The University Of Sheffield. Neuroscience Institute.

School outreach

Inspire the new generations into scientific research, physiology, discovery, innovative thinking and a visionary, life-changing future.

FROM BENCH TO CLASS

Our perception of reality is regulated by the sensory systems. At the University of Sheffield, the Hearing and Vision Research groups work together on several interrelated projects aimed at discovering how sound and light are processed by our ear and eye and then perceived by the brain to drive human behaviour. We also use basic-discovery research to develop therapeutic intervention methods to prevent or cure sensory disorders, which affect millions of people in the world.

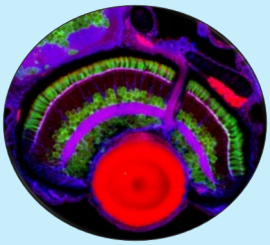
We plan to take our research to schools to promote science and encourage innovative/creative thinking among students.

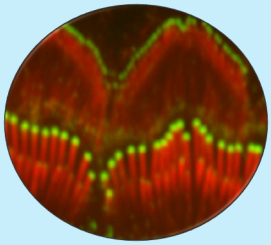
SENSORY SYSTEMS ARE FOR LIFE

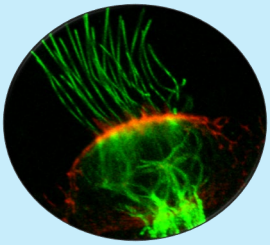
Our research groups at the University of Sheffield work together to discover the biology underpinning the development, function, ageing and genetic-based malfunction of several sensory systems such as hearing, vision, balance, olfaction, taste and pain.

OUR SET OF ACTIVITIES

Three 5-minute lectures on sensory systems, sensory deficits and their social implications. These lectures will be embedded into five interactive learning experiences (see pgs. 5-10). Overall time can be tailored to suit school policy.







Our goal is:

- to illustrate basic principles in human biology and what can go wrong.
- to show how scientists work to address important questions in human biology and develop treatments for disorders.
- to promote innovative thinking.
- to encourage students to be creative.
- to encourage and develop the student's presentation skills.

The activities proposed in this booklet can be carried out independently or they can be combined. Each activity is recommended for a particular age group, but can easily be adapted to different age groups.

INTERACTIVE ACTIVITY

1. Exploring the sensory system through virtual reality

Activity description:

This activity offers students the opportunity to embark on a journey through the sensory systems through virtual reality models (wearing 3D goggles). This allows students to better understand the anatomy of the sensory organs, how they work and the consequences associated with sensory deprivation.

Key stage or age group suitability: Key stage 4 – 5 (age 14-18)

What will students do?

During this activity students will be able to interact with the software by, for example, identifying the different components of the auditory and visual systems and discover their specific role. This will facilitate the understanding of how light and sound waves are converted into electrical signals that are perceived by our brain. This state-of-the-art technology will also provide students with a feeling of being involved in a research project (e.g. giving the excitement of looking down a microscope).

Time: up to 10 min/student (10 students/each run). Whilst waiting to engage in this activity students will participate in activities 2, 3 or 4.
Location: School – classroom.

Student achievements:

- to understand basic concepts of human biology.
- to discover the physiological processes occurring within our bodies.
- to raise awareness regarding sensory system malfunction.
- to discuss mechanism of disease prevention.

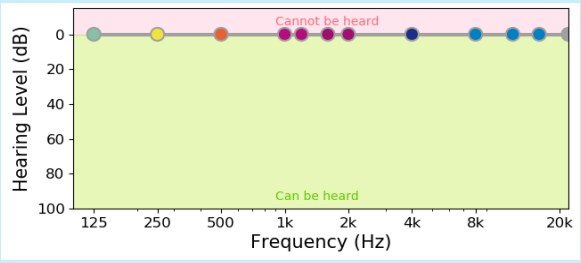
OUR SET OF ACTIVITIES

2. Sensory deprivation

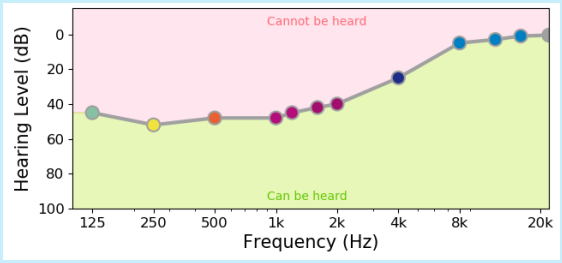
Activity description:
To appreciate the importance of the sensory systems, students will get the opportunity to experience how hearing and vision can be affected by different conditions.

