuss whether it is necessary to speak politely to smart speakers.

Questions	Suggested response
<p>Is it possible for smart speakers to be rude to us?</p>	<ul style="list-style-type: none"> <li>• Maybe smart speakers come across as rude or impolite if they don't always respond when you ask them a question. But that's not the case. Usually when this happens it is due to the speaker not hearing the user, misinterpreting their question or not being able to answer or do what the user asks because of how they've been designed.</li> <li>• Smart speakers aren't human, they don't have emotions, and they can't feel offended. Smart speakers are programmed to respond to the user's voice and follow their commands. This should happen even if the user is rude to the smart speakers.</li> <li>• Smart speakers could be designed to use different response styles if they detect rude words in the user's voice commands.</li> </ul>

	<ul style="list-style-type: none"> <li>Some speakers are programmed to avoid responding at all if the user is insulting them, or respond simply by saying that they do not know the answer.</li> </ul>
<p><i>“Smart speakers have no feelings so it’s okay to be rude or impolite to them.”</i></p> <p>Do you agree with this view?</p> <p>Can you think of reasons why you shouldn’t be rude or impolite?</p>	<ul style="list-style-type: none"> <li>Learners will discuss a range of views.</li> <li>Smart speakers aren’t human, they don’t have emotions, and they can’t feel offended.</li> <li>However, interacting rudely with inanimate objects, even smart speakers, might spill over into interactions with real people, especially if observed by children.</li> <li>Being consistently polite can become a habit. Practicing courteous behaviour, even with machines, reinforces this positive habit.</li> <li>Speaking clearly, without using slang or bad language, might ensure that commands are more easily understood by the device.</li> <li>While you might not believe the device has feelings, being rude to it might make others around you uncomfortable.</li> </ul>
<p>Would you trust AI more or less if it had feelings? Say why/why not.</p>	<p>More Trust:</p> <ul style="list-style-type: none"> <li>People may feel AI that seems emotional is friendlier and more like a human.</li> <li>Users might believe that an AI with feelings can better understand them.</li> <li>Feeling connected to the AI could make users trust it more.</li> </ul> <p>Less Trust:</p> <ul style="list-style-type: none"> <li>Users might worry that an emotional AI is unpredictable.</li> <li>If it has emotions, it might can act on whims or biases, like humans.</li> <li>Users might fear that emotionally-aware AI could become too nose-y or intrusive, leading to mistrust.</li> </ul>

### Plenary

- Groups share their responses and answers with the class.
- Teacher collates responses and suggestions on Smart Board or screen.
- Revisit learning intentions and success criteria.

### Additional resources

Notes for teachers about smart speakers and AI.

<https://dataschools.education/wp-content/uploads/2023/07/UnderstandingSmartSpeakersForTeachers.pdf>

## Lesson 5: Smart speakers and privacy

### Learning intention

- To understand safety and privacy issues associated with smart speakers.
- To design my own AI device.

### Success criteria

- I can say why it's not a good idea to share secrets with a smart speaker.
- I can say how engineers are working to overcome this problem.
- I can explain how to change the security settings on a smart speaker.
- I can design my own AI device and select features.
- I can work well with others.

**Activity 1:** Play the scene “Can Smart Speakers Keep Secrets?” from the McMurdo video, where the family discuss issues relating to the security of smart speakers and AI systems. Link here: [https://media.ed.ac.uk/media/t/1\\_1gn8s3x1](https://media.ed.ac.uk/media/t/1_1gn8s3x1). Timing: 15:14 – end.

Learners discuss the main points to emerge from the video. The key learning objective is to understand the data collection and storage practices of these devices. Then, as a class or in groups, learners discuss the following questions.

Questions	Suggested response
Is it a good idea to share secrets with a smart speaker? How safe would it be?	<p>No, it's not a good idea to share secrets with a smart speaker. While they have security features, there's always a risk of hacking or unintentional recording. It's safer to keep personal information private.</p> <ul style="list-style-type: none"><li>• Smart speakers can sometimes activate accidentally and record conversations.</li><li>• Conversations can be stored on company servers, making them potentially accessible.</li><li>• If someone breaches or hacks the speaker's security, they might access your conversations.</li><li>• Some devices may share data with third parties, either intentionally or due to software vulnerabilities.</li><li>• It's always best practice to limit sharing of personal information, even with devices you own.</li></ul>
Can others find out what I have said to my smart speaker?	<p>Yes, under certain circumstances, others could potentially find out what you've said to your smart speaker.</p> <ul style="list-style-type: none"><li>• Companies like Amazon, Google, and Apple have been known to store what users say to their smart speakers for varying periods. While these are generally used to improve voice recognition and other features, they reside on the company's servers.</li></ul>

