



# Practical ACTION

TEACHER GUIDE

GOLD AWARD



## PROJECT IDEAS INCREDIBLE INOCULATIONS

Inspired by the Global Grand Challenges presented by infectious diseases, three project ideas have been developed:

**Research:** REACHING THE LAST FEW

**Practical:** KEEP IT COOL!

**Communication:** FINDING FUNDING

## YOUTH GRAND CHALLENGES

The Youth Grand Challenges is a new STEM competition that aims to inspire young people, aged 11-to-19, to see how science and technology can be deployed to tackle global health issues. The competition calls on students to come up with innovative solutions that have the potential to change the world, and will reward the best projects from young people created in response. The theme for 2016/17 is infectious diseases.

To participate in the Youth Grand Challenges competition, students must undertake a CREST project on a topic of their choice that relates to the overarching theme of infectious diseases – such as mosquitos, sanitation, or vaccines, and that is in an eligible topic area aligned with a current theme of research supported by the Global Grand Challenges  
<http://gcgh.grandchallenges.org/>

To enter your students for the Youth Grand Challenges competition, go to [www.youthgrandchallenges.org](http://www.youthgrandchallenges.org)

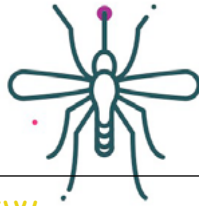
## SUPPORTING YOUR STUDENTS

To support educators and young people in the Youth Grand Challenges competition the British Science Association has released a suite of new CREST resources on the theme of infectious diseases. These resources have been produced by Practical Action and 4Science for the Youth Grand Challenges, in partnership with the CREST Awards scheme.

For each project, there is a Student Brief, providing a project idea and questions to get your students started, and a Teacher Guide, with some useful links and tips for prompting your students in their projects.

If you would like your students to achieve a CREST Award for their project, or for more information on how to support your students in their CREST Award project please go to [www.crestawards.org](http://www.crestawards.org).

Alternatively, if you do not wish to register for the full CREST Award, you can still use these resources on their own.



## REACHING THE LAST FEW

### Research project

#### Examples of diseases that have been eradicated

- Find out about successful programmes to eradicate disease

#### The vaccination programs that are currently underway

- Are there programmes currently underway?
- What progress has been made?

#### Where in the world are they taking place

- Which areas of the world are eradication programmes based?
- How many people are affected?
- What types of community benefit?

#### The challenges these programmes have to overcome

- What are the physical and environmental challenges?
- Are there social and political challenges as well?
- How might these be overcome?

#### The funding that supports them

- What has been the costs of eradication programmes so far?
- What are the costs of not funding them?

#### The costs and who pays

- In which countries are funds generated to cover these costs?
- Which organisations fund these sorts of project?

#### The benefits to local people and the wider population

- What is the impact on individuals and local communities?
- Are there any wider impacts?

#### How might we tackle diseases such as Malaria that cannot be vaccinated against but we would still like to see them eradicated

- What is being done to systematically eradicate malaria?
- Will this be successful or are the challenges too great?

## KEEP IT COOL

### Practical project

#### Different ways of generating off grid electricity

- Consider sustainable sources of energy
- Why is there an advantage to these sources?
- Is it ever appropriate to use unsustainable sources?

#### The variability of wind, sunlight, tides, and water flow that you might encounter

- Where will the system have to operate and in what conditions?
- What sources of energy might be available?

#### Multiple generating solutions that work together

- What systems will you select and what is your rationale?
- How can they work together to produce a constant supply?

#### The tests you will put it to

- How can you test your system realistically?

#### The voltage and current you will need it to produce to run a very small fridge/cooler

- You do not need to have a fridge/cooler to test you just need to decide what power it will require
- You will need to find a simple component that will act in the place of the fridge/cooler

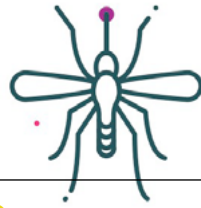
#### Comparing it with other peoples designs

- Are there several groups working on the same idea?
- How will you compare your designs?
- Can you cooperate and share ideas?
- Can you split the design problem up with different teams working on different elements?