Key stage or year group suitability: Key stage 4 – 5 (age 14-18)

What will pupils do?
Students will use high-performance noise-cancelling headphones that will simulate sudden hearing loss and the sensation of social isolation (see examples below). Students will also have the opportunity to watch natural landscapes that are altered according to a particular visual dysfunction.



"Bohemian Rhapsody" by Queen
Normal Hearing Person



"Bohemian Rhapsody" by Queen
Person with cochlear otosclerosis

Time: 5-10 min/student (6 students/each run).
Location: School – classroom.

Student achievements:

- Better appreciate the implications of sensory deprivation – the feelings of isolation, the loss of independency that accompanies the illness and the sensations experienced by someone with damage of the sensory system.

OUR SET OF ACTIVITIES

3. Techniques in physiology

Activity description:
During this activity students will be taught the principles of fluorescence microscopy and calcium imaging at cellular level using fixed and fluorescently labelled sensory organs.

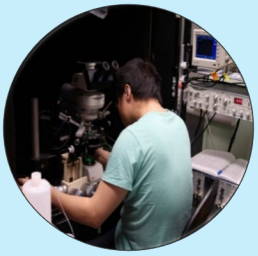
Key stage or age group suitability: Key stage 5 (age 16-18)

What will pupils do?
We will provide 10 teaching fluorescent microscopes (bench-top). Students will use these miscoscopes to understand the principles of microscopy and calcium imaging.

Time: 15 min/student (10 students/each run).

Location: School – classroom. Alternatively, we can run this activity during the school visit at the University (see pg. 10)

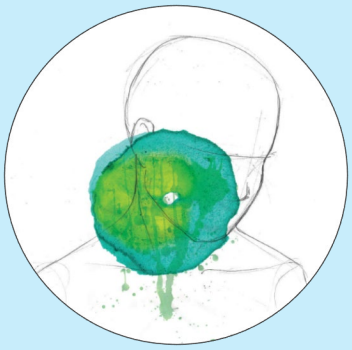
Student achievements:
- to gain insight into research and biology.
- to acquire a basic understanding of the materials and methods used in research.



OUR SET OF ACTIVITIES

4. Artistic representations of sensory deprivation

Activity description:
This activity is designed to make the students more aware and considerate towards people who suffer from sensory disorders. To do this, we have developed a set of artistic drawings that will represent the struggles of patients that suffer from sensory disorders.



Key stage or age group suitability: Key stage 4-5 (age 14-18)

What will pupils do?
During this activity we will provide four rollup drawings that are especially designed to illustrate the daily struggles of people that suffer from hearing and vision loss, pain and balance disorders. Students will assess the drawings and with the help of our laboratory members will identify the challenges of the patients.

Time: 5 min/student. Multiple students can do the activity at the same time. <u>This activity is optional and will be discussed with teachers prior to the visit.</u>

Location: School – classroom.

Student achievements:

- to be aware of what sensory deprivation is and that there are visible or non-visible symptoms in different sensory disorders.

Students that suffer or know someone that has such a diagnosis will feel empowered and may receive more support from colleagues/friends.

OUR SET OF ACTIVITIES

5. Group presentations at the University of Sheffield

Activity description:
Students and teachers are invited to the University to participate into a group debate. This activity will be carried out as a consolidation exercise after the school visit. This activity will be followed by a tour in the laboratories.

Key stage or age group suitability: Key stage 5 (age 16-18)

What will pupils do?
During this activity students will be introduced to the concept of developing a group debate. Each group will give a brief presentation where each part will take a different standpoint (e.g. researcher, clinician, patient, educator) on a pre-selected topic such as "Why teenagers should avoid loud music?". This will be followed by a debate.

Time: up to 3 hrs, depending on the available time from schools. For this activity, all the students (and teachers) involved in project will be invited to the University to explore our research and teaching facilities.

Location: University of Sheffield.

Student achievements:
- to improve their presentation skills and critical thinking.
- to learn how to articulate scientific concepts.
- to understand why research is important.
- to made them aware of career paths involving research, medicine, science and advocacy.

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wellcome

MRC Medical Research Council

BBSRC bioscience for the future

RNID