

# GO FORTH!

## DIGITAL HERITAGE LEARNING RESOURCES

Dr Lyn Wilson, Digital Documentation Manager, Historic Environment Scotland



1

## DIGITAL DOCUMENTATION & DIGITAL INNOVATION @ HES

- Use a range of digital technologies to document our heritage in 3D
- Apply digital documentation data to assist in conservation, site management, learning, interpretation & accessibility
- Apply innovative digital techniques for the benefit of the historic environment
- Participate in applied scientific research of relevance to the heritage sector
- Collaborate with local, national and international partners
- Participate in training programmes, community engagement and outreach
- Provide advice and guidance to the heritage sector



2

## SKILLS AND CAPACITY BUILDING

Supporting the next generation of digital heritage experts

Since 2012, annual paid trainee positions in Digital Documentation and Digital Innovation



3

In 2013, the iconic Forth Bridge was nominated for World Heritage status



Cabinet Secretary for Culture, Fiona Hyslop, MSP celebrates completion of the nomination dossier

4



# SCOTTISH TEN



New Lanark



The Antonine Wall



Heart of Neolithic  
Orkney



St Kilda



Old and New towns  
of Edinburgh



Mt Rushmore



Rani Ki Vav



Eastern Qing Tombs



Sydney Opera House



Nagasaki  
Industrial Heritage

Our five year project using cutting edge technologies to create exceptionally accurate 3D digital models of Scotland's five UNESCO World Heritage Sites and five international heritage sites in order to better conserve and manage them.

5

## Sites of Japan's Meiji Industrial Revolution Nagasaki, Japan



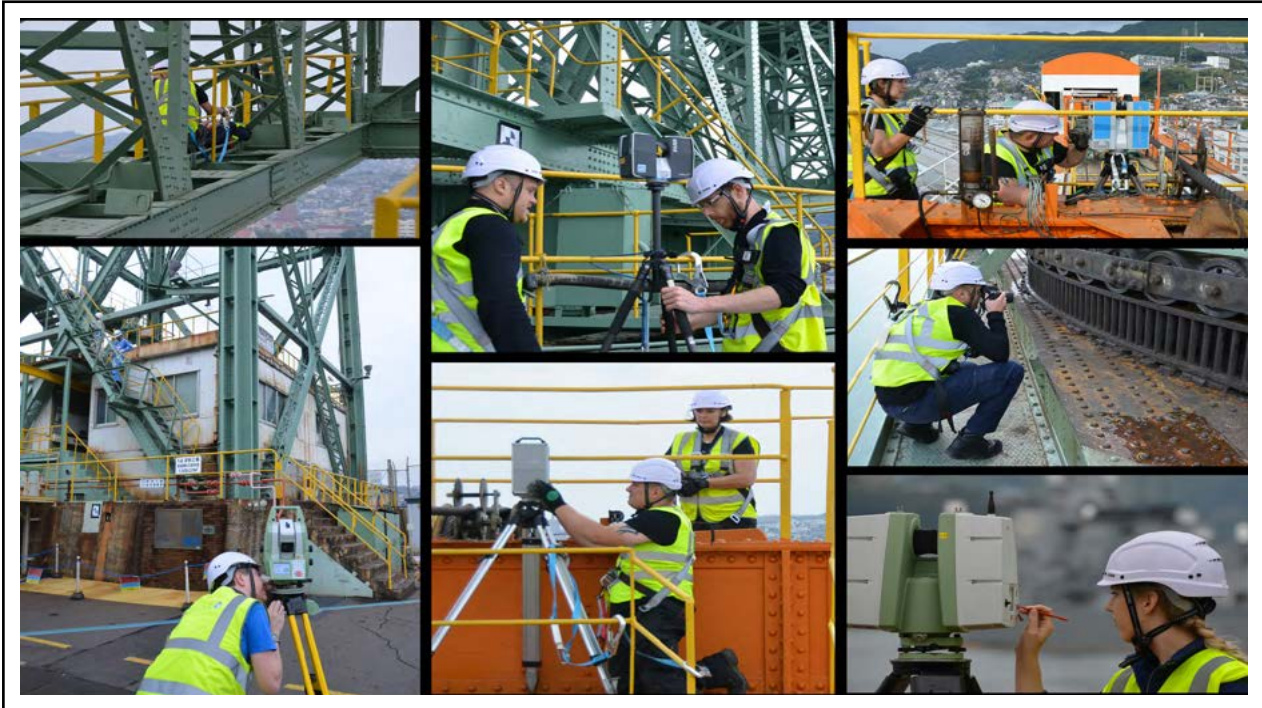
MITSUBISHI  
Heavy Engineering, Ltd.

