STEM DIVERSITY: REPORT ON INTERNATIONAL BEST PRACTICES

ACDICT 2017 Council Meeting

Hello!

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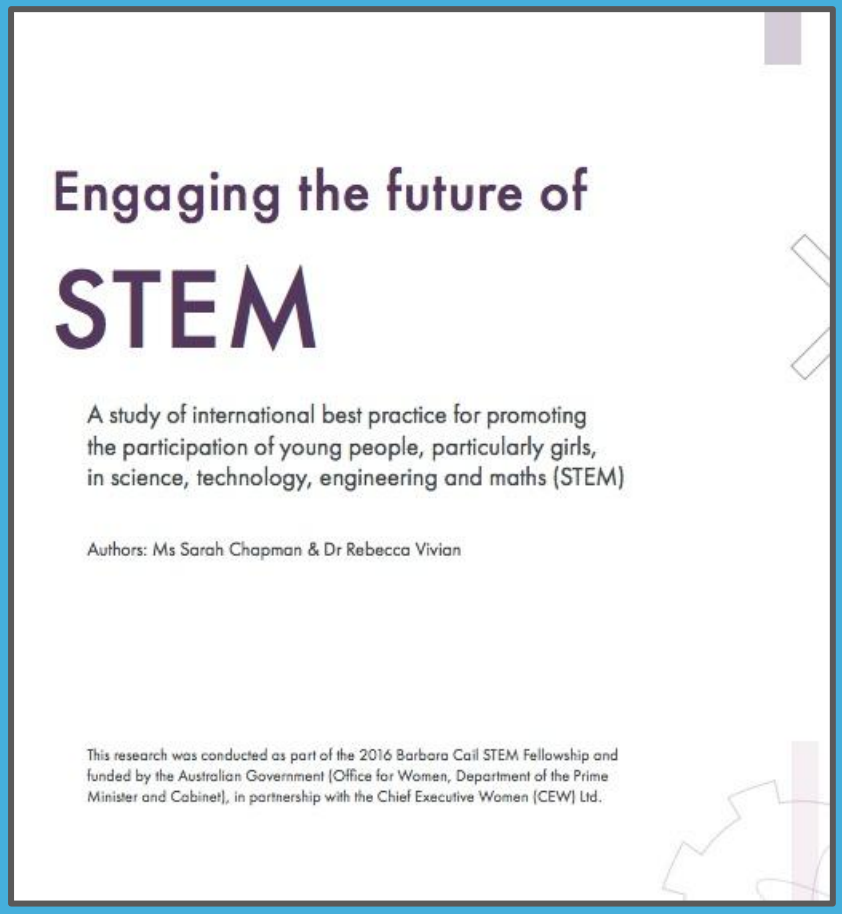
Barbara Cail STEM Fellowship

