CREST AWARDS

GOLD AWARD

DESIGN THE ULTIMATE TOOTHBRUSH

70H Typically 70 hours of project work
Recommended for 16-18 year olds

Design & make project

Investigate what makes the ideal toothbrush and design your own.

#engineering
#health
#hygiene

HOW TO RUN CREST USING THIS ACTIVITY

Entering your project without a teacher or facilitator? No problem! You can enter your work yourself by following this link: **www.crestawards.org/sign-in**

Looking for some support? Find a mentor by contacting your local STEM Ambassador hub: **www.stem.org.uk/stem-ambassadors/local-stem-ambassador-hubs**

To use their project to achieve a CREST Gold Award your students will need to:

- **Develop and lead the project**
- **Complete a minimum of 70 hours of project work**
- **Consider the broader impact of their project and demonstrate an innovative approach**
- **Write a project report or portfolio of evidence**
- **Reflect on their work during the project using a student profile form**

Preparation

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

Create a new Gold Award project with the name(s) of the student(s) and the title of their project. If you don't have all these details, you can fill them in later!

We have some super handy workbooks and profiles for your students to use when running a CREST Award. You can download these when you create your CREST account by following the link above.

Run the project

Encourage your students to use the Gold student guide to plan and carry out their project. Each student involved in the project should complete their own profile form.

You don't want all their good work to go to waste, so be sure they keep a record of all their amazing progress. Keeping a regular project diary will save them precious time when writing their final project report.

The students should spend at least 70 hours on the project in total.

Remember to consider safety and risks!

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, each student should complete a Gold profile form and communicate their project. This is a chance for them to reflect on all the interesting things they've learnt and the invaluable skills they have used.

Students working in a group can either submit a joint report or separate reports, but they must each complete a profile form.

Use the CREST criteria on the profile form to help the students check that they have included everything in their report.

Enter your project for a CREST Gold Award

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

Log in to your CREST account at **www.crestawards.org/sign-in**

Select your project and upload the profile form per student, project report and other evidence, such as pictures and diagrams.

Finally, complete the delivery and payment details for assessment and to order your snazzy certificates.

Congratulations on submitting for CREST Gold!

What next?

Is university on the horizon for your students? They can use their project to help demonstrate their newly found STEM skills and knowledge in UCAS personal statements.

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**

STUDENT BRIEF

GOLD AWARD

Design the ultimate toothbrush

In this project, you will research and test the properties of a range of different toothbrushes. You will then use your findings to help you design the ultimate toothbrush.

Getting started

To start this project, it may be a good idea to look at a range of different toothbrushes available. Things to look at include:

- What different shapes do they have? What do they claim to do? Certain bends or bristle shapes are supposed to reach areas that other brushes can't reach.
- How many 'grades' of hardness there are for the bristles?
- Which are the most expensive? How does the price of regular toothbrushes compare to electric toothbrushes?
- What other products are available for teeth-cleaning purposes?

Testing toothbrushes:

Select some toothbrushes to test. Think about the properties you want to test. For each property, you will need to devise an experiment. Think about why toothbrushes have to have certain properties, and whether there are certain standards that have to be met in industry when manufacturing them. For example, can bristles be too hard or too soft? Which is best?

When testing the toothbrushes, make sure you try to obtain quantitative data. Drawing conclusions: When you've conducted tests on a range of toothbrushes, draw some conclusions about the value of different products. Are some toothbrushes significantly better than others?

Designing your own:

When you've tested a range of properties you should have some ideas about which features were the best. Try to design the ultimate brush using the results of your research and testing.

Think about the materials you would use, and the cost of manufacturing. Also think about how to mass produce your toothbrush. Explain how you could use computer aided manufacture (CAM) to automate the process.

Some examples of the properties you may wish to test include:

- The shape of the toothbrush head and the area and density of bristles on the head
- Flexibility of the handle – measure how easily and how much they bend before they break
- Strength and wear resistance of the bristles
- Their 'reach' – in other words, do some toothbrushes reach areas that others don't? Will you test your toothbrush on people or on something else? Is it safe to test on people?
- How well they clean
- How abrasive they are - could they damage teeth and gums?

Things to think about

You could conduct some tests to determine whether toothbrushes are necessary. Perhaps try to see if a piece of cloth can clean as well as a brush.

Useful resources

You could try to link up with an engineer (or similar) from a toothbrush manufacturer. They should be able to tell you what properties are tested in industry and how. Local universities may also be useful, as they are likely to have more advanced testing equipment for you to use.

STUDENT BRIEF

GOLD AWARD

Health and safety

Science project work is both dynamic and exciting but can also carry some risk. To avoid any accidents, make sure you stick to the following health and safety guidelines before getting started:

- find out if any of the materials, equipment or methods are hazardous;
- assess the risks (think about what could go wrong and how serious it might be);
- decide what you need to do to reduce any risks (such as wearing personal protective equipment, knowing how to deal with emergencies and so on);
- make sure your teacher agrees with your plan and risk assessment.

Will you test your toothbrush on people or on something else? Is it safe to test on people?

Remember!

Science isn't just about data. The most successful projects will demonstrate good communication skills and show original ideas that address a real-world problem.

Look at the world around you and consider all the innovative ways that you could address the challenge. Even if things go wrong, use this to show what you have learned. Don't forget to use the student profile form to help structure your project.