内閣官房

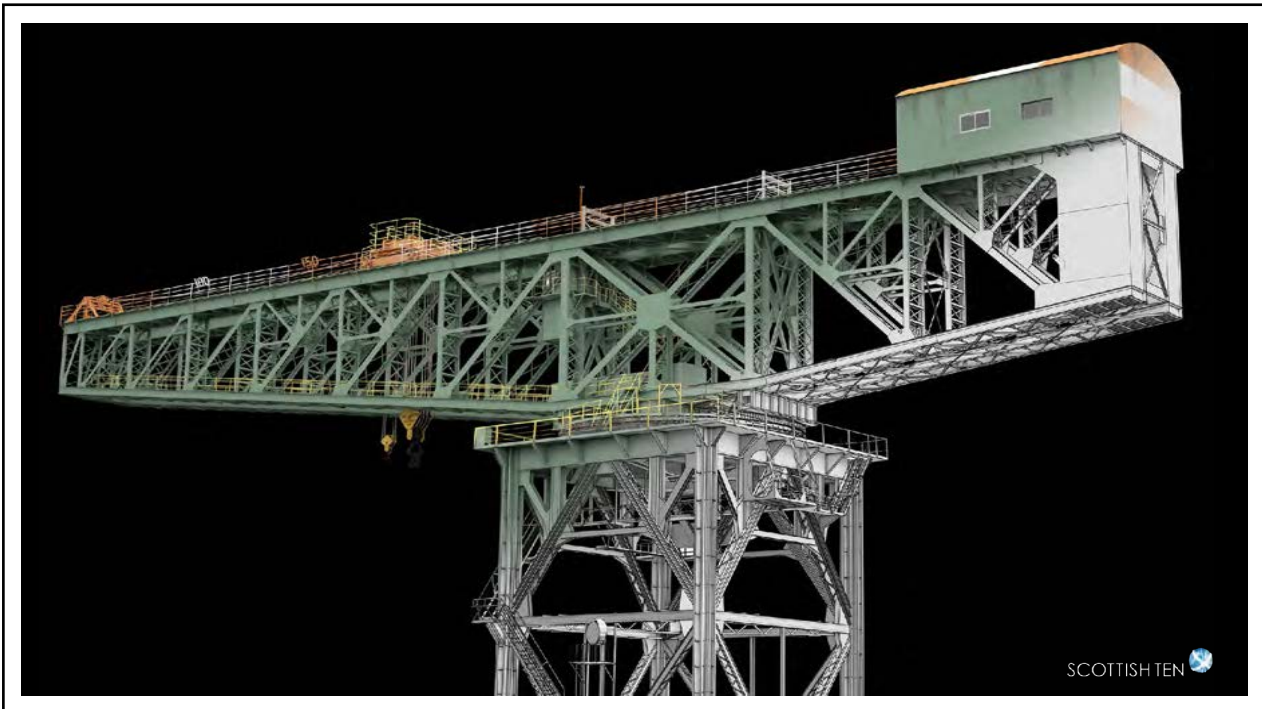
JAPAN'S  
MEIJI  
INDUSTRIAL  
REVOLUTION

SCOTTISH TEN

6



7



8



We undertook a pilot digital documentation feasibility study to support World Heritage nomination