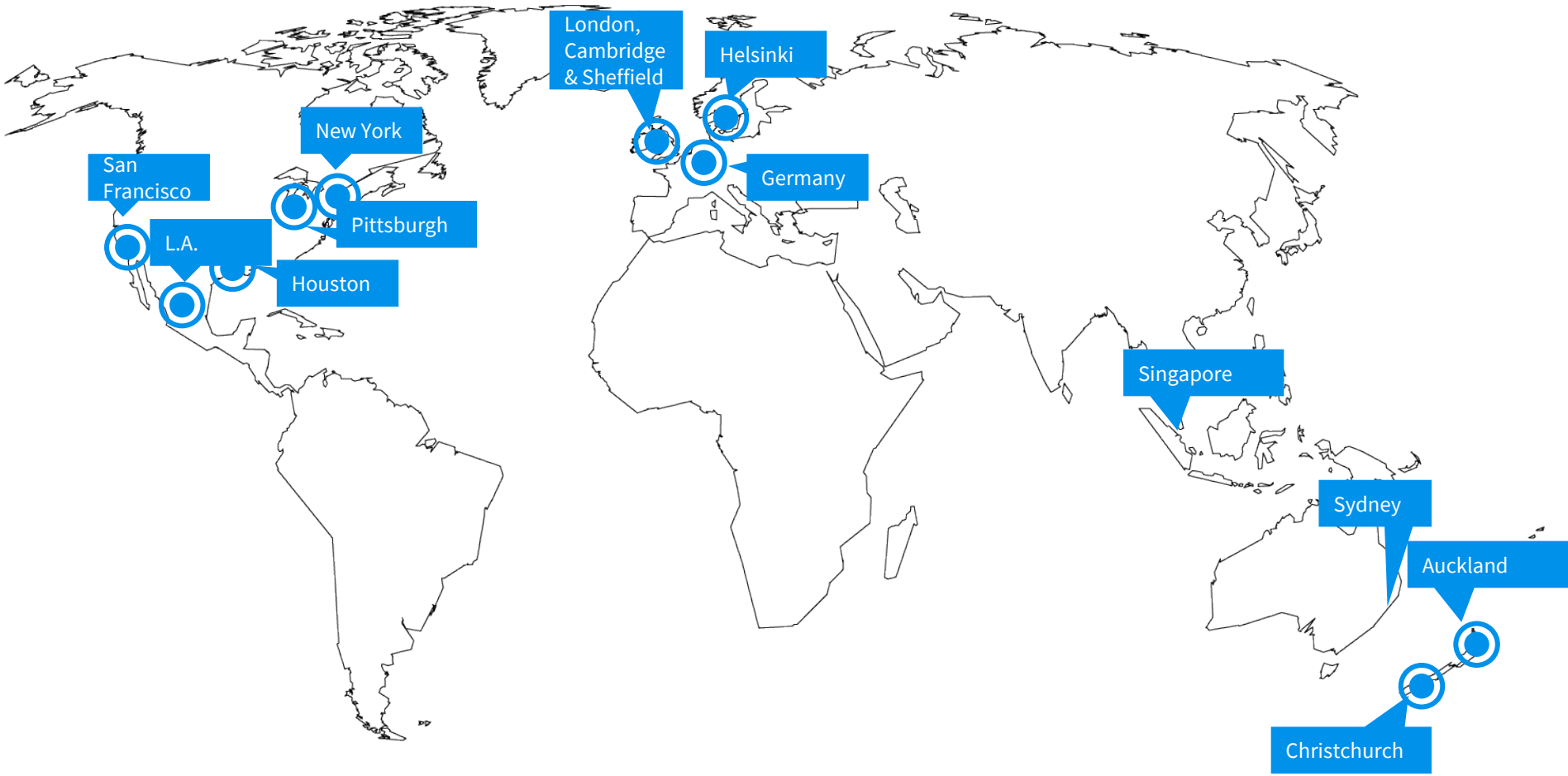
Funded by the Chief Executive Women (CEW) Ltd, in partnership with the Australian Government (Office for Women).

