



THE UNIVERSITY
of EDINBURGH

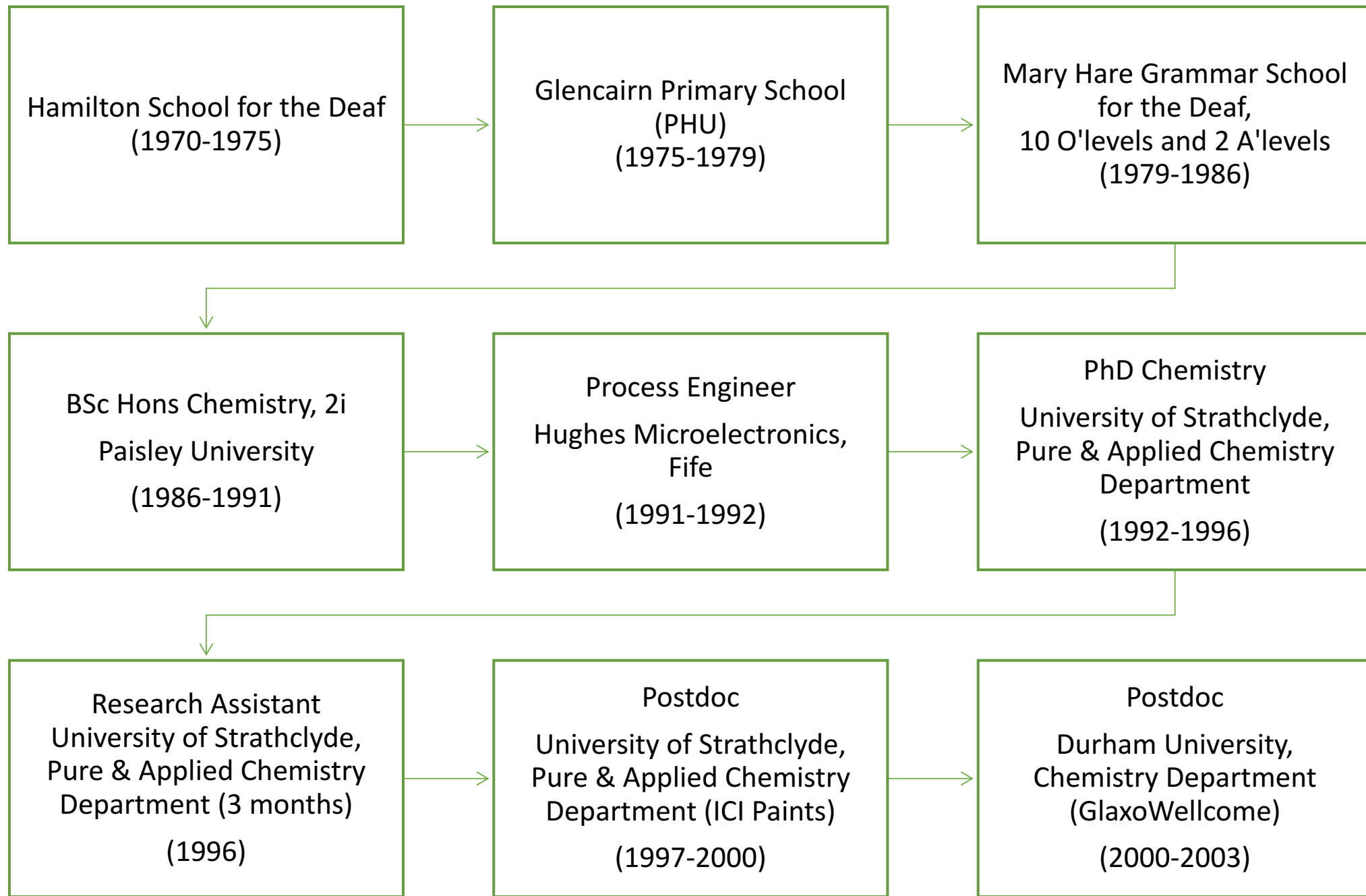


Science and Maths in BSL Glossary Project's 10 years Anniversary

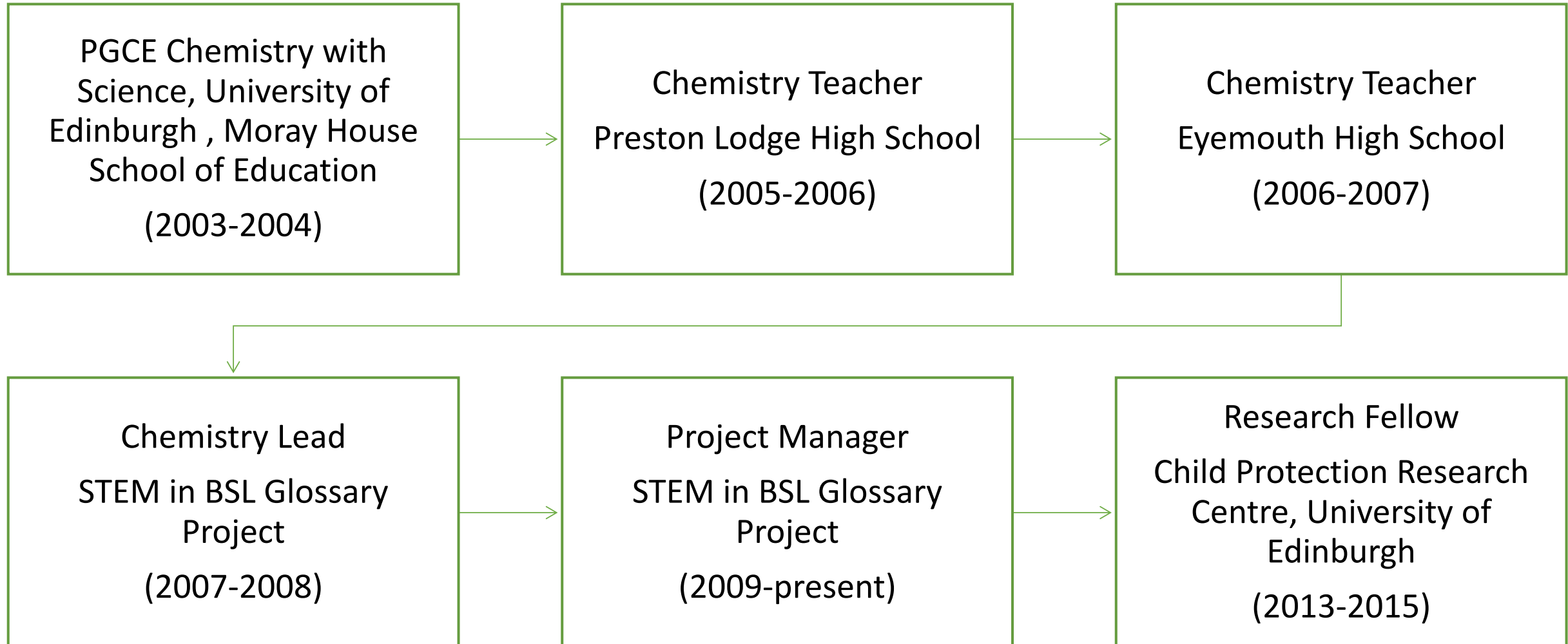


Dr Audrey Cameron, CChem MRSC

24 June 2017



My journey



rsp.org

Mail - CAMERON Audrey - OutlookOnline Tutoring Prices & Plans | SpinesDriveHome - DropboxDr Audrey Cameron OChem MRSC |...

