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AI Under One Roof: The Ethics of Smart Homes

Why?

This lesson equips students with a critical understanding of the rapidly evolving landscape of smart home technology and its integration into daily life, building awareness about privacy, security, and ethical implications. By exploring the practical applications and potential challenges of AI in residential settings, students learn to navigate the benefits and risks of digital advancements responsibly. Engaging with these topics prepares students to become informed and conscientious digital citizens, capable of making educated decisions about technology use in their own lives and society at large.

Materials Needed	Time needed
• Printouts of simulation handout	• Approximately 45 - 60 minutes

Objectives

- Students will be able to identify and describe the functions of various smart home devices, from common to lesser-known gadgets.
- Students will be able to analyze the potential privacy and security risks associated with smart home technology.
- Students will be able to evaluate the ethical considerations of using AI-powered devices in residential settings.

Key Concepts & Vocabulary

- **Smart Home**: House equipped with interconnected, internet-enabled devices for automation and control.
- **IoT (Internet of Things)**: Network of physical objects embedded with sensors, software, and other technologies.
- **Autonomy**: Devices operating independently, without human intervention.

Lesson Components

1. **Before You Watch**: Connect lesson to background knowledge of smart homes and get students' attention
2. **Video**: Show the pedagogy.cloud video explaining the ethical considerations in the topic of AI in smart devices
3. **Case Study**: Detail a real-world scenario that relates to the issue of smart homes and AI use
4. **Simulation**: Lead students through an interactive activity exploring the possible ethical considerations
5. **Discussion**: Ask whole-class questions to reflect on experience and consider perspectives.
6. **Assessment**: Verify student understanding with an exit ticket

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1. Before You Watch

“Real or Fake” Quiz
The list below consists of some real and some fake smart home devices. Have students guess which are real and which are fake by the descriptions.

1. **Smart Thermostat** (Real): Adjusts temperature to your preferences.
2. **Intelligent Egg Tray** (Real): Alerts when eggs are low.
3. **Smart Blender** (Fake): Analyzes nutrition and suggests recipes.
4. **AI Laundry Sorter** (Fake): Automatically sorts laundry by color.
5. **Voice-Controlled Curtains** (Real): Opens and closes with voice commands.
6. **Intelligent Food Composter** (Fake): Analyzes waste and turns it into best possible compost overnight.
7. **Smart Door Mat** (Fake): Alerts when it needs cleaning.
8. **Smart Toothbrush** (Real): Monitors brushing habits and technique.
9. **Robotic Window Cleaner** (Real): Cleans windows autonomously.
10. **Self-Watering Plant Pot** (Real): Waters plants based on moisture level.
11. **Smart Mirror** (Real): Displays news, weather, and notifications.
12. **Holographic Home Assistant** (Fake): Projects 3D holograms for interaction.
13. **Pet Emotion Analyzer** (Fake): Detects and reports a pet's mood.
14. **AI Closet Organizer** (Fake): Suggests outfits based on projected weather.
15. **Smart Sleep Tracker** (Real): Monitors sleep patterns and quality.

While You Watch: Mention these topics and questions for students to look out for as they watch the video:

- Describe how a smart fridge might remind you when you're low on milk.
- Find an instance in the video where privacy concerns about smart homes are mentioned. What are these concerns?
- How does the video suggest balancing AI autonomy with human control in smart homes?

2. Video Summary

The animated video introduces AI-powered smart homes that enhance convenience and efficiency through personalized experiences, from automatic curtains to AI voice assistants and smart fridges. It raises ethical considerations related to AI autonomy, privacy, surveillance consent, data security, and the digital divide, highlighting the need for a balance between technological advancements and human control. The narrative emphasizes the importance of engaging in open dialogues about these ethical challenges to ensure that future smart homes respect individual values and rights while leveraging technology for better living.

3. Case Study

Distribute or read Case Study handout.
Summary: The Rivera family upgraded their home with AI-powered smart devices, enjoying increased convenience but facing dilemmas around privacy, security, and autonomy. They contemplated solutions like enhancing privacy settings, boosting

security measures, and setting boundaries for AI's decision-making capabilities. Their experience underscores the need to balance the benefits of smart home technology with considerations for privacy, security, and personal control.

4. Simulation

Objective:
Students will explore the challenges and considerations faced in maintaining privacy and security while utilizing a variety of smart home devices, including some lesser-known gadgets.

Distribute the Simulation Handout to groups (approx. 4 students).

Scenario:
A family is wanting to upgrade their home with an array of smart devices to enhance their living experience. From common devices like smart thermostats and locks to more unique gadgets like smart plant monitors and intelligent kitchen appliances, they aim to create a seamless, efficient, and enjoyable home environment. However, they need to ensure their smart home is secure and their privacy is protected.