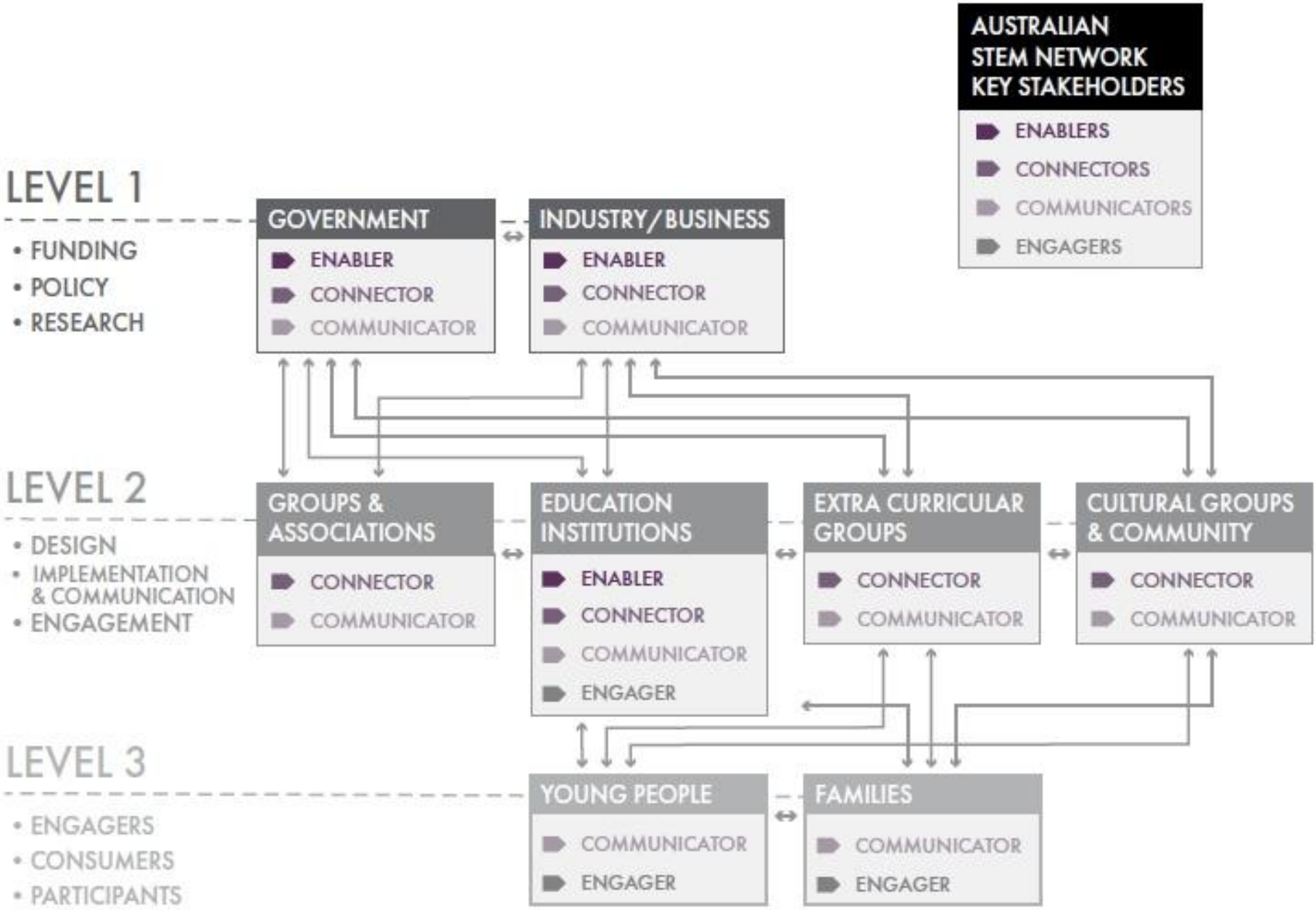
tinyurl.com/STEMfuture



STEM report launch at the Commonwealth Bank of Australia, Sydney.

PROJECT SCOPE


London, Cambridge & Sheffield
Helsinki
New York
San Francisco
Germany
Pittsburgh
L.A.
Houston
Singapore
Sydney
Auckland
Christchurch


AUSTRALIAN STEM NETWORK KEY STAKEHOLDERS
ENABLERS
CONNECTORS
COMMUNICATORS
ENGAGERS
LEVEL 1
• FUNDING
• POLICY
• RESEARCH
GOVERNMENT
ENABLER
CONNECTOR
COMMUNICATOR
INDUSTRY/BUSINESS
ENABLER
CONNECTOR
COMMUNICATOR
LEVEL 2
• DESIGN
• IMPLEMENTATION & COMMUNICATION
• ENGAGEMENT
GROUPS & ASSOCIATIONS
CONNECTOR
COMMUNICATOR
EDUCATION INSTITUTIONS
ENABLER
CONNECTOR
COMMUNICATOR
ENGAGER
EXTRA CURRICULAR GROUPS
CONNECTOR
COMMUNICATOR
CULTURAL GROUPS & COMMUNITY
CONNECTOR
COMMUNICATOR
LEVEL 3
• ENGAGERS
• CONSUMERS
• PARTICIPANTS
YOUNG PEOPLE
COMMUNICATOR
ENGAGER
FAMILIES
COMMUNICATOR
ENGAGER