	<ul style="list-style-type: none"> <li>• If you mistakenly share your account details or your voice recordings, others might access them.</li> <li>• If someone hacks your account or device, they might access your questions and voice commands.</li> <li>• However, other people's smart speakers won't find out what you said to your smart speakers. These systems don't communicate with those in other households.</li> <li>• Conversational assistants made by different companies can't speak to each other. So your Alexa won't tell your friend's Siri what songs you've been listening to.</li> </ul>
Give an example of something that it wouldn't be wise to say around a smart speaker.	<p>It wouldn't be wise to say sensitive financial or personal information around a smart speaker, such as: "Hey, just to remind you, my online banking password is 'Sunshine123'!"</p> <p>Sharing such details poses a risk if the device accidentally records or if the data is hacked or becomes compromised in some way.</p>

Groups feedback to the class for further discussion. The key teaching point is that it is always best practice to limit sharing of personal information, even with devices you own.

**Activity 2:** In groups, learners use the Internet to find out about the security settings of Alexa.

Activity	Menu of possible responses
Use the Internet to find out how to change the security settings of Alexa.	<ol style="list-style-type: none"> <li>1. Open the Alexa App.</li> <li>2. Navigate to Settings &gt; Device Settings.</li> <li>3. Choose Your Device.</li> <li>4. Delete Voice Recordings to remove stored voice interactions.</li> <li>5. Change Wake word to reduce accidental activations.</li> <li>6. Turn off Drop-In for enhanced privacy.</li> <li>7. Check Communication Settings to adjust call/message preferences.</li> <li>8. Enable Two-Factor Authentication in "Account Settings" for added security.</li> </ol>

You can find out how to change Alexa's privacy settings with this series of videos:  
[https://media.ed.ac.uk/playlist/dedicated/1\\_rl0w5obg/1\\_bqgqxbmp](https://media.ed.ac.uk/playlist/dedicated/1_rl0w5obg/1_bqgqxbmp)

**Activity 3:** In pairs or in groups, learners design their own AI device. Their design should be based on the theme of “AI for Good” – the system they design should help humans or help the environment. They begin by researching different functions and the potential benefits of each.

Function	What is it?	Possible benefits
1. Facial recognition	Automatically recognises and remembers people just by looking at them. Identifies or verifies a person by analysing and comparing patterns in their face with stored data.	<ul style="list-style-type: none"> <li>You don't need to type in passwords; it just sees your face.</li> <li>Better safety – it'll know who's allowed to use it and who's not.</li> <li>It recognises you so it can change settings to how you like it when it sees you.</li> </ul>
2. Gesture sensor	Allows a device recognise and respond to movements, like waving a hand or swiping in the air. It's like giving commands without touching anything.	<ul style="list-style-type: none"> <li>Control your gadgets by just moving your hands or fingers.</li> <li>Imagine turning up your music by just swiping in the air!</li> <li>Useful when hands are dirty or wet.</li> <li>Saves space – no need for buttons or touchscreens.</li> <li>Set up your favourite gestures to do specific things.</li> </ul>
3. Smart Speaker	A device that turns electronic signals into sound. It's what lets you hear music, videos, or answers to your questions.	<ul style="list-style-type: none"> <li>Your AI can talk back to you or answer your questions out loud.</li> <li>Play songs, stories, or podcasts whenever you want.</li> <li>Get audible alerts for things you need to remember.</li> <li>Chat with friends without holding a phone.</li> </ul>
4. Eye recognition	A technology that identifies a person by looking at unique patterns in their eyes, especially the iris.	<ul style="list-style-type: none"> <li>Eyes are unique, so it's hard for someone else to pretend to be you.</li> <li>No need to remember passwords; just look at the device.</li> <li>Unlock or use gadgets without touching anything.</li> <li>Some systems can tell where you're looking and show info or zoom in.</li> <li>In the future it might even tell if you're tired or unwell by checking your eyes.</li> </ul>
5. Sentiment analysis	Sentiment analysis is a tech tool that figures out if words or sentences are happy, sad, angry, or have some other emotion.	<ul style="list-style-type: none"> <li>It can cheer you up with a joke when it senses you're having a difficult day.</li> <li>Your device can pick songs based on how you're feeling from your messages.</li> <li>If it knows you're upset, it might reply more kindly or helpfully.</li> <li>It could sense if you're frustrated with homework and offer tips.</li> </ul>

