digitalcareers

Learning and Teaching Resource

Using Nanotechnology to Improve Touch Screens

Teacher Guidance | Year 3/4 resource | 50 minutes

Teacher Background Information

In this activity, students will explore the use of touch screens as a user interface. They will collaborate in small groups to identify the properties of materials that are currently used in these digital systems and explore the difficulties and challenges with using this type of material.

Students will then be introduced to the emerging field of nanotechnology and explore its potential in improving touch screen interfaces. Through *Modelling, Simulation* along with *Evaluation*, students will make inferences in their group about the potential improvements that nanotechnology could make to their touch screen devices in the future.

Australian Curriculum Alignment

Digital Technologies: Modelling, Simulation and Evaluation activity

In this activity students will explore the use of digital systems and our interactions with common user interfaces. The computational thinking skills underpin learning across the Digital Technologies curriculum and link closely with the critical and creative thinking general capability.

> *In the Australian Curriculum: Digital Technologies, computational thinking is one of the key ideas. It is a problem-solving method that involves various techniques and strategies that can be implemented by digital systems. Techniques and strategies may include organising data logically, breaking down problems into parts, defining abstract concepts and designing and using algorithms, patterns and models.*
>
> ACARA

This activity presents opportunities for students to develop, practise, and apply a number of understandings, skills, and capabilities from across the Australian Curriculum. The suggested links to the Australian content descriptions and General Capabilities appear at the end of this document.

This activity also has links to the following Australian Curriculum General Capabilities of critical and creative thinking, and information and communication technology (ICT) capabilities. More detail about these links can be found at the end of the document.

Lesson Goals and Success criteria

To model and simulate the use of touch screens in a user interface and evaluate different types of materials that could be used to improve this digital system and a user's interactions with this kind of device.

- Explore how a touch screen works and the material it is made from
- Identify and define problems with the materials currently used in touch screen interfaces
- Apply understanding of new nanotechnology materials and how these could influence the design of touch screens in the future

Teaching and Learning Activities

Introduction

What is a touch screen and how does it work?

Commence a whole class discussion using this conversation starter. It may be useful to have an iPad or touch screen on hand for the students to engage with. In the discussion try and address the following:

What do we use it for?

How do we use it?

What parts of a normal computer is a touch screen similar to?

The most challenging part of this conversation for the students will be '*how does it work*?'. There are a number of videos on YouTube that could be used to help answer this question. An example of these videos can be found below:

www.youtube.com/watch?v=FyCE2h_yjxI

Learning Activity Steps

1. Split students into groups (ideal number would be three students per group)
2. Provide each group with a printed worksheet, writing equipment, a polystyrene sheet, and a plastic counter (to represent an electron)
3. Explain to students that the polystyrene sheet represents a touch screen similar to the screen on an Ipad. Each student will take turns to test the screen to determine what properties it has.
4. Have a whole class discussion about the word **Properties** and create a mind map definition of this word on the whiteboard. When the whole class has an understanding of the word properties get them to write down a definition for the word properties on their worksheet and begin testing the properties of the material and record their findings.
5. Student 1 will test the material to see if it is **rough or smooth**. Get this student to place the counter on the polystyrene and get them to swipe. Explain to students that the counter

represents electrical energy coming from their finger (you can introduce electrons if comfortable with this topic). The counter is what the Ipad recognises as touch.