175 Faces of Chemistry

Celebrating diversity in science

FacesAboutNominate

Royal Society of Chemistry

I'm interested in people talking about

I'm interested in people that have

Search

More faces...

Dr Thulani Dlamini

Thulani was first exposed to science at secondary school and now develops materials...

Dr Ifat Parveen Shah

MRSC



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SSC

Scottish Sensory Centre



Dr. Audrey Cameron – University of Edinburgh,
STEM in BSL Glossary Project – Project Manager

Gary Quinn – Heriot Watt University, Assistant
Professor in BSL Linguistics – STEM in BSL
Glossary Project Sign Linguistics consultant

Rachel O'Neill – University of Edinburgh,
Lecturer in Deaf Education and Programme
Director of MSc Inclusive Education



Scottish Sensory Centre

Works collaboratively with parents, professionals and young people to give a positive and enabling impact on the educational provision for children with sensory impairment and those who support them.

- Professor John Ravenscroft – SSC coordinator
- Sheila MacKenzie – Web and resource administrator
- Ruth Simpson – SSC administrator



Scottish Sensory Centre

A man with a beard and glasses, wearing a dark sweater, is seated at a light-colored wooden desk. He is using British Sign Language (BSL) to communicate with a woman seated across from him. The woman has dark, curly hair and is wearing a blue sweater. She is looking at the man and has her arms crossed. On the desk, there are several sheets of paper, some of which are pink. A professional video camera on a tripod is positioned between them, recording the interaction. The background is a plain, light-colored wall.

Examination arrangements in
Scotland for signing deaf
candidates

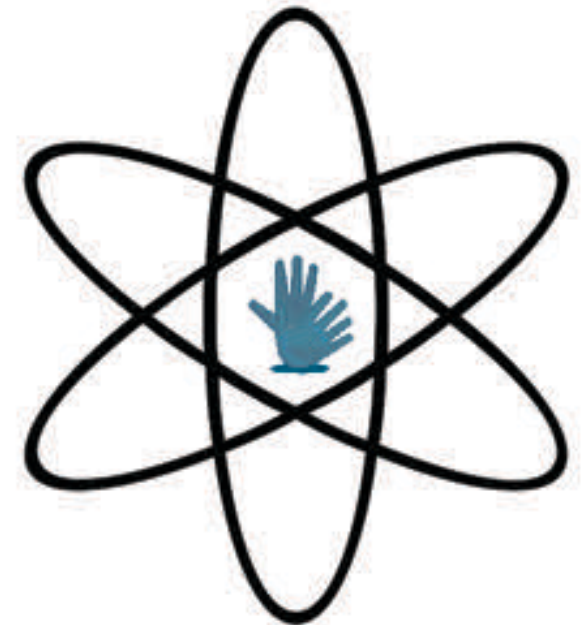
Examination arrangements in Scotland for deaf signing candidates

- Since 2003 Scottish deaf candidates have been able to access their examinations in sign language and respond in sign.
- No minimum BSL qualification level set for communicators (Burns, 2011)
- Most recent research shows 9% of teachers working with deaf children have BSL Level 3 or above (*or Level B2 in Europe*) but 57% of them work with children whose preferred language is BSL or SSE (Ravenscroft & Wazny, 2017)



Scottish Sensory Centre's STEM in BSL glossary project

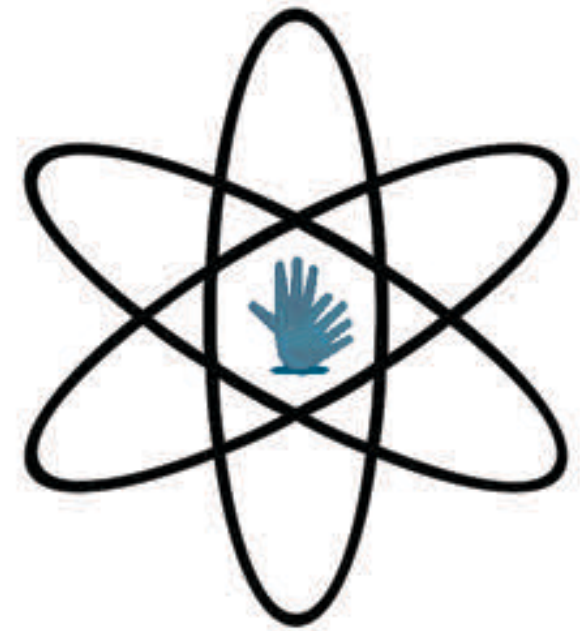
The STEM in BSL glossary project was set up in 2007 to increase access to education for deaf students, teachers/lecturers and BSL/ English interpreters in the UK and access to their examinations in British Sign Language.



Scottish Sensory Centre's STEM in BSL glossary project

Since 2007 nearly 1,500 signs for science and mathematics have been collected and developed.

- Astronomy
- Biology
- Chemistry
- Geography
- Maths
- Physics



Project Funders since 2007



Institute of Physics and Engineering
in Medicine



THE UNIVERSITY of EDINBURGH

College of Arts, Humanities and Social Sciences



THE UNIVERSITY
of EDINBURGH Alumni



LONDON
MATHEMATICAL
SOCIETY
150 YEARS

EDINBURGH
MATHEMATICAL
SOCIETY



The Royal Academy
of Engineering



Alumni Fund



Glossary website

sssc.education.ed.ac.uk

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SSC Scottish Sensory Centre

Google Custom Search


News Library **BSL Glossary** Learning Research Contact

British Sign Language Glossaries of Curriculum Terms


Astronomy




Biology



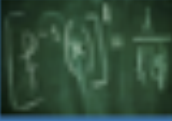
Chemistry




Geography



Mathematics




Physics



- [Introduction](#)
- [Physics Glossary Feedback](#)

External links

- [Signing Biotechnology](#) developed by University of Edinburgh (external link)
- [Tech-Signt](#) IT signs in BSL (mainly web) by Ben Fletcher (external link)
- [TechTheatreBSL](#) (external link)



A-Z Index

A	B	C
D	E	F
G	H	I
J	K	L
M	N	O
P	Q	R
S	T	U
V	W	XYZ

Search the Glossary for terms

Google Custom Search

Topic

ssc.education.ed.ac.uk

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SSC Scottish Sensory Centre

News Library BSL Glossary Learning Research Contact

BSL Glossary - Mathematics

Signs by Subject

Algebra Arithmetic Geometry & Trigonometry
Probability & Statistics Question Types Miscellaneous

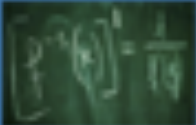
A to Z of Signs

A	B	C
D	E	F
G	H	I
J (empty)	K (empty)	L
M	N	O
P	Q	R
S	T	U
V	W	X (empty)
Y (empty)	Z (empty)	

Examples

Examples

Mathematics



Quicktime download

Please note: The default format of the video clips is generic mp4 format. You can also view the clips in Quicktime if you prefer.