Everyone can play an integral role in Australian STEM diversity and engagement.

RESEARCH FINDINGS

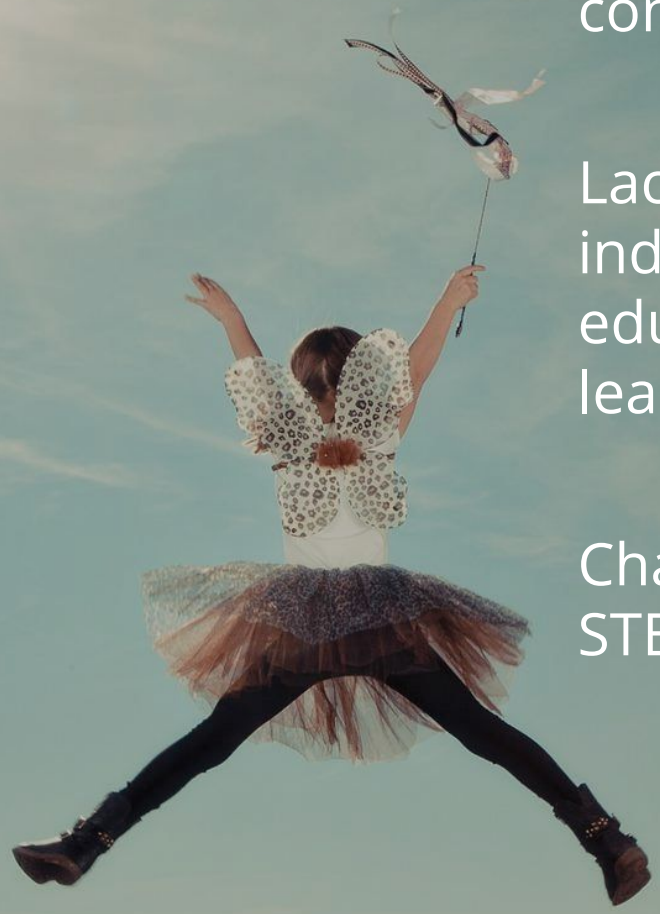
CHALLENGES

Engaging girls and women

Lack of relevance to everyday life - STEM being an abstract construct.

Lack of links to the ‘humanness’ around STEM.

Lack of clarity on STEM careers (including job titles) and professional activities.



Fear of failure and lack of confidence in STEM.

Lack of role models in STEM industries and postsecondary education, particularly in leadership.

Challenges around the culture of STEM industries.


Parents/caregivers lack of understanding and lack of support towards STEM pathways.

CASE STUDIES

LUMA Centre, Finland

Umbrella organisation brings together Finnish university Science, Mathematics, and Technology faculties to implement STEM education & outreach.

“Together we are more!”

LUMA CENTRE

- Umbrella organisation with a common national strategy.

- Cross-disciplinary collaboration - STEM faculties.
- StarT - STEM project-based learning challenge.
- Teacher training (in-service & pre-service).
- Clubs & resources.
- LUMAT publication.