Roles:
- **Tech Enthusiast Parent**: Enjoys integrating the latest gadgets.
- **Privacy-Conscious Parent**: Values the benefits of smart devices but is wary of privacy implications.
- **Gadget-Loving Teen**: Excited about using smart devices for entertainment and convenience but unaware of potential risks.
- **Security Savvy Child**: Interested in how devices work and ensuring they are safe to use.

Tasks:
Device Audit: Have students come up with smart devices that may be in the home, including and assess their function.
Suggested Devices: If students need suggestions for devices to list, here is some possibilities: smart thermostats, smart locks, smart lights, smart fridges, voice assistants, smart TVs, smart cameras, smart doorbells, robotic vacuum cleaners, smart ovens, smart blinds, smart mirrors, smart plant monitors, smart pet feeders, smart beds, smart showers, smart toothbrushes, smart fitness mirrors, smart aroma diffusers, smart egg trays.
Security Check: Have students identify potential security vulnerabilities for each device and suggest measures to safeguard them, such as two-factor authentication and encryption.
(The students representing the different roles should be focused on their portion of this analysis – opportunities or concerns)
Privacy Plan: Have students consider what data the different devices might collect, and determine whether they are a big enough concern to keep each device out of their homes.
Educational Presentation: Each group talks about their smart home setup and safety

strategies.

5. Discussion

These questions are designed to be used in whole-class discussion. Ask questions that relate most effectively to the lesson.

1. Which smart devices posed the greatest security challenges, and how were they addressed?
2. How did the family balance the convenience of smart devices with privacy concerns?
3. What lessons did you learn about the responsible use of smart home technology, and how can these lessons apply to others?
4. How can families ensure their privacy when using smart home technology?
5. How can smart homes be made accessible and beneficial for people of all ages?
6. What measures can be taken to prevent the digital divide from widening with the advancement of smart home technology?

6. Assessment

Exit Ticket: Provide a prompt for students to reflect on their learning, such as:

- How do smart devices change the way we interact with our homes?
- What are the potential risks of having so many connected devices in one household?
- What ethical considerations should be taken into account when designing new smart home devices?

Sources to Learn More

- Site discussing the ethics of Internet of Things (IOT) smart homes: https://www.housing-technology.com/the-ethics-of-smart-home-iot-devices/
- Article about smart toothbrushes being used in an online attack on a company's servers - https://www.zdnet.com/google-amp/home-and-office/smart-home/3-million-smart-toothbrushes-were-just-used-in-a-ddos-attack-really/

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Case Study: The Smart Home Dilemma

Introduction
In the city of Techville, the Rivera family decided to upgrade their home with the latest AI-powered smart devices. They installed smart locks, lights, thermostats, and even a fridge that could order groceries online. But they soon faced a dilemma: How much control should they hand over to their smart home?

Background Information
AI in smart homes uses technology to make life easier. Devices can learn from your habits to automate tasks like adjusting the thermostat or playing music. However, these conveniences come with questions about privacy, security, and control.

Problem Analysis
The Rivera family enjoyed the comforts of their smart home, but they encountered several challenges:
Privacy Concerns: The smart devices collected data about the family's daily routines. Who else could access this information?
Security Risks: The more devices connected to the internet, the higher the risk of hacking. Could someone outside the family control their home?
Autonomy: The smart thermostat adjusted the temperature based on past preferences, but sometimes the family wanted something different. Should they always adjust settings manually, or let the AI decide?

Possible Solutions
To address these challenges, the Rivera family considered several solutions:
Enhanced Privacy Settings: They could customize their devices' privacy settings, limiting the data collected and shared.
Improved Security Measures: Installing security software and using strong, unique passwords for each device could reduce hacking risks.
Balanced Autonomy: They might set guidelines for when AI could make decisions and when to override automated choices, maintaining a balance between convenience and control.

Conclusion
The Rivera family's experience highlights the delicate balance between embracing AI's conveniences and maintaining privacy, security, and personal autonomy in a smart home. Reflective questions for consideration:

Discussion Questions
- How would you manage privacy and security in a smart home?
- Should there be limits on what AI can control in your living space?
- How can we ensure technology benefits everyone, regardless of their economic status?

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Simulation Activity: The Security Challenge

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Device	What it offers	Security risks

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Video Script for Animator

Hello Young Innovators! Today we're discussing the ethics of AI in smart homes
Title screen

Today we have the chance to check out a brand new house. This is an Artificial Intelligence-powered smart home, where everyday objects come to life, making our lives more convenient and efficient. Imagine waking up to curtains that automatically let in the soft morning light and a coffee maker that knows just when to start brewing your favorite blend.