Sign

ssc.education.ed.ac.uk

SSC Scottish Sensory Centre

News | Library | Contact | BSL Glossary | Learning

BSL Chemistry Glossary - chemical reaction



- ▶ Definition
- ▶ Fingerspell
- ▶ View this clip in Quicktime

Related terms

- ▶ chemical change
- ▶ reaction

▶ Return to Chemistry Home

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Definition

bsc.education.ed.ac.uk

News | Library | Contact | BSL glossary | Learning

BSL Chemistry Glossary - chemical change - definition



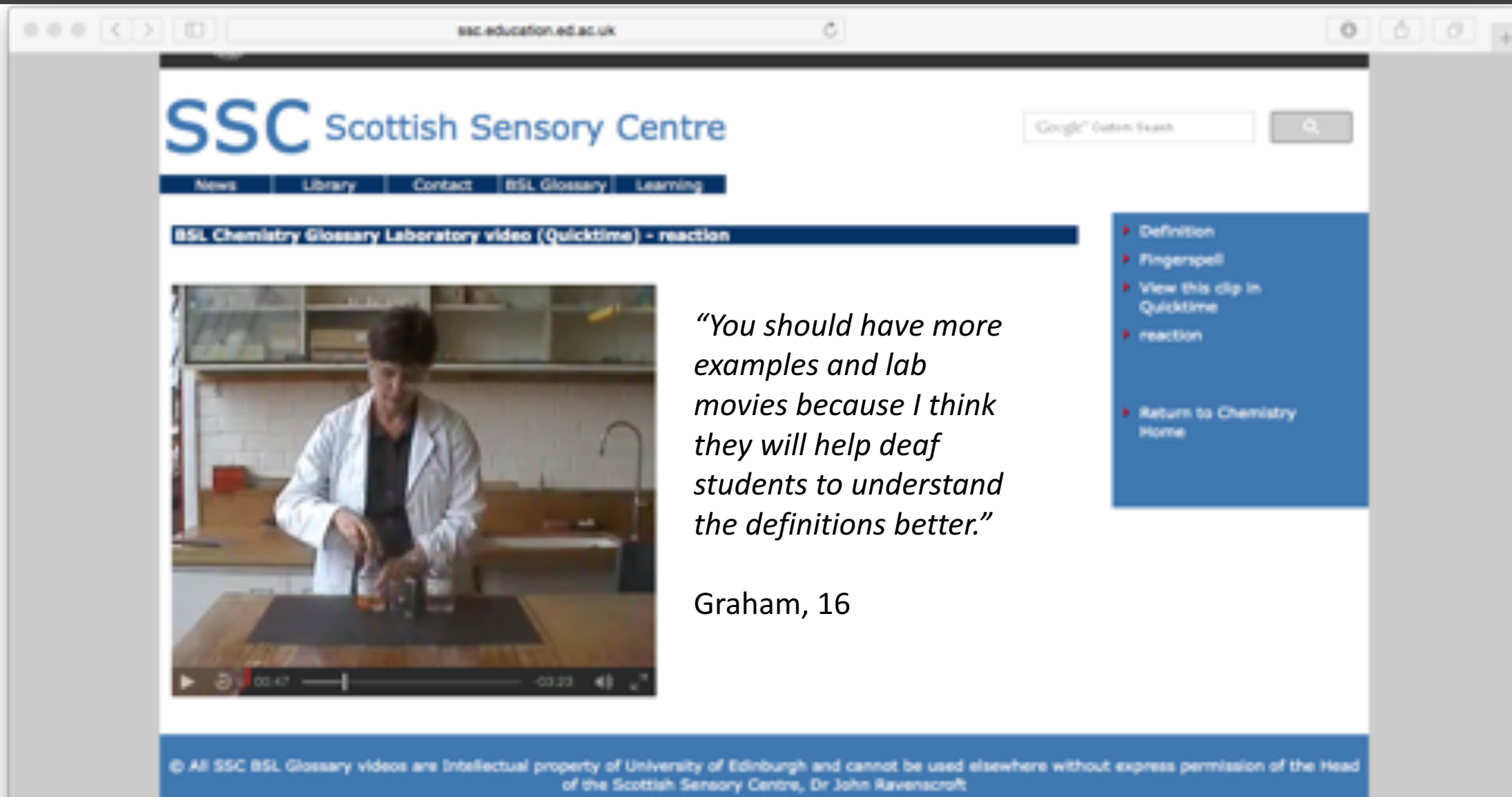
Translation: Chemical change is what happens when some chemicals are put together, and they change into a new substance. An example is when you cook bread in a toaster. The toast is black. You can't change it back to bread again. It stays as toast because it's gone through a chemical change.

Reactant → Product

Sodium + Chlorine → Sodium chloride

- View this clip in Quicktime
- Laboratory video (Quicktime) - reactivity series
- Laboratory video (Flash) - reactivity series
- Laboratory video (Quicktime) - reaction
- Laboratory video (Flash) - reaction
- Laboratory video (Quicktime) - chemical reaction
- Laboratory video (Flash) - chemical reaction
- Fingerspell
- chemical change
- Return to Chemistry Home

Laboratory demonstrations or examples



The screenshot shows a web browser window with the URL `ssc.education.ed.ac.uk`. The page header features the **SSC Scottish Sensory Centre** logo and a navigation menu with links: [News](#), [Library](#), [Contact](#), [BSL Glossary](#), and [Learning](#). A search bar labeled "Google Custom Search" is located in the top right. Below the header, a blue banner reads "BSL Chemistry Glossary Laboratory video (Quicktime) - reaction". The main content area contains a video player showing a person in a white lab coat performing a chemical reaction in a laboratory setting. To the right of the video is a blue sidebar menu with the following links: [Definition](#), [Fingerspell](#), [View this clip in Quicktime](#), [reaction](#), and [Return to Chemistry Home](#). At the bottom of the page, a blue footer contains the copyright notice: "© All SSC BSL Glossary videos are Intellectual property of University of Edinburgh and cannot be used elsewhere without express permission of the Head of the Scottish Sensory Centre, Dr John Ravenscroft".

SSC Scottish Sensory Centre

News Library Contact BSL Glossary Learning

BSL Chemistry Glossary Laboratory video (Quicktime) - reaction

Definition
Fingerspell
View this clip in Quicktime
reaction
Return to Chemistry Home

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"You should have more examples and lab movies because I think they will help deaf students to understand the definitions better."

Graham, 16

Science glossaries in sign language

- Scottish Sensory Centre, Scotland
<http://www.ssc.education.ed.ac.uk/bsl/list.html>
- Wolverhampton University, England www.sciencesigns.ac.uk
- Universidade Federal do Rio de Janeiro, Brazil
http://projetosurdos.bioqmed.ufrj.br/categoria/produtos/projeto_glosario/
- Science Signs/ Lexicon, NTID, USA
<http://www.rit.edu/ntid/sciencesigns/>
- *embe* Outreach (ASL library) USA
<http://www.needsoutreach.org/Pages/sl.html> (App)
- Signing science dictionary (ASL) USA
<http://signsci.terc.edu/SSD/index.htm> (animation)
- Specialised Bulgarian sign language, Bulgaria <http://www.signlanguage-bg.com/products.php?page=10> (Pay)
- Deaf STEM from Germany
- Czech sign glossary