LUMA CENTRE FINLAND

Jippo

LUONNONTIETEITÄ, MATEMATIIKKAA JA TEKNOLOGIAA LAPSILLE

Ihmettele
Löydä
Opi

front page

Virtual clubs homepage

virtual Clubs

Choose your age group:

3-6 years of age

7-10 years of age

Science Theatre: The ball end Magician and Magic

Video Club 7-10 years

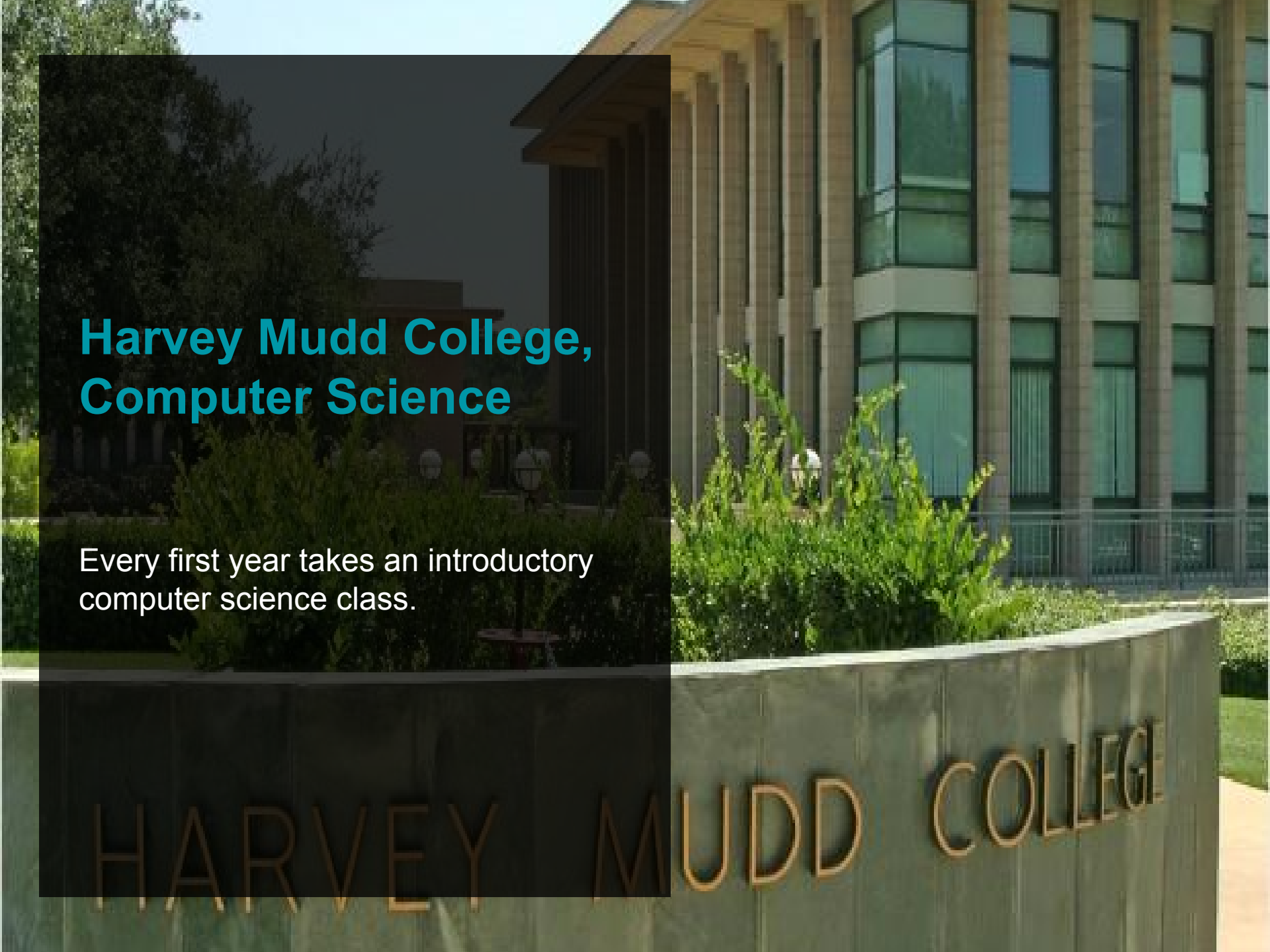
In this work, we learn theatrical ilmapallontäyttymisen seemingly out of nowhere. In the background is anyway a rigorous science.