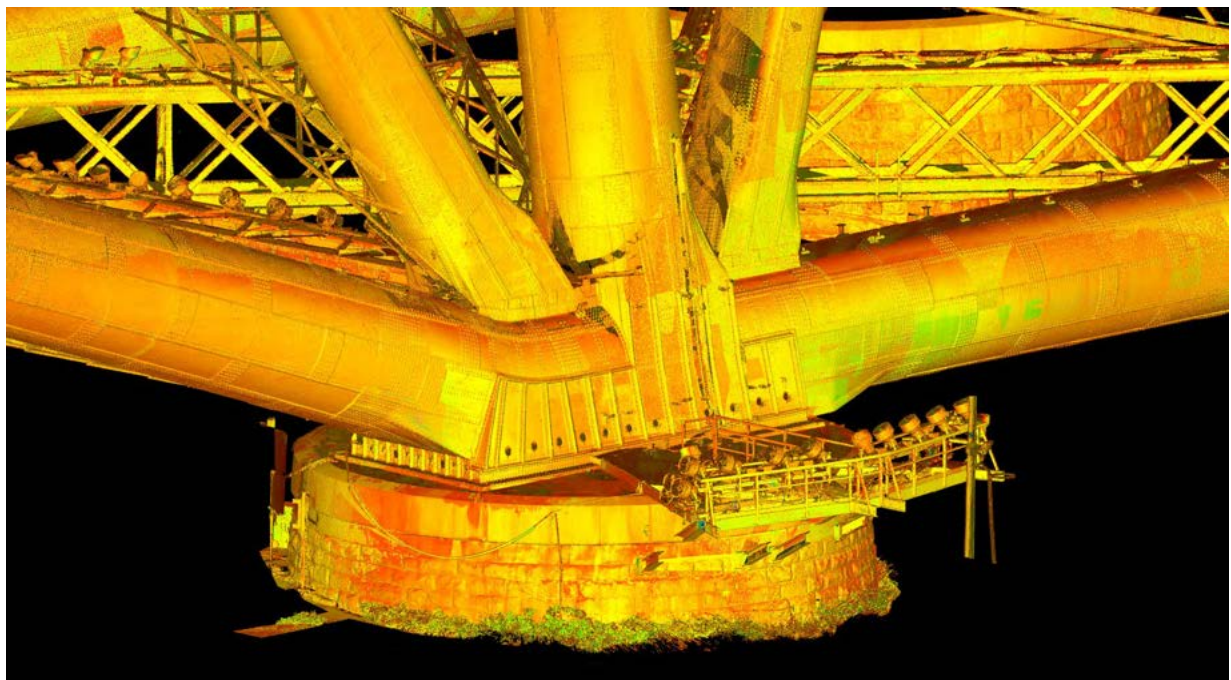


9

Pilot Results



10



11

## Digital Documentation Potential

- **Conservation**
  - Accurate 3D survey of existing as-built structures for conservation and management.
  - Provide baseline survey data for potential condition monitoring of the bridges.
  - Generate data which could be used for finite element analysis of small components on the bridges.
- **Management**
  - Provide weight to the Management Plan for UNESCO World Heritage nomination.
- **Health & Safety**
  - Generate data which can be developed into virtual health & safety and familiarisation site induction tools for bridge contractors and emergency services.
- **Learning & Interpretation**
  - Provide digital content for interpretation – potential for input into Network Rail Visitor Centres, remote/online access.
  - Provide digital content for education – e.g. Curriculum for Excellence lesson plans.
  - Promotion of engineering – ambassador for the profession, with potential to inspire younger generations.
- **Political**
  - Supporting the strategic outcomes identified in the National Performance Framework, not least those relating to education and young people, heritage, business and national identity.
- **Tourism**
  - Application in advertising campaigns for Scotland (notably cruise-ship and rail travel markets).
- **Media**
  - Possible commercial use in the entertainment industry (e.g. gaming, cinema).

12



In 2015, the Forth Bridge was inscribed onto the UNESCO World Heritage List



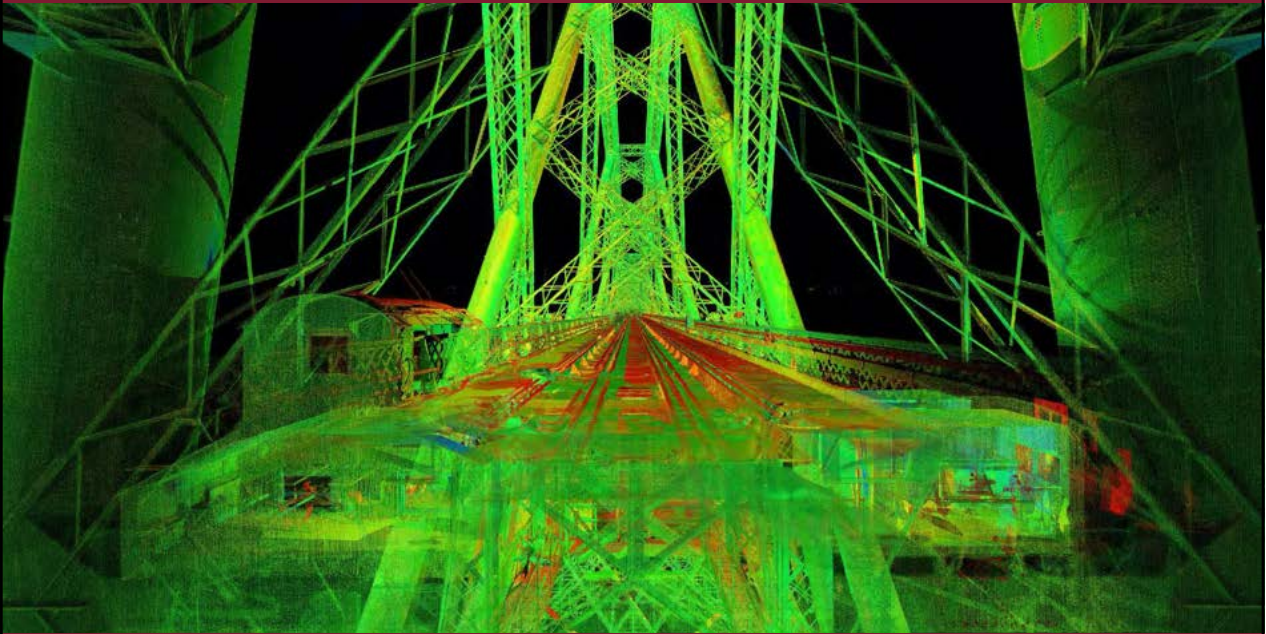
13

## 3D Forth Bridges Project



14

Creating an enormous digital 3D model from almost 1,500 separate laser scans



The 3D model provides the raw data from which the Go Forth! Resources were developed

15

We are incredibly fortunate to have a fantastic record of the Forth Bridge construction



National  
Records of  
Scotland

Its construction was recorded in detail by photographer engineer, Evelyn Carey

16



The original glass plate negatives are held in the NRS



They are part of the British Rail collections

17

Our challenge: Use the Forth Bridge to inspire a new generation



Working with teachers and schools in Dundee and Fife to scope out the Go Forth! project

18



# GO FORTH!

A major new educational resource is now available to all Scottish schools, using 3D digital documentation of the three Forth Bridges to support the teaching of STEM subjects and the Curriculum for Excellence.

The recording of all three Forth Bridges commenced in 2015 with funding from the Scottish Government, creating photorealistic 3D models from the accurate point cloud data. With digital models for all three Forth Bridges complete, work commenced on generating learning resources designed to inspire school pupils, the aim being to generate an interest in the bridges themselves, and to stimulate an enhanced take-up in associated science and technology subjects.