BSL Glossary Team – Deaf Scientists, mathematicians, sign linguists and teachers



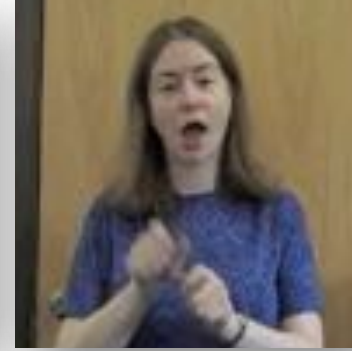
John Denerley,
Wildlife Park
owner



Janet Wardle-Peck
BSc Hons Agriculture
& Environmental
Science & teacher



Dr Mark Fox
PhD Chemistry &
Senior Research
Officer



Claire Leiper BSc
Biology/ English,
BSL tutor and
researcher



Rob Rattray
BSc Science and
teacher



John Brownlie,
BSc Hons Physics



Derek Rodger,
BSc Chemistry &
teacher



Tania Allan
BSc Zoology & BSL
tutor in schools

BSL Glossary Team – Deaf Scientists, mathematicians, sign linguists and teachers



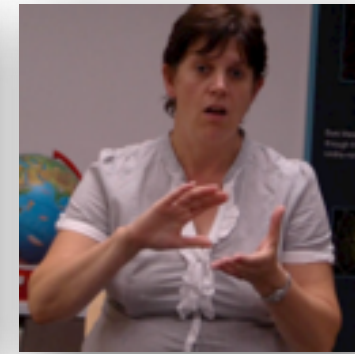
Mark McQueen,
MA linguistics



Mary Frances Dolan,
BSc Chemistry &
teacher



Dr. Gerry Hughes
BSc Hons Maths &
teacher



Dr Audrey Cameron
PhD Chemistry &
teacher



Lee Robertson
BSc Hons
Aerodynamics



Dr Colin Dunlop,
PhD Physics &
Research Fellow



Assistant Professor
Gary Quinn,
MA linguistics



Alasdair Grant,
BSc Hons Ecology

BSL Glossary Team – Deaf Scientists, mathematicians, sign linguists and teachers



John Wilson,
BSL Poet & sign
linguist



Cathie Birch,
BSc Hons Maths &
teacher



Dr Ken O'Neill
PhD Maths



Malcolm Sinclair,
BSc Hons Maths &
teacher



Frankie McLean
BSc Hons Immunology



Claire Ingham
Studied PhD Biology
& teacher



Liam McMulkin
2nd year student
Life Sciences

BSL Glossary Team – Partners

Rachel O'Neill – Lecturer in Deaf Education, University of Edinburgh

Eileen Burns – Head teacher, Hamilton School for the Deaf

Tania Johnston – Science communicator at Royal Observatory Edinburgh

Steve Owen – Science communicator at Royal Observatory Edinburgh

Dr Rhian Meara – Swansea University – Geology Lecturer

Dr Jan Barfoot – EuroStem Cell, University of Edinburgh

Robin Morton – Centre of Regenerative Medicine, University of Edinburgh



Sign development workshop

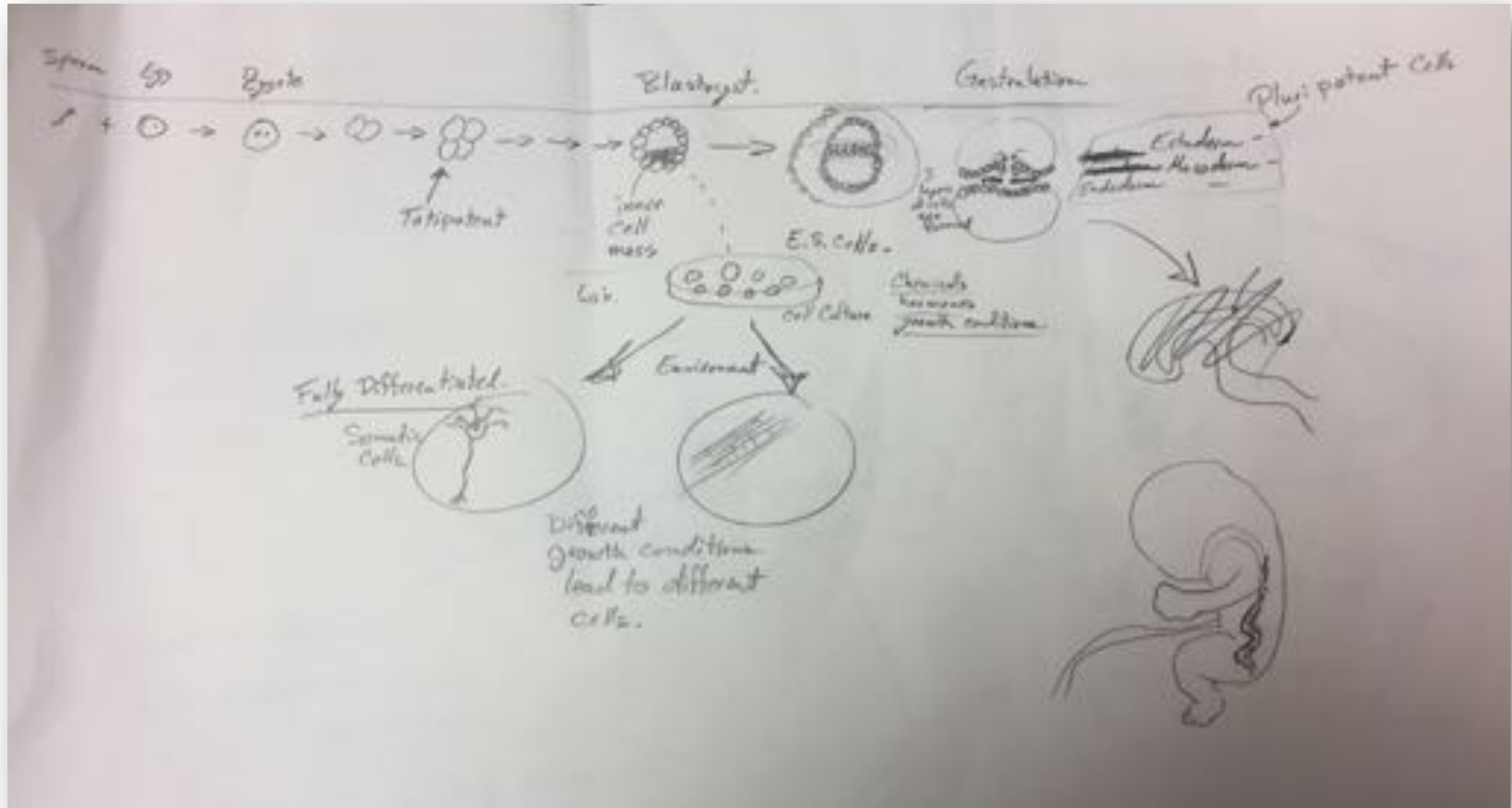
Development of new signs

1. Deaf-led
2. Fluent in sign language and subject knowledge
3. Collecting scientific terms
4. Collecting existing signing terms
5. Coining new terms using productive lexicon
6. Semantic/ morphological links between signs
7. Evaluation within and outwith team

A typical list of terms with definitions for discussion

Stem Cells Glossary		
	Term	Definition
1.	Adult stem cells	See tissue stem cells.
2.	Animal-human hybrid	An embryo which is a mixture of both human and animal tissue, created by inserting human DNA into an animal egg.
3.	Asymmetric division	Cell division resulting in two daughter cells with different properties. Observed in some but not all stem cells.
4.	autologous cell therapy	A therapy using cells derived from a patient's own body. This often involves the extraction of cells and an 'ex vivo' (outside the body) step of growing and multiplying them before transplanting them back into the patient.
5.	Blastocyst	A ball of around 250 cells formed around five days after fertilisation.
6.	Cell culture	The process by which live cells are grown in the laboratory. The cells are placed in a petri dish and given a mixture of nutrients so that they can survive and divide.
7.	Cell line	A population of cells all carrying the same genes, grown in the laboratory through many cycles of growth and division over many generations of cells.
8.	Cell replacement therapy	The replacement of cells damaged by disease or injury, with new healthy ones derived from stem cells. The ability of stem cells to self-renew and differentiate into particular cell types offers the potential to culture stem cells in the lab to become replacements. Where the original stem cells are derived from the patient, there is the potential to avoid immune rejection. Also referred to as cell transplantation therapy or stem cell therapy.
9.	Cleavage	Division and resulting multiplication of cells in the early embryo.
10.	Differentiation	The process by which cells become specialised to perform certain tasks. When a cell can differentiate no more it is said to be terminally differentiated.
11.	Embryonic stem cells (ES cells)	Stem cells from the inner cell mass of the blastocyst which will go on to produce every cell in the human body.