This last science theater video will encourage all club members to use some of the skills learned tiedeteatterielemettejä and develop their own small science theater performance! raffle presentation will award three distinguished performances.

The bill should be

-päähenkilö, which is a human or a doll (pehmoeläin, hand puppet, stick figure doll, legoukko ...)

-jokin little story. The story may be similar to the stories of the examples were



Harvey Mudd College, Computer Science

Every first year takes an introductory computer science class.


Y.
XI CAB

Carnegie Mellon University, SCS4ALL

A student-run, non-profit organization that works to develop a program of social and professional activities and leadership opportunities to broaden participation and interest in computing by underrepresented groups.

Bias Busters @ CMU

- Workshops for CMU faculty, staff and graduate students.
- Adopting train-the-trainer model to scale.

"You won't change everyone, but you can build the status quo."

ACCESSIBILITY IN COMPUTING

Partnered with Washington University, AccessComputing - experts.

Workshop for awareness-raising.

Empowering students with disabilities to be active participants and creators of technology.

Stanford University, Office of Science Outreach

RISE - Raising Interest in Science and Engineering

Summer Research Program for Teachers.

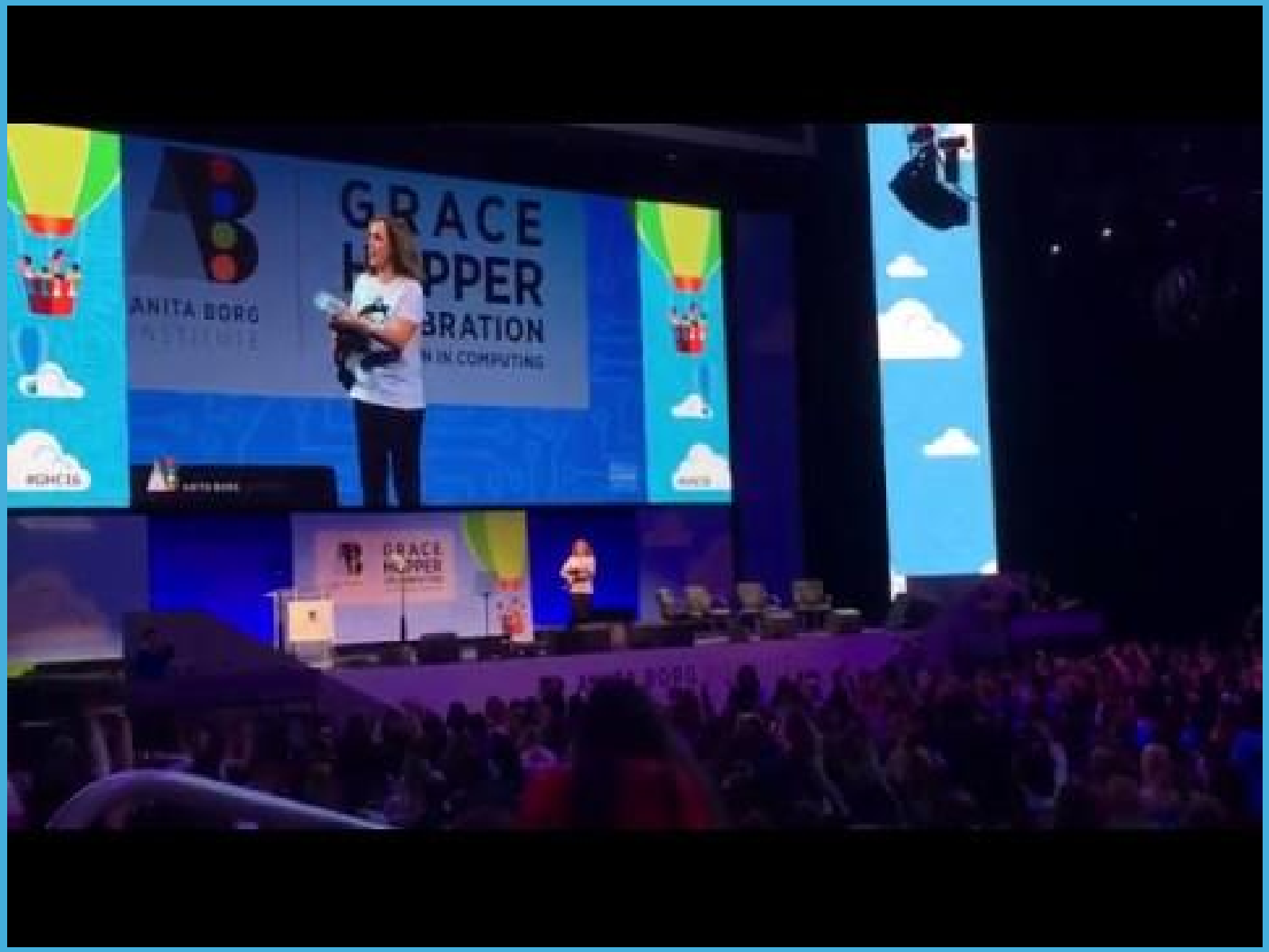
Engaging students and teachers in authentic research experiences.