[Socrat narrating throughout, facing viewers.
Visual: From inside a tech-infused smart home, curtains open showing the sun rising, and a coffee maker turns on by itself. Example Image: https://i.imgur.com/gEDesPl.jpg]

In these homes, AI acts as the brain behind the scenes, learning from our habits and preferences to create personalized experiences. From AI-powered voice assistants that play your favorite music to smart fridges that remind you when you're out of milk, the possibilities are endless.

[Visual: A lady walks into the scene and "talks" to a voice assistant on her phone, and a smart fridge displays a "low milk" reminder with an image of a milk carton showing a low level of liquid and a blinking red light. Example Image: https://i.imgur.com/BYKsNxS.jpeg]

As we embrace these smart devices, we step into a web of ethical considerations. One significant concern is the potential for AI to make decisions on our behalf. Should an AI thermostat decide the temperature of your home, or should it always ask for your input? Balancing AI autonomy with human control is a delicate ethical dance.

[Visual: A man walks by a thermostat in the house; he looks at it, and it adjusts itself to be warmer. Then, the man reaches out to change the setting even higher, symbolizing human control. Example Image: https://i.imgur.com/mM9PXuT.jpeg]

Let's explore some real-world examples where AI in smart homes is already making an impact. Consider elderly care, where smart devices can monitor health vitals and alert family members or medical professionals in case of an emergency, offering peace of mind and potentially life-saving interventions.

[Visual: An elderly person in a living room, with smart devices around. A heart rate monitor on a screen sends an alert. Example Image: https://i.imgur.com/tMO3WTi.jpeg]

However, this introduces another ethical quandary: surveillance and consent. With cameras and sensors tracking movements for safety, where do we draw the line between care and invasion of privacy? It's crucial to ensure that all individuals in a smart home have agreed to the level of monitoring in place.

Moreover, the issue of data security looms large. As smart homes collect vast amounts of personal data, the risk of breaches and unauthorized access can't be ignored. Ensuring that AI systems in smart homes are secure against cyber threats is not just a technical challenge but an ethical imperative to protect personal privacy.

[Visual: One of the screens in this smart home gets a red ALERT message across the front of it. Then an image of a lock closing down replaces the alert. Example Image: https://i.imgur.com/hX2r3yu.jpeg]

Another layer of ethical consideration is the digital divide. As smart homes become more prevalent, there's a risk that only those who can afford these technologies will benefit, potentially widening the gap between different socio-economic groups. Ensuring equitable access to the advantages of smart home technologies is an ethical challenge that society must address.

[Visual: Two homes side by side. One is very technological looking, while the other looks very traditional. People walk out of the front doors of the houses and look at each other across a fence line. Example Image: https://i.imgur.com/ByAUrbl.jpeg]

The journey into the world of AI-powered smart homes is not just about marveling at the technological advances but also about navigating the complex ethical landscape they present. From privacy and autonomy to security and equality, these are the considerations that will shape the future of our living spaces.

[Visual: Zoom out to show the neighborhood, now with a variety of homes, some high-tech and some traditional, all connected by glowing lines that form a network. Example Image: https://i.imgur.com/xCWKPZS.jpeg]

As we continue to integrate AI into our homes, people need to engage in open dialogues about these ethical challenges, ensuring that the smart homes of the future are not only intelligent but also respectful of our values and rights.

[Visual: In the town mentioned above, people from different homes meet in a park, discussing and shaking hands, symbolizing community and ethical discourse. Example image: https://i.imgur.com/ixIb7Gl.jpeg]

Let’s discuss: Should there be limits on AI autonomy in homes?
[Display question on screen: Should there be limits on AI autonomy in homes?]

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Video Script for Narrations

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In these homes, AI acts as the brain behind the scenes, learning from our habits and preferences to create personalized experiences. From AI-powered voice assistants that play your favorite music to smart fridges that remind you when you're out of milk, the possibilities are endless.

As we embrace these smart devices, we step into a web of ethical considerations. One significant concern is the potential for AI to make decisions on our behalf. Should an AI thermostat decide the temperature of your home, or should it always ask for your input? Balancing AI autonomy with human control is a delicate ethical dance.

Let's explore some real-world examples where AI in smart homes is already making an impact. Consider elderly care, where smart devices can monitor health vitals and alert family members or medical professionals in case of an emergency, offering peace of mind and potentially life-saving interventions.

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Let’s discuss: Should there be limits on AI autonomy in homes?