DISCOVERY AWARD

CREST AWARDS

ENRICH MY CLASSROOM

Teacher pack

TEAM PROJECT

Working in teams, students are challenged to design the classroom of the future using new materials and digital tools to improve the learning environment.

#coding
#nanotechnology
#ergonomics
#magnetism
#electricity

IN PARTNERSHIP WITH

urenco
The Energy to Succeed

Contents

Background

Schools have changed a lot over the years. Technology, research, design and engineering have transformed the classroom. Chalkboards became whiteboards and then Smart Boards. Notebooks and textbooks became laptops, e-books and tablets. Gone are overhead projectors and TV trolleys. Instead of passing notes, students are texting under their desks. Teachers have a much greater understanding of learning differences and there is a heavier focus on differentiation. Classrooms are more colourful. Desks are more often arranged in clusters than in rows. School lunches are healthier. The list goes on.

Enrichment

Enrichment occurs when you take something and make a change or addition that will improve it. There are many applications and uses of enrichment around us. For example, enrichment can describe a scientific process used in the nuclear industry. URENCO is an example of a company in this field; it enriches uranium so it becomes a usable fuel supply for nuclear power stations. Enrichment takes place inside a centrifuge, which spins really quickly to separate isotopes of uranium, U-235 and U-238.

In this project, students are challenged to come up with an innovative idea to enrich their experience in the classroom.

The future of classrooms

What will classrooms look like in the future? Perhaps students of the future will be able to travel to the moon or be in the crowd when the Berlin Wall came down, from the comfort of their classroom. Instead of the 10 subject options available at their school, students might have access to 100s or 1000s of subjects and specialist teachers through online learning. Maybe there will be standing desks for students who have difficulty maintaining focus while sitting or moving walls will make spaces more adaptable.

Technology, design and engineering certainly have an important role to play in improving our classrooms and there's huge potential to use tools like VR, AI, chatbots and 3D printing to improve the value and impact of education.

URENCO

URENCO has teamed up with the British Science Association to sponsor this resource as it forms a key part of the Richie education programme, which focuses on nurturing an interest in science, technology, engineering and maths (STEM) subjects. You can find out more about Richie, including the various teaching resources, quizzes and games, at www.learnwithrichie.com

You can learn more about URENCO's work at www.urenco.com. URENCO supplies isotopes to a wide range of fields including the medical industry, where they are used in cancer treatments, and the food industry, where research into nutrition and diet requires isotopes of elements such as zinc, iron and calcium.

Overview

Enrich my Classroom has been specifically developed to meet the CREST Discovery Award requirements. By undertaking the activity and completing the reflective CREST Discovery Passports, all your students should be able to achieve an Award. This resource can be delivered in school during lessons, as an extracurricular activity or as an enterprise activity. The project can be completed over 5 lessons or as a one-day event.

The challenge

Part One: Research Workshops
Students are split into teams of 5-7 for this Discovery Day. In part one of the project, team members are split up to join different research workshops, on one of the themes below. Students will be introduced to the science behind these topics and discover more about how they are used in school today.

- **Coding:** students investigate what we use computer programs for, and how they are designed.
- **Nanotechnology:** students learn about this field of research and innovation concerned with building materials and devices on the scale of atoms and molecules through exploring specific examples.
- **Ergonomics:** students explore the concept of designing products and systems with the needs of the user in mind and investigate how ergonomics is used to design seating and writing products.
- **Magnetism:** students discover how information can be stored by adding a magnetic property to a material, looking at the example of credit cards, and computer hard drives, and consider how this has affected the development of technology.
- **Electricity:** students find out about sources of electricity that have little or no CO2 emissions such as nuclear power stations and renewable energies and look at ways of meeting school electricity needs using local sources.

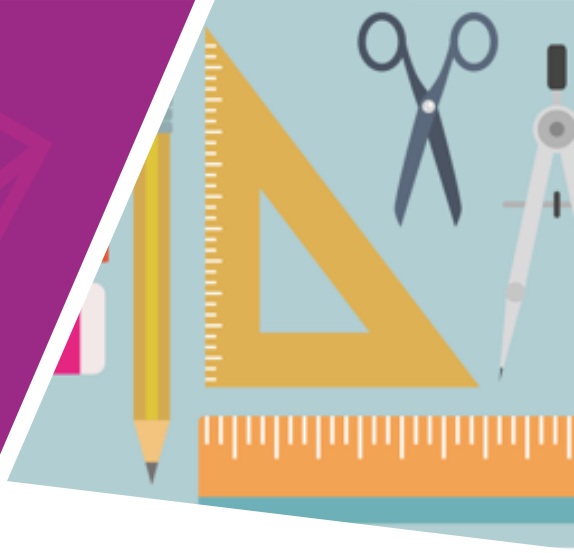
Part Two: Design Challenge
Teams come back together to feedback what they have learned and develop their own innovative ideas for enriching the classroom, based on the ideas from at least two of the workshops. This could mean designing an app, finding a new way to use nanotechnology, or using ergonomics to design a new classroom interior. During this process students will need to research and test their idea. These ideas will be presented to their peers at the end of the session.