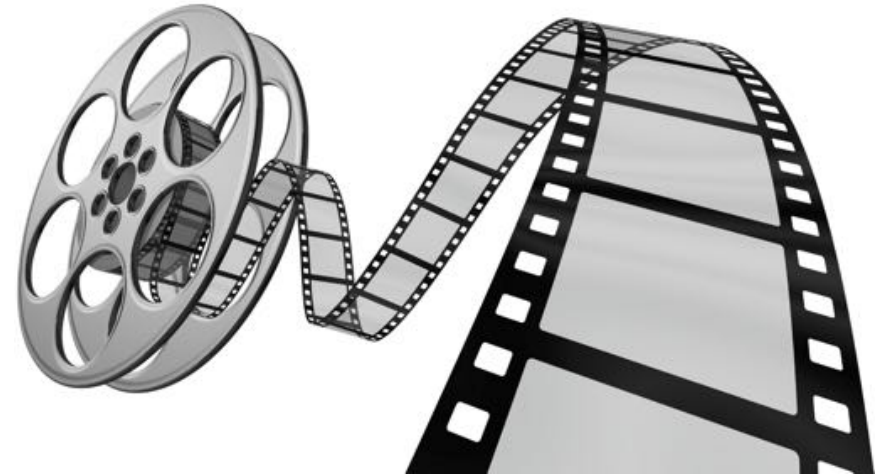
At the most recent sign development workshop – an artist was appointed to explain different terms linked to stem cells to help us visualise at cellular level.



The list of complex terms is now organised in the form of a mind map to help the development process



Movies

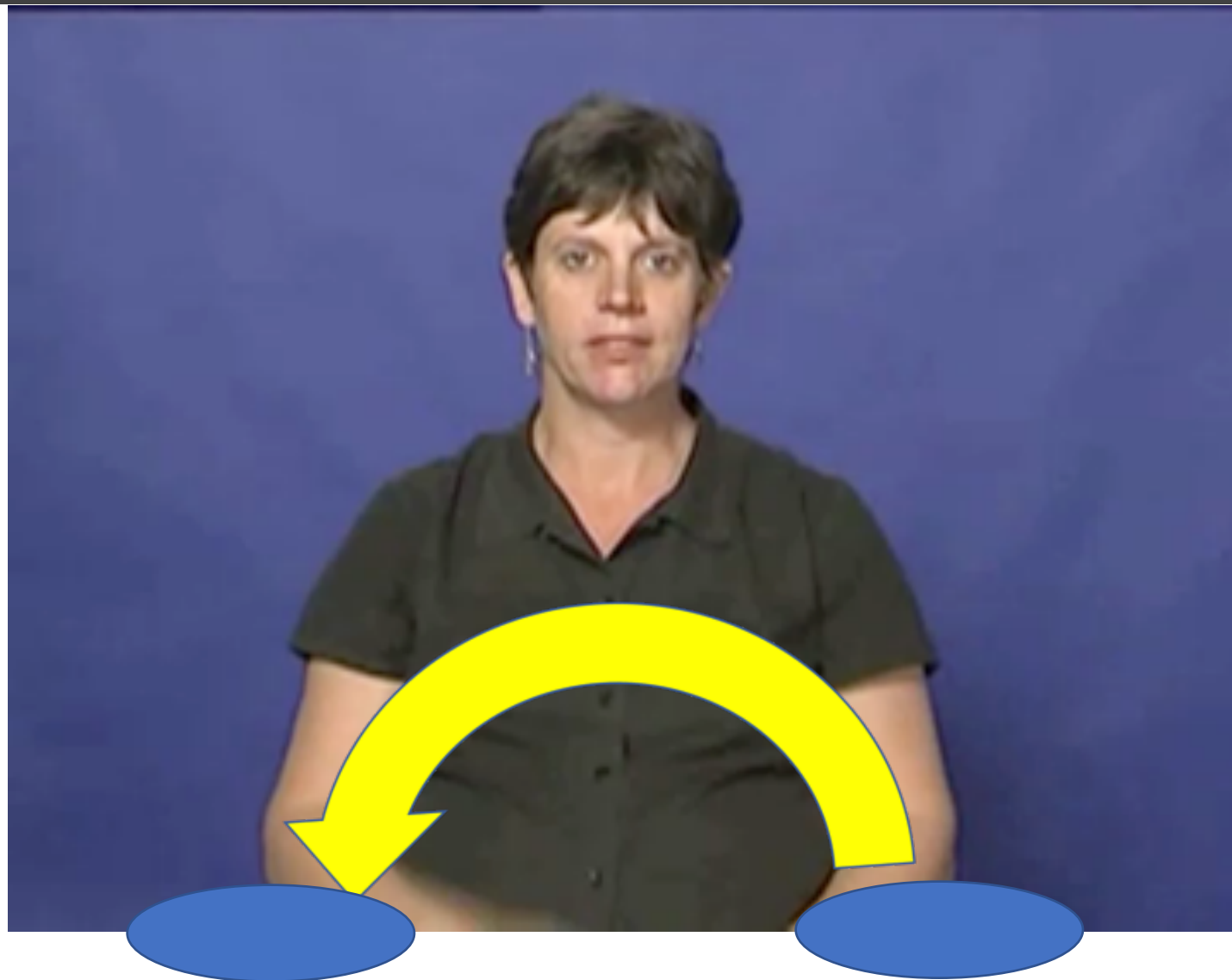




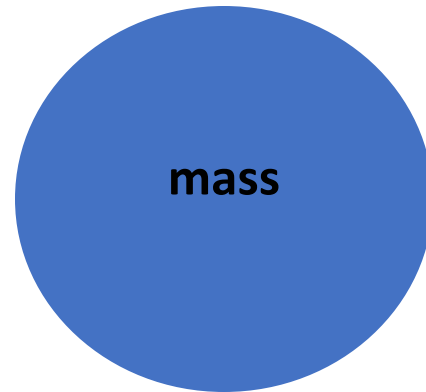
Comment from a participant

“I thoroughly enjoyed working with the team on the development of BSL signs. I thought it was very thorough how we all made sure we were clear on the concepts and then discussed possible signs which were checked by a linguist.”