		<ul style="list-style-type: none"> <li>• If it knows you are worried about something it can offer tips or advice.</li> </ul>
6. Camera and screen	A device that captures pictures or videos of things around you.	<ul style="list-style-type: none"> <li>• Can take pictures of moments, friends, or places to remember later.</li> <li>• Chat face-to-face with pals or family, even if they're far away.</li> <li>• Play games or use apps that blend the real world with computer graphics.</li> </ul>
7. Voice modulation	Allows the AI to change its speaking tone or mimic different accents, making interactions more dynamic or tailored to the user.	<ul style="list-style-type: none"> <li>• The AI can switch its voice to sound happy, sad, or excited, making it more fun to chat with.</li> <li>• It can copy different accents or speak in foreign languages.</li> <li>• You can make the AI's voice sound just the way you like it, maybe even your favourite character.</li> <li>• In video games, it can use different voices for characters, making the game way more epic.</li> </ul>
8. Voice biometrics	Verifies a person's identity based on their unique voice characteristics.	<ul style="list-style-type: none"> <li>• Just by hearing your voice, your device can tell it's you and unlock or start up. No one else can pretend they are you.</li> <li>• No need to remember long passwords. Just speak, and you're in!</li> <li>• If you're eating or your hands are full, no problem! Your voice is all you need.</li> </ul>

**Activity 5:** In groups, learners review their research on AI features and share their findings. Then they identify which features would be useful for the AI system they will design..

**Activity 6:** In the same groups, learners design an AI system to help humans or the environment. Their design should include:

- The name of the system
- What does the AI device do?
- What problem does the AI device solve?
- Which AI functions does the device use (from activity 5)?

### Plenary

- Groups share their designs, including the AI features they decided to use
- Teacher collates responses and identifies common themes in the ways that learners wanted AI to help.
- Revisit learning intentions and success criteria.

## Extension activities

**Activity 7:** Learners can design the appearance of their AI device. This could involve simple sketching or more detailed aspects of art and design.



















**Activity 8:** Using the Internet, learners research 3 different types of smart speaker system. They determine common features and differences in what each system offers. They compare prices. They can decide which is the best system to recommend.

**Activity 9:** Learners can carry out an exploration activity linked to perceptions of AI and the extent to which they are sentient. This can support their discussion. Here is an example of such an exploration activity, which can be adapted: AI Literacy activities by Stefania Druga, available from the last page of:

[https://github.com/stefania11/ai\\_playground/blob/master/public/worksheets/Posters%20AI%20Literacy%20Families.pdf](https://github.com/stefania11/ai_playground/blob/master/public/worksheets/Posters%20AI%20Literacy%20Families.pdf)

### Exploration Activity

Pick how you perceive your own AI technology across different dimensions. For example, is your technology more like an animal or a person?

Animal		_____		Person
Understands		_____		Misunderstands
Unfriendly		_____		Friendly
Smart		_____		Not Smart
Caring		_____		Uncaring
Unforgetting		_____		Forgetful
Truthful		_____		Untruthful
Like a friend		_____		Like a parent
Exciting		_____		Boring

**Activity 10:** Learners research or discuss what the future of smart devices might be. What kinds of features or functionality might they offer 5 years from now? 10 years from now?

Note: The next generation of Alexa will have a large language model on board such as Chat GPT. Learners might discuss the benefits of this feature.

Potential benefits:

- Whether it's finding out about science or history, the smart speaker can engage in back-and-forth question and answer sessions, making learning more interactive. Conversing with a smart device will feel more like talking with a human.
- Ask for a story and the smart speaker can create one using the language model, even customising it based on preferences. For example, "Make up a short story about pirates being lost in a storm at sea."
- Great for learning a language - the speaker translates or even teaches pronunciation in real-time.
- Users can give more complex commands or set up intricate routines around the home by just talking to the speaker. "Set up my morning routine. At 7 am, play some Taylor Swift from my Spotify playlist, turn on the kitchen lights, start the coffee maker, and tell me what the weather is going to be like today."