6. This student then marks on the worksheet where they think this material belongs on the scale from rough to smooth (there is no correct answer here this is just a guess).
7. Student 2 will test the material to see if it is **elastic or plastic.** Get this student to press their finger into the polystyrene. If no mark is made, then the material is elastic. If a mark remains in the material, then it is more plastic (it is important to remind students to only press as hard as they normally would on a touch screen so not to push too hard).
8. This student then marks on the worksheet where they think this material belongs on the scale from elastic to plastic (there is no correct answer here this is just a guess).
9. Student 3 will test the material to see if it is **brittle or malleable.** Get this student to bend the polystyrene. If the polystyrene breaks it is brittle. If the polystyrene bends into a new shape without breaking it is malleable (these words will need some explanation as this will be the first time most students will have seen these words).
10. This student then marks on the worksheet where they think this material belongs on the scale from brittle to malleable (there is no correct answer here this is just a guess).
11. Ask students to imagine if this was really a touch screen. What problems or uses might there be if our touch screen had the same properties as the polystyrene? Get students to write in the spaces provide on the worksheet example of a problem or use that property could have if this was a real touch screen.

Introducing Nanotechnology

12. Give each group the laminated nanotechnology sheet and explain that this new material represents something called graphene. Graphene is a brand-new nanotechnology material created by scientists to **improve its properties.**
13. Give students a few minutes to play with the new material and discuss how this material is different.
14. Student 1 will now test the new material to see if it is **rough or smooth.** Get this student to place the counter on the laminated sheet and get them to swipe.
15. This student then marks on the worksheet where they think this material belongs on the scale from rough to smooth (there is no correct answer here this is just a guess).
16. Student 2 will test the material to see if it is **elastic or plastic.** Get this student to press their finger into the laminate. If no mark is made, then the material is elastic. If a mark remains in the material, then it is more plastic (it's important to remind students to only press as hard as they normally would on a touch screen so not to push too hard).
17. This student then marks on the worksheet where they think this material belongs on the scale from elastic to plastic. (there is no correct answer here this is just a guess)
18. Student 3 will test the material to see if it is **brittle or malleable.** Get this student to bend the laminate. If the laminate breaks it is brittle. If the laminate bends into a new shape without breaking it is malleable.

19. This student then marks on the worksheet where they think this material belongs on the scale from brittle to malleable. (there is no correct answer here this is just a guess)
20. Prompt students to have a discussion in their groups and see if there are any other properties this nanotechnology have that might be good to improve a touch screen. Get them to highlight these properties on their worksheet.
21. For all of the highlighted words get students to write in the space provided why these properties could improve touch screens in the future.

Summary/Assessment

Finish this activity with a whole class discussion comparing and contrasting the two materials.

Which material would be better for use in a touch screen?

What properties are useful in a touch screen?

How could nanotechnologies change and improve our current touch screens?

There are many useful videos on YouTube that explain nanotechnologies and the discovery of graphene.

Australian Curriculum Outcomes

Digital Technologies

- Identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007)
- Explain how student solutions and existing information systems meet common personal, school or community needs(ACTDIP012)
- Plan, create and communicate ideas and information independently and with others, applying agreed ethical and social protocols (ACTDIP013)

General Capabilities

- *Critical and creative thinking:* In this activity, students will collect, compare and categorise facts and opinions found in a widening range of sources, explore situations using creative thinking strategies to propose a range of alternatives, and identify and apply appropriate reasoning and thinking strategies for particular outcomes.
- *Information and communication technology (ICT) capability:* This activity presents an opportunity for students to practice, develop and apply their capabilities to create and modify simple digital solutions, creative outputs or data representation/transformation for particular purposes, and identify and compare the use of the main components of different ICT systems.

A property is:

Some common properties:

Create a word art with lots of different properties with simple descriptions for students to select from:

Rough

Smooth

Light

Heavy

Thick

Thin

Malleable

Brittle Plastic Elastic

Transparent

Opaque

Shiny

Dull

Current touch screen

Rough **Smooth**

Problem or use in touch screens and why?

Elastic **Plastic**

Problem or use in touch screens and why?

Brittle **Malleable**

Problem or use in touch screens and why?

Nanotechnology touch screen

Rough **Smooth**

Problem or use in touch screens and why?

Elastic **Plastic**

Problem or use in touch screens and why?

Brittle **Malleable**

Problem or use in touch screens and why?

Other properties that could improve touch screens

Nanotechnology – Graphene (laminated)