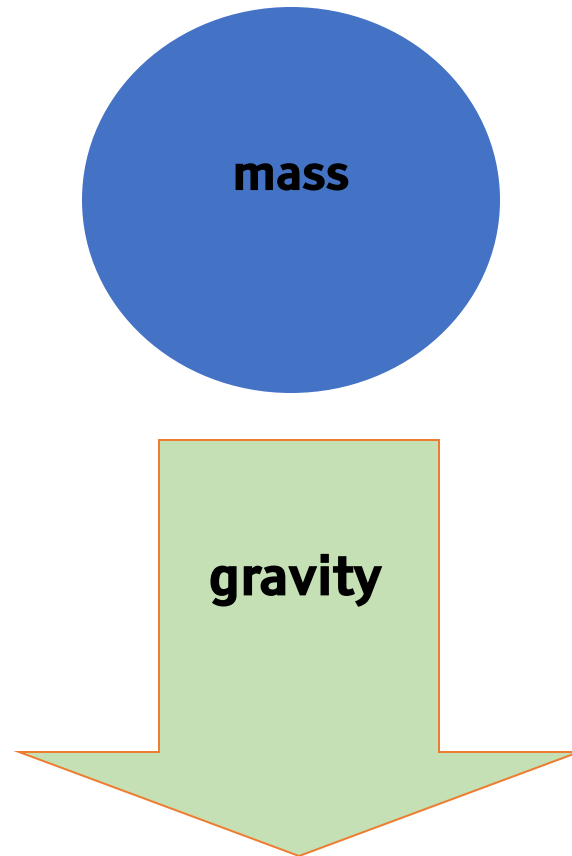
Family of signs to explain concept



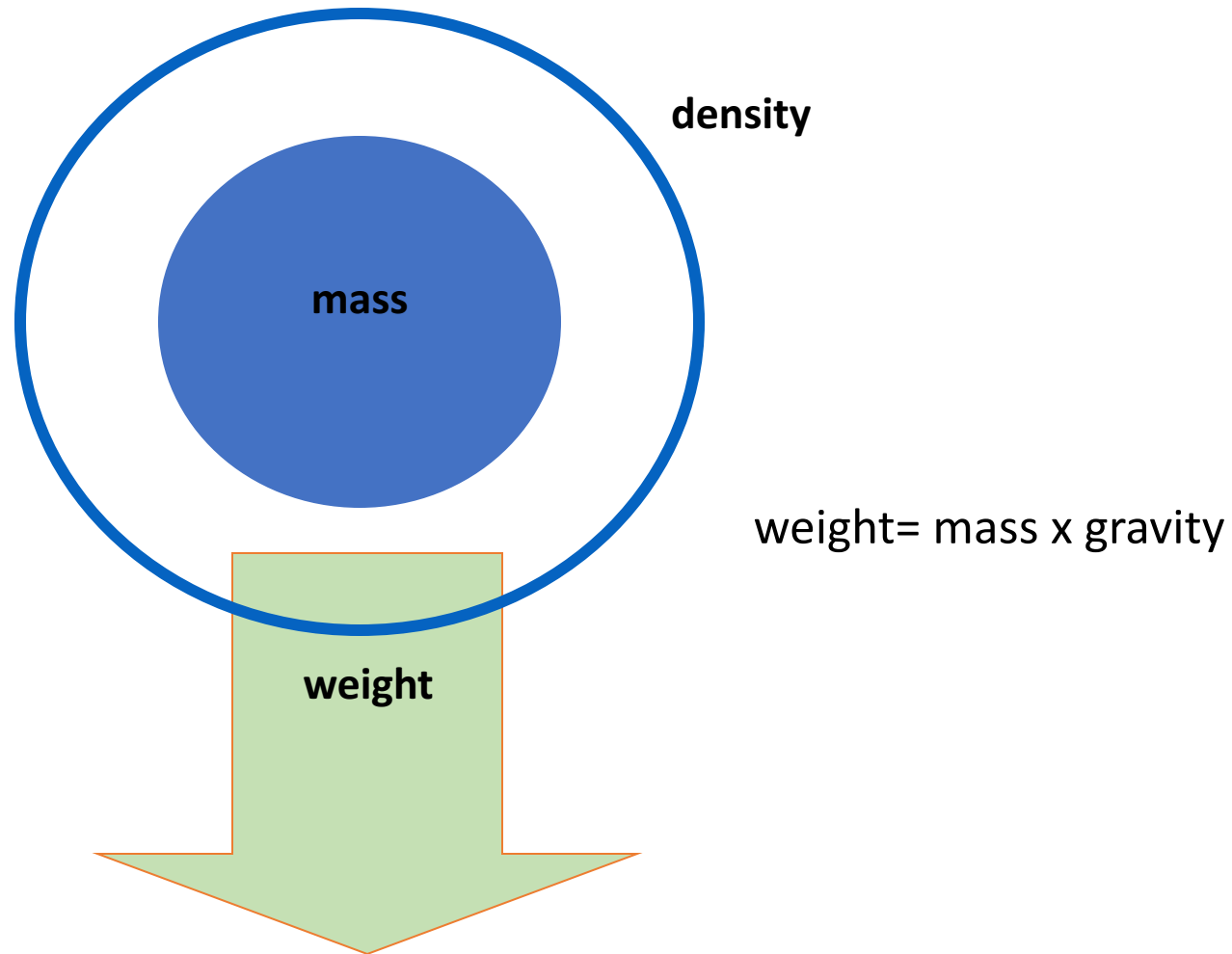
Degree of Iconicity between form and meaning
e.g. Mass, Density and Weight