Working with the assistance of technical teaching expertise from Dundee City Council, the Centre for Digital Documentation and Visualisation (a partnership between Historic Environment Scotland and The Glasgow School of Art) has created several teaching packages all of which are available through Education Scotland's Glow network:

- Go Forth and Discover
- Go Forth and Design
- Go Forth and Create
- Go Forth and Explore
- Go Forth, See and Hear



19

## GO FORTH AND DISCOVER

SERIES OF 10 CHALLENGES TO BUILD UNDERSTANDING WITHIN THE SOCIAL STUDIES CURRICULUM FROM FIRST LEVEL ONWARDS  
3D MODELS AND ANIMATION USED IN REAL-TIME GAME ENGINES

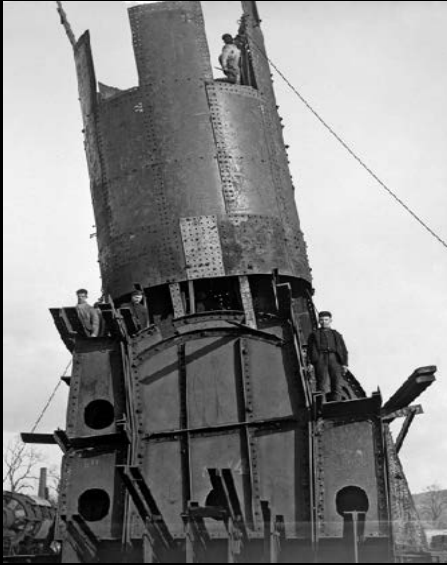
### CfE Pupil Objectives

- I can identify key landmarks in Scotland
- I can create a timeline of events
- I can access a range of trustworthy resources in develop an understanding of a local place or historical event
- I can identify similarities and differences between my life and the life of those in the past
- I can demonstrate an understanding of the key figures and their roles in the building of the Forth Bridge