Learning objectives

Students will cover a range of topics linked to the Key Stage 3 science and design and technology curriculum, including areas within the following attainment targets:

- Materials (Chemistry)
- Electricity and magnetism (Physics)
- Waves (Physics)
- Energy (Physics)
- Design (Design and technology)
- Evaluate (Design and technology)
- Technical knowledge (Design and technology)

Materials



Activity	Materials
Introduction	❑ Discovery Passports (1 per student) ❑ Student Pack (1 per student)
Research Workshop: Coding	❑ Writing materials ❑ Jam sandwich-making items: jam, bread, knife, etc ❑ Access to computers for internet research and to analyse survey data
Research Workshop: Nanotechnology	❑ Writing materials ❑ Access to computers for internet research ❑ If possible, examples of nanotechnologies, e.g. Magic Sand and Ferrofluid ❑ Large gloves, e.g. oven gloves or gardening gloves ❑ Beans or counters
Research Workshop: Ergonomics	❑ Writing materials ❑ Selection of pen types for comparison ❑ Materials for designing a pen grip, for example modelling clay ❑ Access to computers for internet research

Research Workshop: Magnetism	❑ Writing materials
	❑ Calculators
	❑ Materials for writing magnetic messages:
	  ❑ pieces of plastic and metal
	  ❑ blu-tack or similar to fix the pieces to the surface
	  ❑ card to cover the layout
	  ❑ magnets to read the words
	❑ Access to computers for research
	❑ Extra print outs of adjustable grid for laying out and covering binary words

Research Workshop: Electricity	❑ Writing materials ❑ Calculators ❑ Materials for investigating electricity generation, e.g. coils of copper wire, magnets and multi-meter ❑ Access to computers for internet research

Timings

Activity	Description	Timing
Introduction	The session leader introduces the day, sorts the teams and describes the workshops.	30m
Research Workshops	Each team member completes a different workshop. The available topics are: 1 Coding 2 Nanotechnology 3 Ergonomics 4 Magnetism 5 Electricity You do not have to offer all five workshops; the number offered can depend on resources available.	1h 30m
Break		
Feedback	Each team member reports back to the team on what they learned in their workshop. Teams begin to make connections and think about the challenge.	30m
Design Challenge	The teams work together to develop ideas in response to the challenge and prepare for the presentation.	1h 30m
Lunch		
Presentations	Teams finalise and deliver their 5-minute presentations. Teachers and students provide constructive feedback and ask questions.	1h
Reflections	Students reflect on their learning and complete their CREST Discovery passport.	10m

Top tips

- To inspire your students, why not invite a STEM ambassador or Inspiring the Future volunteer to introduce the project or give feedback on students' presentations?
- When considering timings, start with the end of your school day and work backwards.
- Account for timings that cannot be changed, such as lunch breaks, and schedule around them.
- Try and plan the day to give your students as much time as possible for the design challenge.
- Before presentations, allow 5 minutes for students to clear their tables and tidy away any equipment.

Step-by-step guide

Pre-project preparation

1. Read through the background information in the pack.
2. Print worksheets and gather the materials needed.
3. Think about which students will make strong leaders and assign them the role of Project Manager for their team (the groups can then decide the other roles).
4. You might like to ask students to ask the adults in their lives about what their classrooms were like when they were at school, to get them thinking about how schools have changed.

Set-up

1. Every team should have a table and enough chairs for 5-7 team members.
2. Teams will need access to the internet for research, which may mean making an additional computer lab or IT suite available for use.
3. Paper and pencils for drawing and sketching ideas should be available.

Introduction (30 mins)

1. Ask students to look at the '**30 years of classroom changes'** images in their student pack. Facilitate a class discussion about what has changed in schools over the last 30 years and what they think might change over the next 30 years.
2. Explain that today they are going to design the classroom of the future using new materials and digital tools to improve the learning environment.
3. Explain the programme for the day and briefly outline the different workshops.
4. Split into teams of 5-7. Each team member should have a specific role to play (as described in the student pack).
    a. Project Manager x1
    b. Communications Manager x1
    c. Market Research Manager x1
    d. Research Manager x1
    e. Engineer (1 or 2 depending on team size)
    f. Designer (1 or 2 depending on team size)
5. Allocate a student from each team to the different workshops.

Step-by-step guide

Research workshops (90 mins)

Activities for the workshops are designed to be student led, with hands-off teacher supervision. Please note that you do not have to offer all five workshop options; the number offered can depend on resources available.

1. Give out the workshop materials.
2. Put up timings on the board.
3. Remind students to take notes to help them provide feedback to their teammates.