Degree of Iconicity between form and meaning
e.g. Mass, Density and Weight

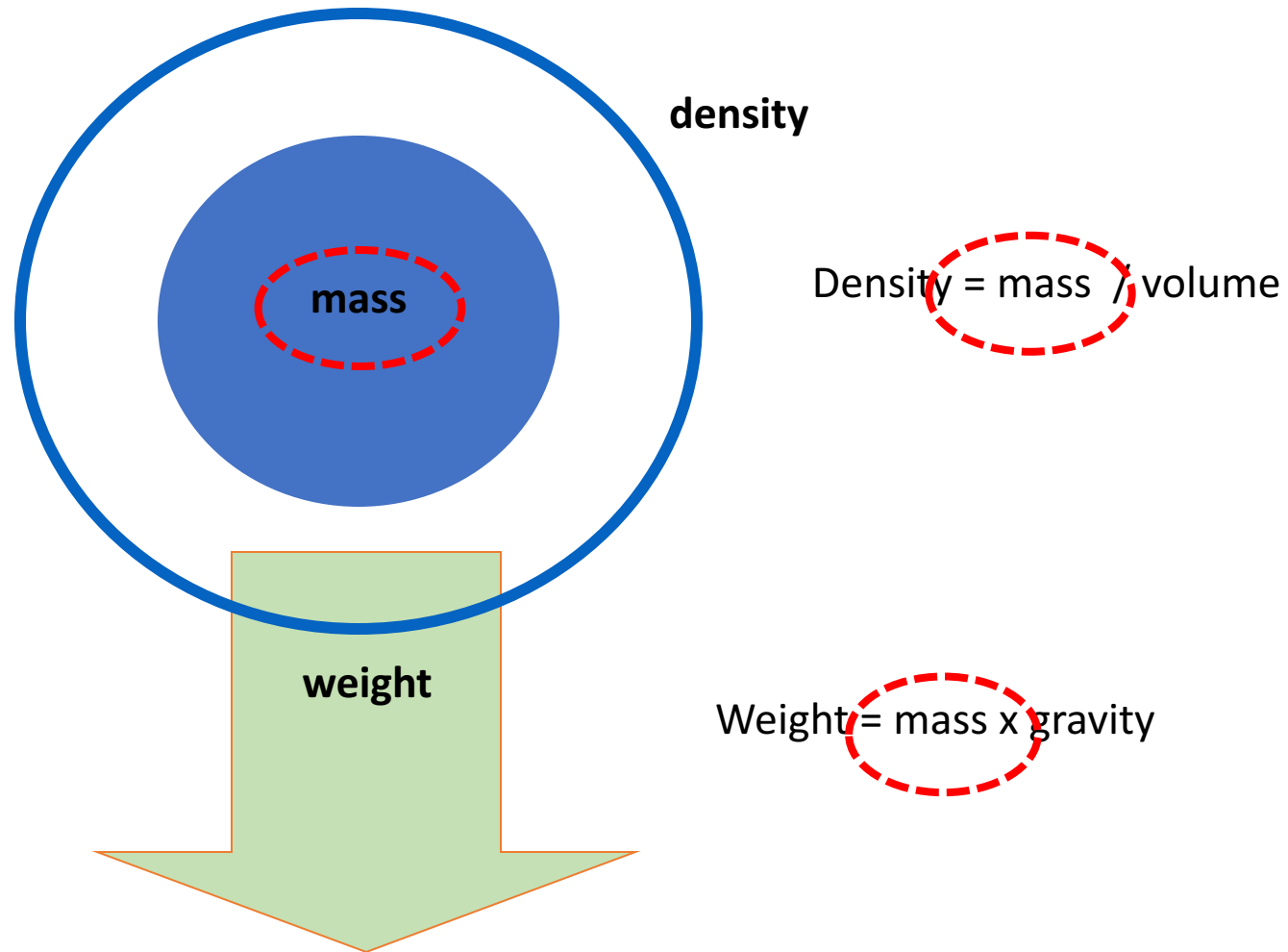


Degree of Iconicity between form and meaning
e.g. Mass, Density and Weight



Degree of Iconicity between form and meaning

e.g. Mass, Density and Weight



Family of signs to explain concept

- Mass
- Gravity
- Weight
- Density
- Speed
- Velocity
- Momentum

Definitions
and
Examples



Filming of signs and definitions



Demonstrating a chemical reaction



Gary explaining the journey of a river



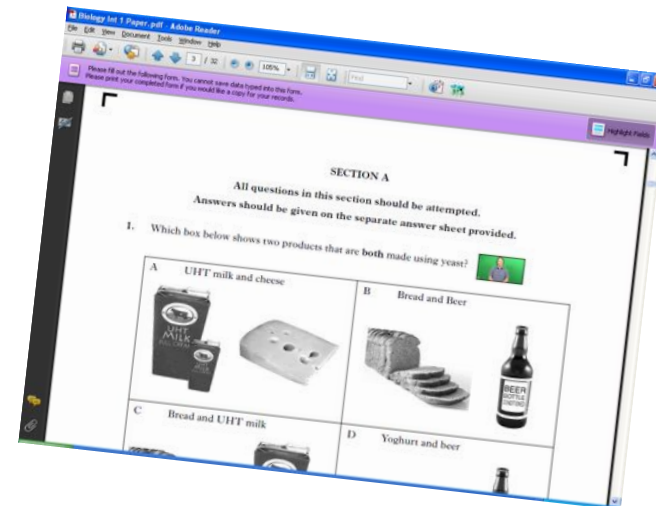
Dr Colin Dunlop demonstrating at Durham University (Physics)

Definition of Arête



Scottish Qualification Authority : digital exams project (2010-11)

- To assess the feasibility and benefits of SQA adopting a system of centrally produced, standardised digital examination papers with added BSL translation of the written questions so that deaf students would not be disadvantaged by variable levels of local translation.



Biology Int 1 Paper.pdf - Adobe Reader

File Edit View Document Tools Window Help





3 / 32 100% Find

Please fill out the following form. You cannot save data typed into this form. Please print your completed form if you would like a copy for your records. Highlight Fields

SECTION A

All questions in this section should be attempted.
Answers should be given on the separate answer sheet provided.

1. Which box below shows two products that are **both** made using yeast?

<p>A UHT milk and cheese</p> 	<p>B Bread and Beer</p> 
<p>C Bread and UHT milk</p> 	<p>D Yoghurt and beer</p> 

Biology Int 1 Paper.pdf - Adobe Reader






File Edit View Document Tools Window Help

3 / 32 100% Find

Please fill out the following form. You cannot save data typed into this form. Please print your completed form if you would like a copy for your records. Highlight Fields

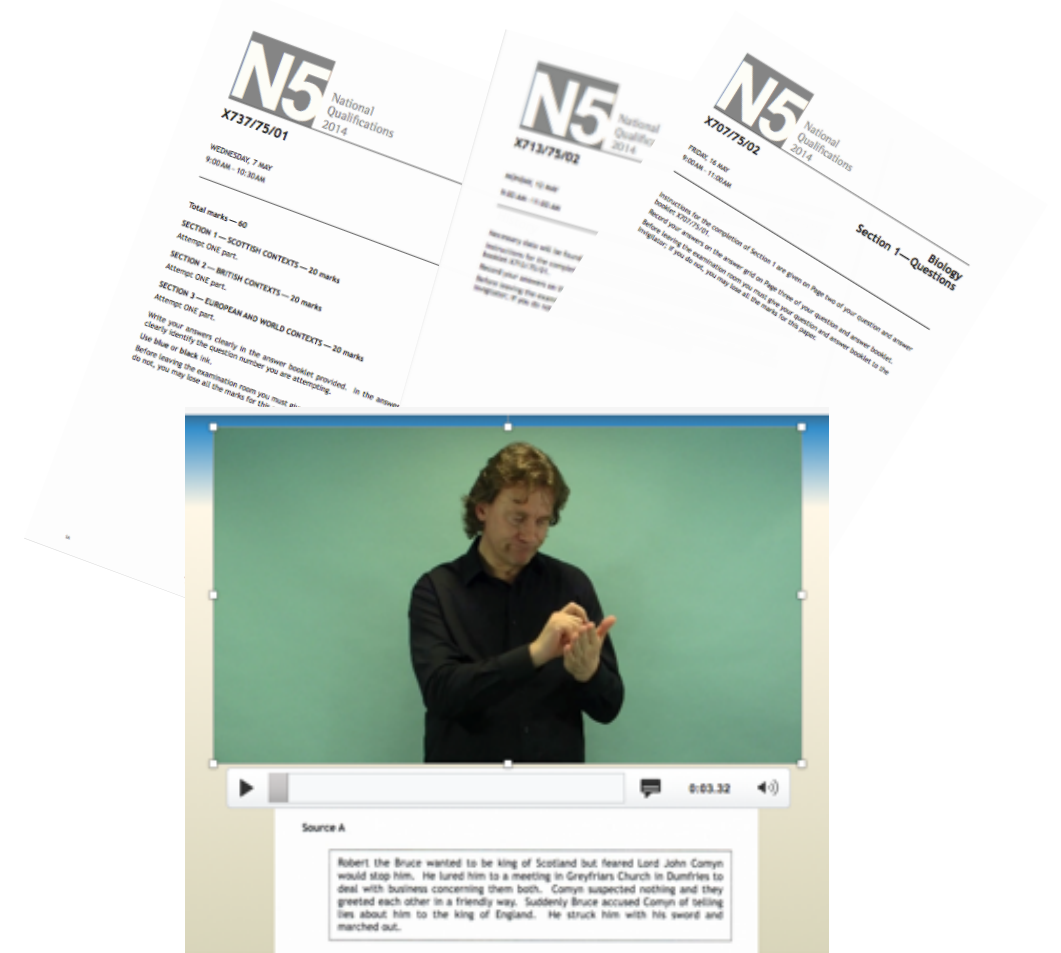
All questions in this
Answers should be given on

1. Which box below shows two products of

<p>A UHT milk and cheese</p> 	 
<p>C Bread and UHT milk</p> 	<p>D Yoghurt and beer</p> 

Scottish Qualification Authority : digital exams project (2015-16)

Created translated exam questions for SQA to assist with support for teachers of deaf children and others providing signed exams to deaf candidates.