20



# MEET OUR BRIGGERS



(L) Image Ref. NRSBR-FOR-4-34-116



David  
Rivet Catcher, Forth Bridge

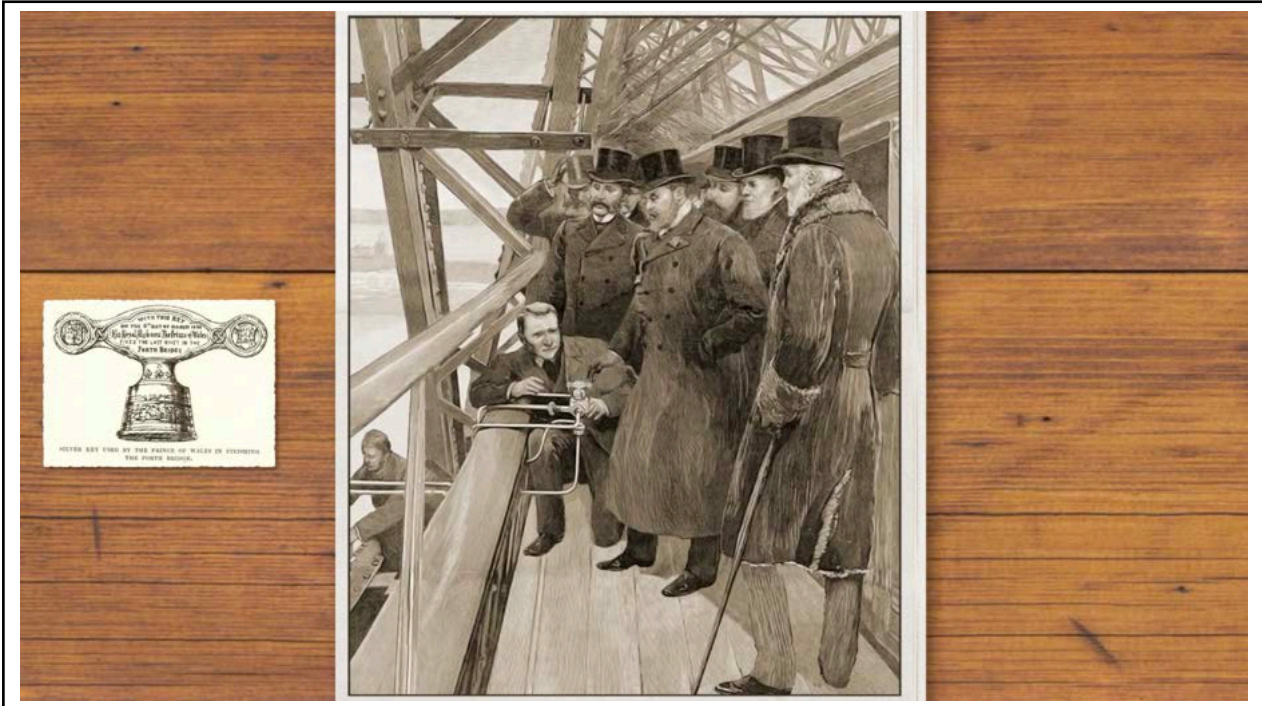


Mr Hay  
Rivet Gang Leader, Forth Bridge



(R) Image Ref. NRSAAA01318





23

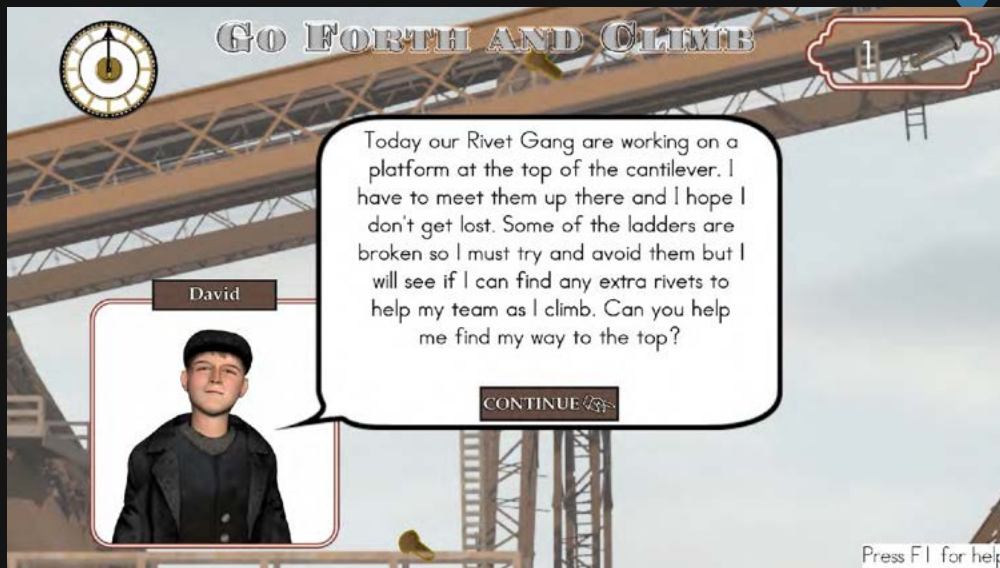
## MULTIPLE RESOURCES AND WAYS TO USE THEM



24



## CHALLENGE 3 - CLIMB



25

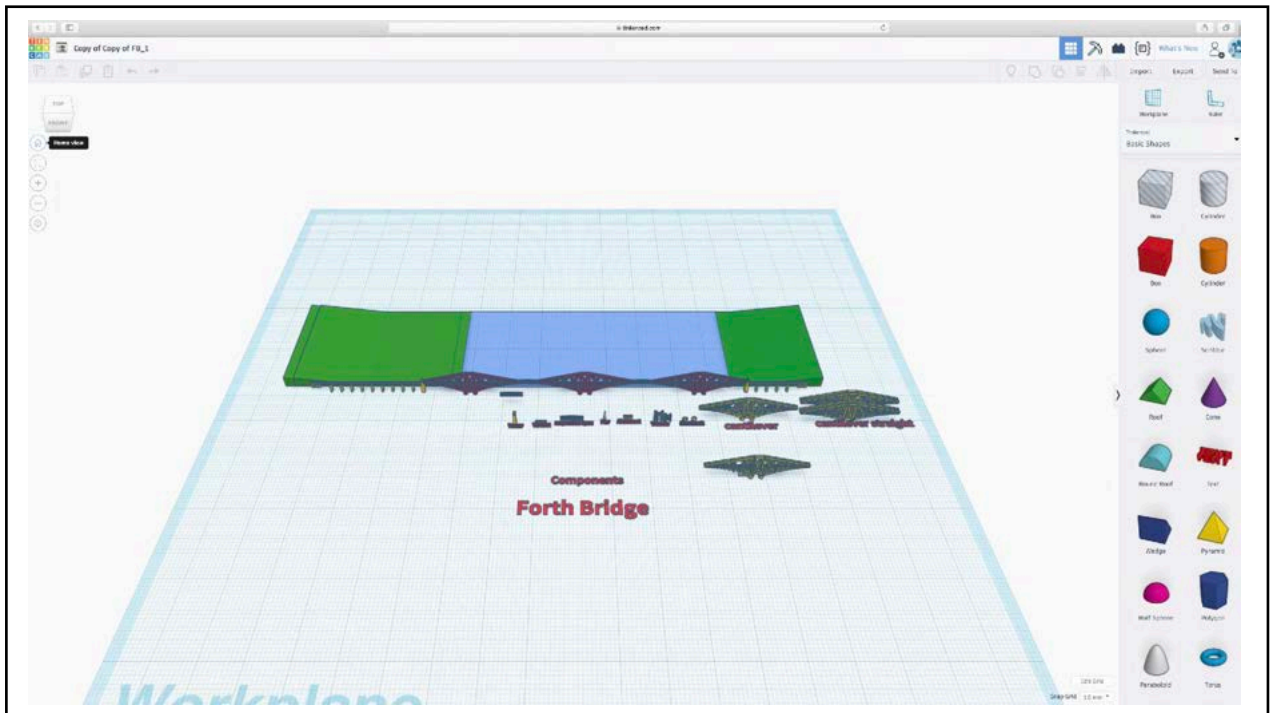
## GO FORTH AND DESIGN

BUILDING ENGINEERING KNOWLEDGE, COMPUTER AIDED DESIGN AND  
PROBLEM SOLVING SKILLS ON & OFFLINE  
3D MODELS USED IN CAD ENVIRONMENTS