RISE

- 7-week STEM research placement.
- Authentic STEM experience.
- Low-SES targeted.
- Stipend.
- 95% of alumni receive a degree and ~80% major in a STEM subject.

TEACHER FELLOWSHIPS

GRACE HOPPER CELEBRATION



15,000

attendees

1,300 | **400**

Organisations | Academic institutions

200

Expo booths

I LOVE, WHATSAPP!
To talk to my mom
Whatsapp Keeps me in touch w/ my loved ones!
GROUP CHATS is my friends
To find each other at conference
WA lets me keep in touch with all my cousins + friends!
Global


An opportunity to
CHALLENGE
ACCEPTED.


amazon
we pioneer
YAHOO!


DisneyTECH
At Disney, we're storytellers. We make the impossible, possible. We do this by utilizing and developing cutting-edge technology and allowing our Technology teams to push the envelope to bring stories to life through our movies, products, interactive games, parks and resorts, and media networks around the world.
LOS ANGELES PALO ALTO
SEATTLE NEW YORK CITY
ORLANDO PITTSBURGH
SAN FRANCISCO BRISTOL
"Technology is part of the DNA at Disney." -Michael
Senior Vice President & CTO
DisneyTECH

PROGRAM CHALLENGES

ATTRACTING DIVERSITY

Connecting with underrepresented & under-resourced communities; broadening 'diversity' strategies.

LACK OF RESOURCING

Reliance on volunteers; change driven by a small group; physical distances or space; financial.

MEASURING IMPACT

Collecting and managing data; evaluating impact; longitudinal analysis; identifying effective programs.

INSTITUTIONAL CHANGE

Inclusive environments; institutional processes; diversity in population & leadership; retaining students; changing culture.

REPORT OUTCOMES

- **Benchmarks for effective STEM programs** - includes factors to ensure successful and sustainable STEM programs
- **Four core strategies for engaging girls** in STEM - includes specific examples and resources
- Identification of **key components within an effective STEM ecosystem** - how each stakeholder plays an important part

