futurum
Inspiring the next generation

ANIMATION SCRIPT

PROSTHESES FOR PEOPLE: MATCHING THE PERSON AND THEIR NEW LIMB

PROFESSOR LAURENCE KENNEY AND DR ALEX DICKINSON

TO MAKE THE MOST OUT OF THIS SCRIPT, YOU COULD:

- Stick it in your book as a record of watching Laurence and Alex's animation
- Pause the animation and make notes as you go
- Add your own illustrations to the sheet
- Create your own animation to accompany it
- Add notes from classroom discussions
- Make notes of areas you will investigate further
- Make notes of key words and definitions
- Add questions you would like answered – you can message Laurence and Alex through the comments box at the bottom of their article: **www.futurumcareers.com/prostheses-for-people-matching-the-person-and-their-new-limb**

SCRIPT:

Around 57.7 million people globally have had a limb amputated as the result of a traumatic incident. It is estimated that 64% of amputees live in Lower and Middle Income Countries (LMICs), where road traffic accidents, unexploded landmines and poor access to medical services all play a part.

Human limbs are complex, so building mechanical replacements is not easy. Prostheses are becoming more sophisticated, but these can be expensive and rely on healthcare and other systems that can support them.

Mechanical engineers Professor Laurence Kenney, from the University of Salford, and Dr Alex Dickinson, from the University of Southampton, in the UK, are designing devices that work for real people in the real world.

futurum
Inspiring the next generation

ANIMATION SCRIPT

Laurence's project involves teams working in the UK, US, Uganda and Jordan to improve body-powered prostheses.

These are upper limb replacements that incorporate mechanical components that can be moved by the wearer, allowing them to grasp objects. Traditional body-powered prostheses consist of a mechanically operated 'hand', attached via a cable to a shoulder harness. Designs are relatively low-cost and cope well with wear and tear.

However, body-powered prostheses have changed little over the last 100 years; they can be tiring to use and the cable restricts a person's reach.

Laurence's team includes a social scientist and a health psychologist, who trained teams of interviewers within Uganda and Jordan. The interviewers invited people with upper limb absence to talk about their experiences and expectations of prostheses.

The team focused their design efforts on addressing the challenges identified in Uganda, where the majority of people interviewed had never had access to a prosthesis.

By considering people's lived experiences, the team learnt that performing farming tasks and household chores was important to users and that a simpler overall design, which is easier to maintain, would be beneficial.

ANIMATION SCRIPT

Laurence and colleagues, including people with upper limb absence, have worked together on the problem of designing a hand which does not rely on shoulder harness-control. The team also made good progress on a socket design that might be fitted more easily and repaired locally.

Alex's project involves working in Cambodia to find data-technology solutions to help people access prostheses that work for them.

His team wanted to see whether it could improve access to prosthetics services by developing digital tools.

Every person who needs a prosthesis will have different body characteristics and residual limb, so there is a need to account for these individual differences to ensure their prosthesis is comfortable and useful.

The team is also investigating fitting digital sensors on prostheses, to record how patients use them in their daily lives, helping prostheses be better tailored to their needs. Prostheses need to be replaced every few years, so this recorded data will also ensure a person's replacement prosthesis more closely fits their needs.

ANIMATION SCRIPT

It is important that 3D scans give the same information if the same leg is scanned several times, or by different people. The team also needs to collect, store and synchronise a person's clinical data records safely.

Alex's team requires a wide range of expertise. While biomechanical engineers understand how the body works and how it can be measured, computer scientists and software engineers can ensure that data is managed effectively and kept secure.

The team has made a lot of progress in developing and deploying digital tools and has confidence that its tools work in the real world.

Laurence and Alex are using their skills and expertise to help people live fuller lives. What could you achieve as a mechanical engineer?