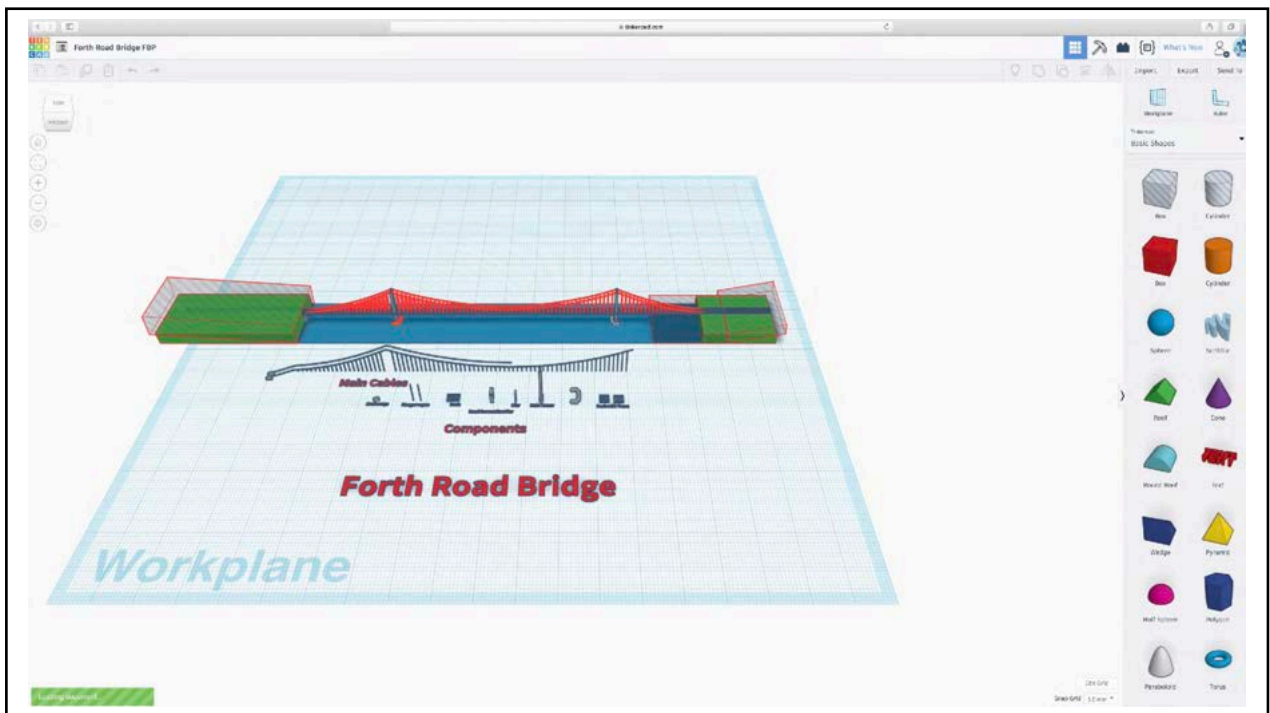
### CfE Pupil Objectives

- I can identify key structural features on a bridge
- I can create a sketch and digital representation of a bridge using my knowledge
- I can solve an engineering problem using physical and digital tools
- I can build and test a range of physical models which I have planned using 3D drawings and software

26



27



28

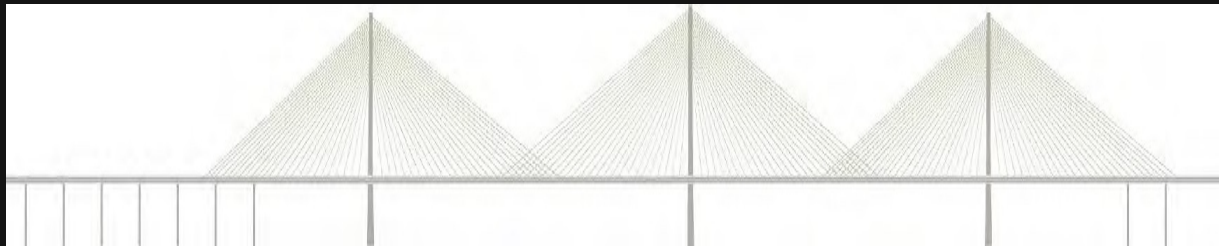


## GO FORTH AND CREATE

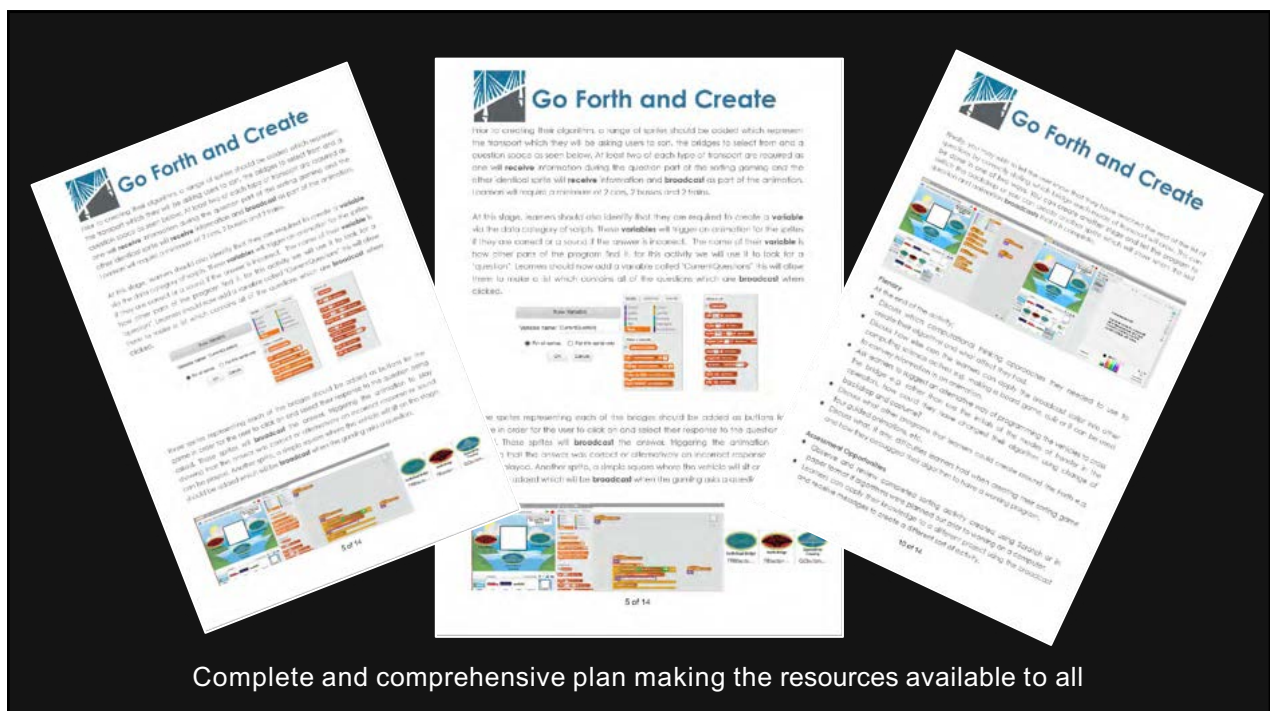
### BUILDING COMPUTER SCIENCE KNOWLEDGE, ENGINEERING AND PROBLEM SOLVING SKILLS COLLABORATIVELY OR INDIVIDUALLY 3D MODELS USED IN CODING PROGRAMMES