Coding:

- In pairs students write down the steps for how to make a jam sandwich, swap the instructions with another pair and use them to make a jam sandwich.
- They will then review the steps and try to replace the sentences used with logic statements or flow charts.
- Students will then discuss why we use computer programs, and apps in particular, exploring how different apps can be categorised.

Nanotechnology:

- Students investigate what nanotechnology is through experimentation with Magic Sand, Ferrofluid or another nanotechnology.
- In pairs, using counters or beans, students will then lay out the letters of a word whilst wearing oven or gardening gloves, reflecting on the challenges of manipulating items on a small scale.
- Finally, they will research and share more examples of nanotechnology, and consider how nanotechnology could be used to enrich the school environment.

Ergonomics:

- In pairs, students use the seating risk assessment to assess their partner whilst sitting at their desk.
- Students then research the types of seating available and why they may be used and make a recommendation for their partner.
- In pairs, students look at a range of different types of pens and identify differences between them before going on to design a new grip for a pen.

Step-by-step guide

Research workshops (90 mins) *continued*

Magnetism:

- Students read the Binary Fact file and write their name and other words using binary.
- Students lay out the words (in binary) using magnetic and non-magnetic materials (e.g. metal washers to represent 1s and plastic discs to represent 0s) on the adjustable grid, and cover with another adjustable grid, and are challenged to 'read' each others' words.
- Ask students to consider the physical space required to store a book with 500,000 characters using this same method.
- Students carry out internet research into the types of technology using magnetic memory and the impact miniaturisation has had.

Electricity:

- Students write down different ways of generating electricity and to describe how they work.
- Provide students with a coil of wire and a magnet and demonstrate how moving a magnet near a coil of wire can produce electricity.
- Pupils write down all the different items in their classroom that require electricity to help them learn. They are challenged to consider alternatives and make predictions as to whether the classrooms of the future will require more or less electricity.
- For higher ability students: in pairs, students calculate the electricity usage for their classroom, using the Power usage fact file, and come up with ideas on how they could reduce this.
- Finally, students discuss surfaces that use motion from walking in the school and how this might be turned into electricity, with reference to the Movement Fact file.

Feedback (30 mins)

1. Using the feedback worksheet, the Project Manager should ask each person in turn to summarise what they have learned.
2. Encourage teams to begin to identify links between the different topics and to think about ways in which they can combine them and implement ideas in their own classroom.

Step-by-step guide

Design (90 mins)

Using the challenge task sheet, each team should come up with ideas to enrich their classroom, based on the links between the workshop topics that they identified in the feedback session.

1. Support the groups to identify problems, generate ideas and carry out relevant research.
2. Students use the challenge task sheet to focus on one idea and start to develop their own concept for enriching their classroom.
3. Students prepare their presentation; they might like to make a poster or a PowerPoint, and to include images and diagrams. Encourage them to think about who will do the explaining during their presentation. Encourage each student to present and discuss what their role in the project was.

Presentations (60 mins)

Each team should prepare a presentation that is no longer than 5 minutes, with each member contributing. The content of the presentation should include:

- An overview of what they are enriching
- Information on how they came up with the idea
- Sketches, drawings or images to illustrate how their solution works

If time allows, other teams may be given the opportunity to ask questions.

Reflection (10 mins)

Time for students to reflect on their learning and complete their CREST Discovery passport.

CREST Discovery Award

Students should complete the CREST Discovery Passport, available at www.my.crestawards.org. When you assess the passport to submit the awards, you will be recognising the skills that students will gain through participation in the day.

Preparation

Ready to get going with CREST? Sign up for a CREST account here: www.crestawards.org/sign-in

Create a new Discovery Award project with the name of the student and the title of the project. If you don't have all the details, you can fill these in later.

Run the project

We've created some super handy packs to help you deliver a successful Discovery Day. The activities in these packs can be done in one day or over a period of shorter sessions, whichever suits you. Students should spend 5 hours on the project.

You can download the Discovery Passport when you create your CREST account by following the link above.

Make sure you complete a risk assessment before running the project.

Reflection

So, your students have been hard at work and completed their CREST project, but don't let this be the end of their learning. At the end of the project, ask all students to complete their Discovery Passport. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Enter your project for a CREST Discovery Award

Hard work deserves a reward! Celebrate and certify your student's achievement by entering their project for a CREST Discovery Award. Simply:

1. Log in to your CREST account at www.crestawards.org/sign-in
2. Select the project and upload a sample of the students' Passports or other project evidence.
3. Check the participating students have met each of the criteria on the teacher assessment page.
4. Finally, complete the delivery and payment details to order your snazzy certificates.
5. Congratulations on completing CREST Discovery!

What next?

The scientific discovery doesn't need to end here. Students can have a go at the next level up – CREST Bronze.

Don't keep all the fun to yourselves, encourage others to take part in CREST projects and share the wonder of science. For free ideas on how to get started, see www.crestawards.org

Managed by

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