#### Cost effectiveness and sustainability

- Will your final design be easy to manufacture?
- Will cost be a factor you consider?
- think about the materials and the sustainability of your design





## FINDING FUNDING

### Communication project

#### Other diseases that have already been eradicated

- Investigate which diseases we have already eradicated
- How was this achieved?

#### The benefits of total eradication

- How has eradication changed people's lives?
- What benefits have the communities they live in experienced?

#### Case studies help to illustrate the impacts

- See if you can find accounts of the benefits and impacts
- Both wide scale studies and personal reflections can be helpful

#### What the costs of such programs might be

- Look into the costs of this at different levels
- Think about individuals, communities, countries, regions and beyond

#### The challenges this last effort must overcome

- How are the last pockets of infection identified?
- What stands in the way of success?
- How will we know we have succeeded?

#### The types of people you will have to persuade

- Who will fund this final push?
- What arguments are liable to persuade them it is important?

#### A presentation could be in many forms, a seminar, video, radio script or paper based resource

- Thinks about all the different ways of presenting things
- What works for one audience may not work for everyone

#### Data will help your case so use it well

- What are the facts and figures?
- How will you present these in a way people can understand easily?

### Useful Links

[www.un.org/sustainabledevelopment/health/](http://www.un.org/sustainabledevelopment/health/)  
Information on Global Goal 3 'Health and Well-being'

[www.nhs.uk/conditions/vaccinations/pages/the-history-of-vaccination.aspx](http://www.nhs.uk/conditions/vaccinations/pages/the-history-of-vaccination.aspx)

The history of vaccines

[www.immunizebc.ca/facts-on-immunity/how-vaccines-work](http://www.immunizebc.ca/facts-on-immunity/how-vaccines-work)

Videos and downloads on how vaccines work

[www.practicalaction.org/zeer-pot-fridge](http://www.practicalaction.org/zeer-pot-fridge)

An electricity free fridge used in developing countries like Sudan

[www.practicalaction.org/technical-briefs-schools-food](http://www.practicalaction.org/technical-briefs-schools-food)

Technical briefs on evaporative cooling and the zeer pot

[https://en.wikipedia.org/wiki/Herd\\_immunity](https://en.wikipedia.org/wiki/Herd_immunity)

Information on how the herd effect works from Wikipedia

### Health and safety

Please do encourage students to take out their own risk assessments if they are carrying out a practical project or a survey, then check them yourself. CLEAPSS will provide any advice should you need it.

[www.cleapss.org.uk](http://www.cleapss.org.uk)



## GENERAL GUIDANCE

### Project health and safety

Students should be encouraged to make their own risk assessment before they carry out any activity, including surveys. In all circumstances this must be checked by a competent person. Students using specialised equipment should be supervised at all times.

Students may want to set up unorthodox experiments and you may need to seek specialist advice.

Organisations such as CLEAPSS and the Royal Society of Chemistry are able to help. The MISAC (Microbiology in Schools Advisory Committee) can provide advice concerning microbiological investigations.

### Support and Guidance

CREST gives students the chance to participate in hands-on science through investigations and enquiry-based learning. Students must decide their own focus; however, you may need to give additional support to students.

Your role is to:

- Act as a sounding board for students' ideas and nurture the students' work
- Help students see mistakes and setbacks as an opportunity for positive learning and lateral thinking (leading to creativity)
- Encourage your students in reflecting on their own performance and learning
- Where relevant, support students to find mentors from academia/industry
- Where relevant, ensure technician support is available to students
- Provide access to the Internet, library books and magazines (such as New Scientist)
- Provide direction to identify suitable sources of relevant information at an appropriate level. (NB. Students must research and select information for themselves).

### Prompts

The student briefs give some triggers to start students thinking. They should realise that each trigger implies several items to research and compare. Encourage students to identify these themselves.

If students struggle to identify these the teacher guide provides extra prompts to help you guide them.

## CREST AWARDS

### Gold

By working towards a CREST Gold Award, students will develop and deliver largely self-directed projects. The aim is for students' work to contribute something new to the scientific or technological community or to a particular field of study. They are supported by an industry or higher education mentor, who can offer guidance and advice, and are required to prepare a final report and present the outcomes of their project to their CREST assessor.

To use their project to achieve a CREST Silver 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

For full details about the CREST Gold Award visit [www.crestawards.org/run-crest-awards/crest-gold/](http://www.crestawards.org/run-crest-awards/crest-gold/)