#### CfE Pupil Objectives

- I can create a program
- I can identify the role of variables, loops and broadcasting within my program
- I can debug my program to meet the solution



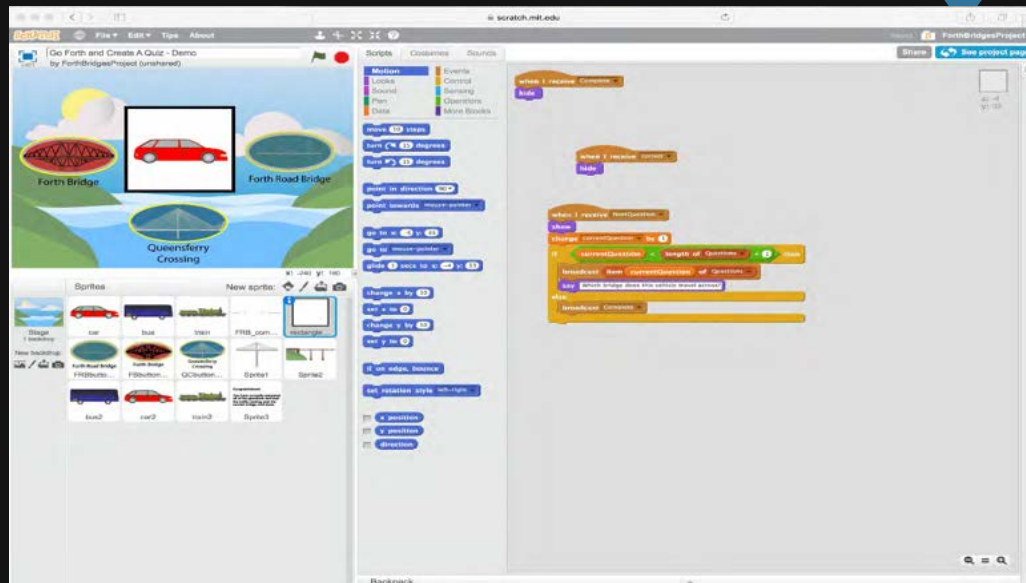
29



Complete and comprehensive plan making the resources available to all

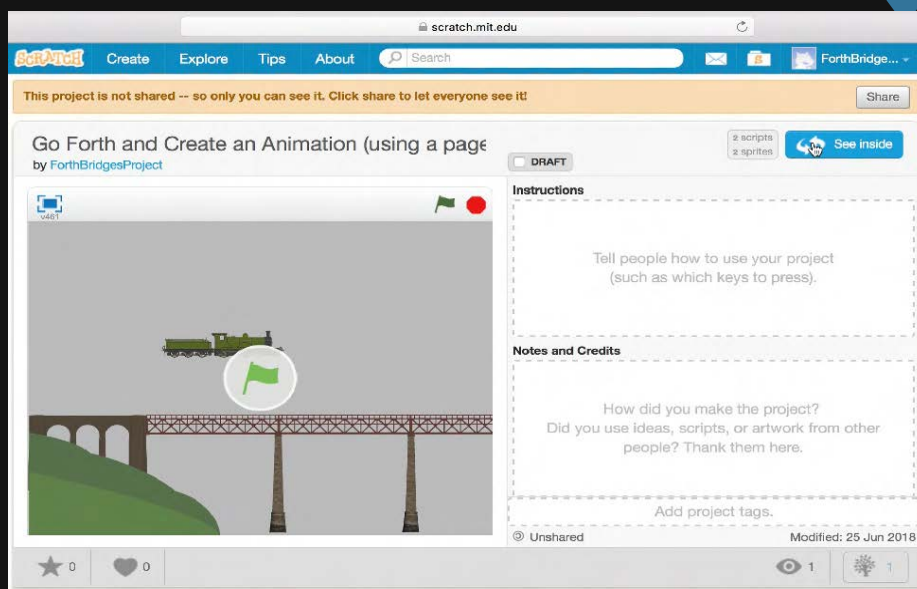
30

## DEVELOPING CODING SKILLS



31

## COMPLETE LESSONS AVAILABLE ON 'SCRATCH'



32





33

To embed learning in the first three learning resources, practitioners can use additional VR and location-based resources



