



Lift the lid on brain science

Teacher Guide



**Alzheimer's
Research
UK**

The Power to Defeat Dementia

Welcome to Brain Box, a new curriculum-linked learning programme that helps students aged 11 to 14 explore the most complex structure in the universe, the human brain.

Brought to you by Alzheimer's Research UK and National Schools Partnership, Brain Box combines interactive digital content with engaging hands-on classroom activities. Inspired by real-world examples of science in action, students develop scientific enquiry skills and gain insight into what a career in research might be like. This guide suggests ways to use Brain Box to inspire your young scientists.



Defeating dementia

People with dementia may start to have problems with remembering, thinking, concentrating or speaking, or difficulties with their vision. They may find it more difficult to do everyday things. Their behaviour or personality might begin to change, and they may not seem like the same person they used to be. We use the word dementia to describe these different symptoms. They can have a big effect on the person with dementia, as well as on their family and loved ones.

Alzheimer's disease is the most common cause of dementia, accounting for about two-thirds of cases in older people. Importantly, dementia is not an inevitable part of ageing – the diseases that cause it can potentially be cured. But success depends on research.

Alzheimer's Research UK is a charity that uses public donations to fund pioneering dementia research that will make a real difference to people's lives – now and in the future.

Around 850,000 people in the UK are living with dementia and 24.5 million of us (around a third) have a friend or family member with the condition. As the population grows and people live longer, these numbers are likely to continue to increase. Research offers hope for people affected by dementia and will open the door for new ways to prevent or treat diseases that cause the condition, most commonly Alzheimer's disease.



The Brain Box learner journey

There are four stages on the Brain Box learning journey:

Stage 1 – Investigating dementia research

Using engaging online resources, students investigate dementia and the scientific efforts to defeat it.

Stage 2 – Brain experiments

Students become brain scientists, developing their scientific enquiry skills through their own experiments.

Stage 3 – Creating a research proposal

Mirroring the real-life selection process, students unlock their creative and scientific potential, as they create their own research proposals.

Stage 4 – Class science summit

Students present their ideas at a class science summit, where they and their fellow scientists vote for the proposal most worthy of funding.

The resources can be used flexibly, so you can choose how to deliver Brain Box within your school and how much time to devote to each stage.



Suggestions for delivering Brain Box

Stage 1 – Investigating dementia research

Students record what they understand by the terms ‘dementia’ and ‘Alzheimer’s disease’, plus one question they would like to find out about. They then use the Dementia Explained website (see first six suggestions on page 5) to lift the lid on how different areas of the brain work; what dementia is; how the brain is affected by diseases like Alzheimer’s; and the scientific methods being used to research and defeat dementia.

Students share what they’ve learned through one or more of the following activities:

- In ‘Just a minute’ share as much information about dementia research as you can, without repetition, hesitation or error.
- Share with a partner what you feel are the five most interesting facts that you discovered about dementia and/or dementia research.
- Write a list of core skills and attitudes required to become a research scientist.
- Write an answer to one of the questions from the start of the lesson.
- Debate the statement: ‘Dementia research should be a global priority.’

Stage 2 – Brain experiments

Here, students get a taste of what it’s like to be a brain scientist. After watching the video ‘Want to become a scientist?’ (see page 5), students conduct the following well-known brain investigation in groups.

Stroop test

Named after an American psychologist who first published in English the effect in 1935, the Stroop test demonstrates how interference within the brain affects reaction time.

Give students the example stroop test provided in this guide. You will see a list of two twenty colour words - one with colours matching the words (e.g. ‘red’ coloured red, ‘blue’ coloured blue) and the other incongruous (e.g. ‘red’ coloured yellow, ‘blue’ coloured green). Students time themselves reading each list aloud and compare reaction times between the two lists. Inevitably, the incongruous list takes longer... and usually causes a few laughs!

Next, students enrich their scientific enquiry skills, using the 'Investigation Planner' to devise their own experiments to investigate an aspect of how the brain works. They could:

- adapt the Stroop test (several variations can be found online, e.g. animal names with matching or incongruous animal images; number words appearing a matching or incongruous number of times); or
- investigate how different conditions affect their scores in the Explore the Brain games (e.g. Memory Grid, Speed Sort) – for example testing how performance is affected when participants are tasked with simultaneously: having a conversation; memorising a list of words; covering one eye; singing a song; clapping every five seconds; or sorting playing cards into suits.

Afterwards, students reflect on how the scientific enquiry skills they're using are the same as those used by real-life dementia research scientists. The journey to becoming a scientist starts at school!