Conclusion of the digital exams in BSL project.

- Budget
- General enthusiasm about the translations
- Debate has started about centralised exams
- BSL (Scotland) Act 2015 may make a difference in opportunities to study BSL as a language for students and staff



Public engagement



Stargazing Event - Queues to get in to Linlithgow Burgh Halls

Making sense of astronomy project (2013-14)

The Royal Observatory Edinburgh



Science & Technology Facilities Council
UK Astronomy Technology Centre



Royal
Observatory
Edinburgh
Visitor Centre



Making sense of astronomy project (2013-14)

Challenges for the Royal Observatory Edinburgh

- Links with the Deaf community
 - Subtitles
 - Scientific language terms
 - Darkness!
-
- Public engagement project (2013-14)



Making sense of astronomy project (2013-14)

Stages of project

1. A taster session held at ROE with people from the Deaf community as focus group
2. Sign development workshop with 5 scientists, sign linguists and ROE science communicators with 2 interpreters
 - 90 new signs – stars; star constellations; solar system; deep sky objects and stargazing
3. Two public 'Astronomy for Deaf people' events held in ROE and Glasgow Science Centre to pilot new signs.

Making sense of astronomy project (2013-14)

Stages of project

4. A networking and skills development day for BSL interpreters and science communicators
5. A series of Deaf accessible events across different venues in Scotland and the rest of UK.



Science Shows



Joint BSL and English science show being presented to Deaf and hearing audience at Dundee Science Festival



Audience, including Dundee Deaf Hub, are taught new BSL signs for the planets in the Solar System



BBC Stargazing Live

Making the Planetarium accessible



BSL/English interpreted planetarium show

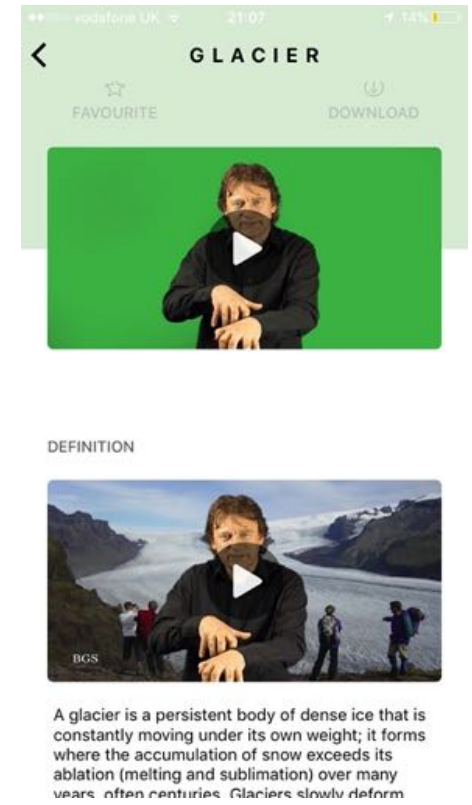
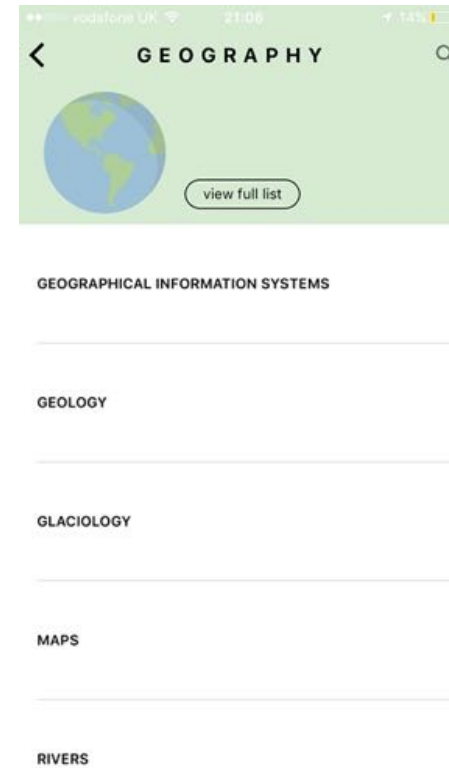


Explaining what to expect inside the planetarium to Deaf and hearing group about to enjoy a show

Impact of project

	Public	Professional
Direct engagement in Scotland	5,903	126
Virtual engagement	650+ (website)	
Direct engagement outside Scotland	12,000	

Total: 18,553



New App for STEM in BSL glossary

App for STEM in BSL: *BSL education*



Next 10 years

- Establish regular funding of the glossary project
- Evaluation of the use of the glossary
- Expand the glossary to cover other subjects
- Provide resources for schools
- Work with professionals who work with deaf children
- Collaborations with international partners

Happy anniversary and many thanks to the BSL glossary team!

Conclusion

“I think the BSL Glossary project is important because it offers high quality science explanation in BSL and technical terms which have previously not been available to deaf children. With many deaf students learning in mainstreamed settings, they really need contact with high quality BSL learning resources. From the feedback we have had from deaf students, teachers and interpreters, I think the Glossary is useful, and it will be even more so when the app is launched.”

Rachel O’Neill, June 2017

References

Burns, E. (2011) How Can We Improve Access to SQA Exams for Signing Deaf Candidates? University of Edinburgh: Unpublished MEd thesis.

Cameron, A, O'Neill, R & Quinn, G. (2017), Deaf students using sign language in mainstream science classrooms. in A Oliveira & M Weinburgh (eds), *Science Teacher Preparation in Content-Based Second Language Acquisition*. Springer, pp. 341-360.

Cameron, A., Quinn, G. & O'Neill, R. (2011) Assessing the feasibility of using digitised British Sign Language examination papers for Deaf candidates in Scotland. Edinburgh: Scottish Sensory Centre <http://bit.ly/1NqMKMm>

O'Neill, K.P., Cameron, A., Quinn, G., O'Neill R. and McLean, F. (2015) British sign language glossary for Mathematics and Statistics. IMA International Conference on Barriers and Enablers to Learning Maths: Enhancing Learning and Teaching for All Learners. 06/2015.

Ravenscroft, J & Wazni, K. (2017) The Qualification of Teachers of pupils with visual impairment, or pupils with hearing impairment or pupils with multi-sensory impairment (vision and hearing impairment) Commissioned Report, Scottish Government.

Scottish Sensory Centre (2017) British Sign Language Glossary Project of Curriculum Terms <http://bit.ly/1NqIPPx>

Email: audrey.m.cameron@ed.ac.uk
g.a.quinn@hw.ac.uk
rachel.oneill@ed.ac.uk

Scottish Sensory Centre's STEM in BSL Glossary website:

<http://www.ssc.education.ed.ac.uk/BSL/list.html>

<http://www.ed.ac.uk/profile/audrey-cameron>