Image Ref: Canmore

- Go Forth and Discover ✓
- Go Forth and Design ✓
- Go Forth and Create ✓
- Go Forth and Explore 🚂
- Go Forth, See and Hear 🧐

34

## Intensive testing phase with young learners



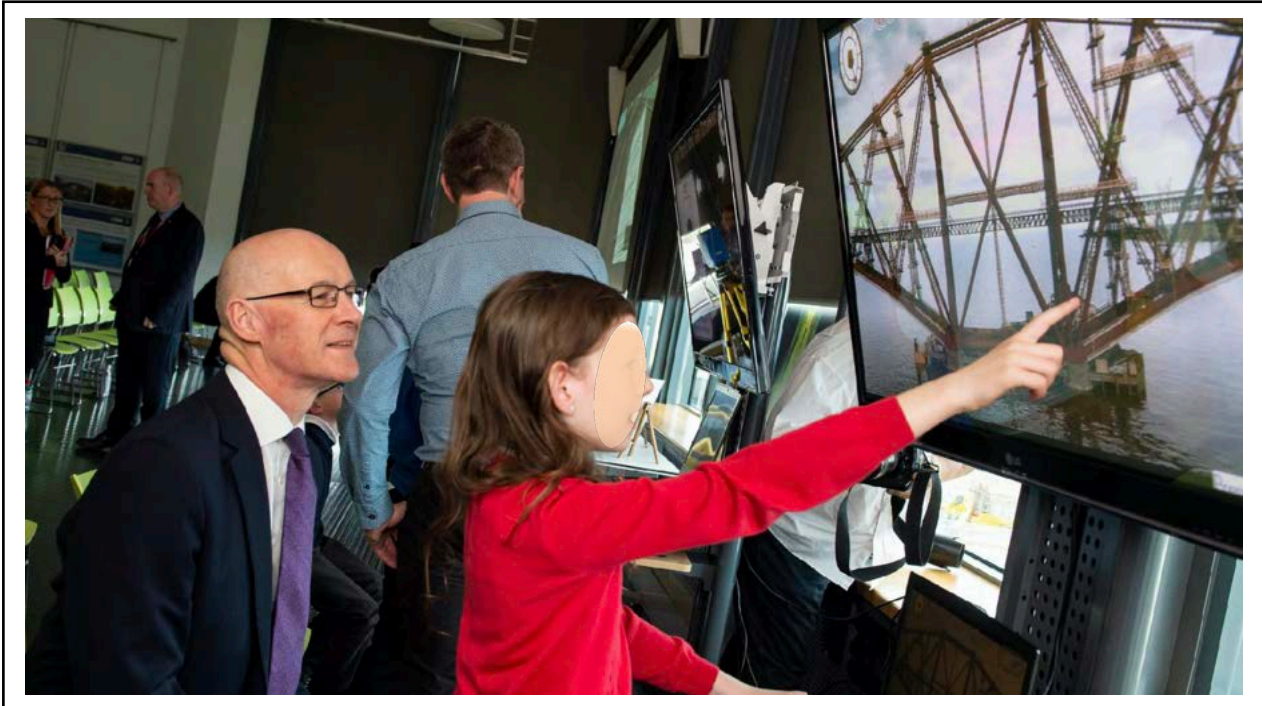
We listened to their feedback and made changes!

35



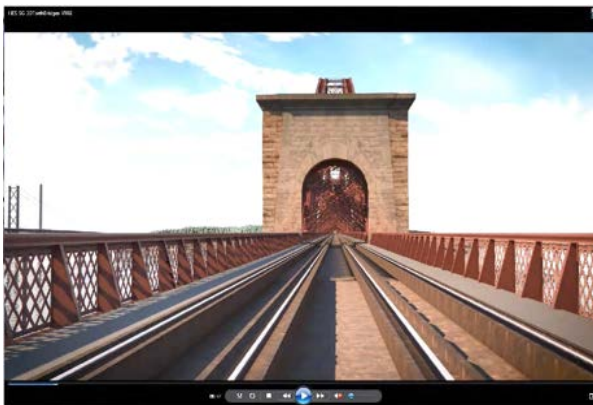
36





37

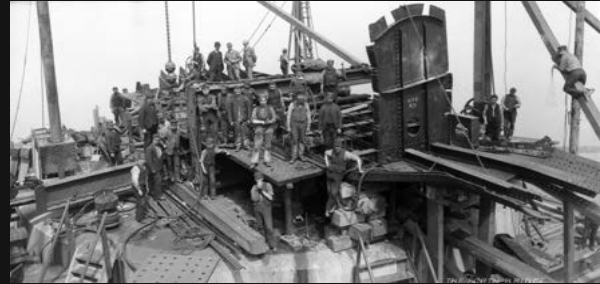
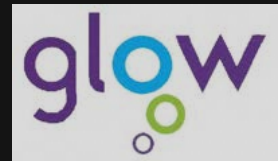
Go Forth! provides safe virtual access to an operational railway bridge...



Go Forth! is just one way in which our new digital resources can be used to share our World Heritage Site with the world

38

You can try out  
the resources  
yourself! 🙌



With thanks to Jenni Mackay, Miles Oglethorpe, Frank Hay and The Briggers, Ian Heigh and Network Rail, Chris Waite and Amey, John Andrew, Transport Scotland, National Records of Scotland, Balfour Beatty, University of Aberdeen, Forth Bridges Forum, CDDV team and all the young learners!