Stage 3 – Creating a research proposal

The third stage of the Brain Box journey puts students' scientific skills to the test, as well as building additional skills needed in scientific careers, such as creativity, communication and organisation. Students can work in groups, pairs or individually, and the task can also be set as homework. Inspired by real-world scientific case studies, students are challenged to mirror the real-life research application process and plan their own brain research proposal. Aided by the 'Research Proposal Guide', students should come up with their own research idea for an app, game or experiment aimed at furthering understanding of dementia. They will prepare a three-minute presentation to communicate their ideas to their peers.

Stage 4 – Class science summit

Brain Box culminates in an exciting class 'science summit' in which students pitch their research proposal ideas to their fellow scientists, to try to win funding. Welcome the young scientists and go through the success criteria. Explain that peer review is an important part of the process for deciding which research should be funded. Each student or group, in turn, has three minutes to present their proposals to their peers. Allow time for students to debate, in groups and then as a class, the merits and weaknesses of each proposal and then vote for the one most deserving of funding.

Students could also share their work or their own experiences of dementia on the 'Memory board' on the Dementia Explained website (see page 5).

Finally, students should reflect on the knowledge skills they've gained through the Brain Box activities. Some of them may be the groundbreaking scientists of the future.



Suggested online resources

Alzheimer's Research UK provides a wealth of engaging online content, providing valuable insight into dementia and careers as a research scientist. Here's a summary of resources you can use to inspire your young scientists.

Resource	URL	Description
What is dementia? (information)	kids.alzheimersresearchuk.org/teens/what-is-dementia	General information about dementia (aimed at teenagers).
Your Amazing Brain (video)	www.youtube.com/watch?v=fP7u6wwbsZo	Neurologist Tim Rittman uses a model to discuss the different parts of the brain and how they work.
Explore the Brain (interactive)	kids.alzheimersresearchuk.org/teens/explore-the-brain	Interactive activity in which students can click on areas of the brain to learn about their functions and how they are affected if damaged. Within each brain area is a simple interactive game, reflecting the skills for which that area is responsible (e.g. Temporal lobe – Memory grid; Frontal lobe – Speed sort; Parietal lobe – Number burst).
Dementia Lab (interactive)	www.dementialab.org	A virtual tour of a dementia research lab, with many resources, images and information for students to explore, showing the methods scientists are using to understand dementia.
A day in the life of a scientist (video)	kids.alzheimersresearchuk.org/teens/dementia-research/alzheimers-research-uks-scientists	A dementia scientist takes viewers through her day at her research lab, where she grows cell cultures, shares data with colleagues and performs a Western Blot test.
Scientist research blogs	kids.alzheimersresearchuk.org/teens/dementia-research/alzheimers-research-uks-scientists	Alzheimer's Research UK's scientists share their lives and their work, through blogs and video.
Want to become a scientist (video)	kids.alzheimersresearchuk.org/teens/dementia-research/want-to-become-a-scientist	Dementia research scientists talk about their careers, and offer advice to students thinking of becoming scientists.
Memory board	kids.alzheimersresearchuk.org/memory-board/	A place for young people to share their videos, artwork, writing, images and other experiences of dementia.
Sea Hero Quest (app)	www.seaheroquest.com	A gaming app that sends data about players' navigation skills to research scientists, to develop our knowledge of what happens in dementia.



Curriculum relevance

England – Science – Working scientifically

- Experimental skills and investigations
- Analysis and evaluation
- Measurement

Northern Ireland – Science and Technology

- Develop skills in scientific methods of enquiry to further scientific knowledge and understanding: planning for investigations, obtaining evidence, presenting and interpreting results.

Scotland – Sciences

- I have collaborated with others to find and present information on how scientists from Scotland and beyond have contributed to innovative research and development. SCN 3-20a
- I have researched new developments in science and can explain how their current or future applications might impact on modern life. SCN 4-20a
- Having selected scientific themes of topical interest, I can critically analyse the issues, and use relevant information to develop an informed argument. SCN 4-20b

Wales – Science – Enquiry

- Planning
- Developing
- Reflecting



Stroop Test

Green	Green
Red	Red
Blue	Blue
Orange	Orange
Blue	Blue
Purple	Purple
Yellow	Yellow
Red	Red
Green	Green
Orange	Orange
Blue	Blue
Yellow	Yellow
Green	Green
Blue	Blue
Red	Red
Orange	Orange
Yellow	Yellow
Red	Red
Blue	Blue
Purple	Purple