tiny.cc/SIGCSEdiversity

Customisable & Accessible Customisable to suit audience needs. Accessible to different audiences and contexts.	**Retains and extends** Designed to sustain engagement and exceed single events/experiences. Links to computing pathways for the intended audience to stay engaged.
Open Resources are free to use for education purposes or available for remixing and re-sharing for non-commercial/education purposes.	**Scales** Considers opportunities for scaling programs to for greater reach, sustained impact, and efficiency.
Evidence-based Established on empirical evidence around the best practice for promoting and sustaining engagement in Computer Science.	**Supports key influencers** Develops resources, or curates existing resources, that can inform and support key influencers.
Evaluated Systematic evaluation of program effectiveness and impact is integrated into the program. Measurements focus on both reach and impact.	**Partners** Links to relevant industry, business, education, community organisations that can inform and enhance the program(s), and/or vice versa.
Designed for diversity Targeted strategies or support to effectively engage and build aspirations for underrepresented groups.	**Real-world relevance** Links to relevant and real world learning opportunities or experiences.

STEM Program Benchmarks

Customisable & Accessible Customisable to suit audience needs. Accessible to different audiences and contexts.	**Retains and extends** Designed to sustain engagement and exceed single events/experiences.
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Evidence-based Established on empirical evidence on best practices.	**Supports key influencers** Develops resources, or curates existing resources, that can inform and support key influencers.
Evaluated Systematic evaluation of program effectiveness and impact is integrated into the program.	**Partners** Links to relevant industry, business, education, community organisations for mutual partnerships.
Designed for diversity Targeted strategies or support to effectively engage and build aspirations for underrepresented groups.	**Real-world relevance** Links to relevant and real world learning opportunities or experiences.

KEY AREAS FOR ENGAGING GIRLS

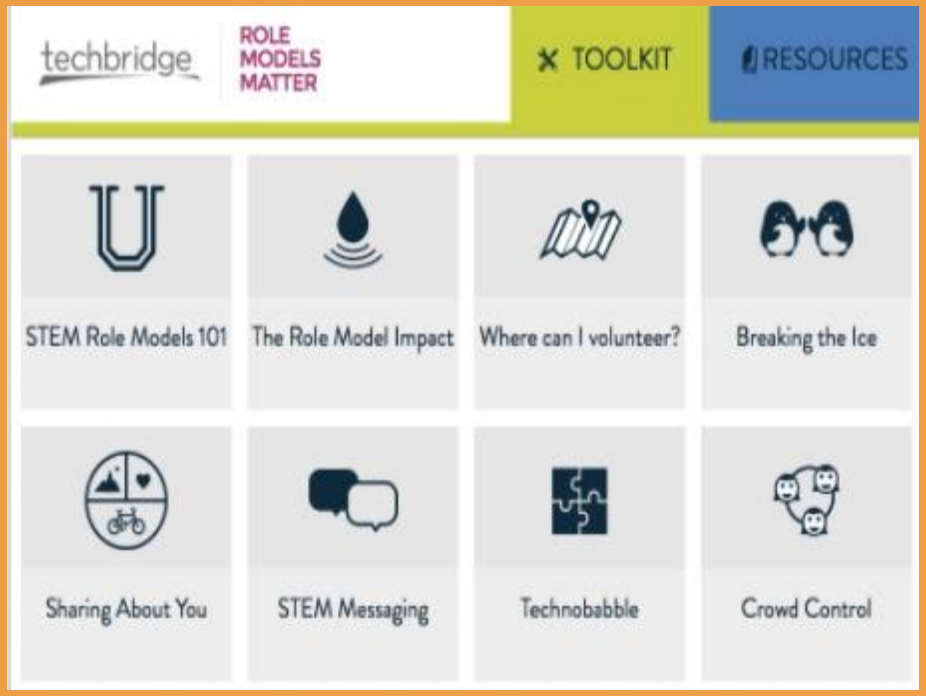
- ❑ Effective messaging
- ❑ Providing girls-only opportunities
- ❑ Family involvement
- ❑ Developing authentic STEM connections

EFFECTIVE MESSAGING

- ★ Redesigning materials to use adjectives to describe STEM professions and activities.
- ★ Having role models and volunteers share their interests and activities outside of their STEM-related activities.
- ★ Developing resources for specific STEM fields with targeted messaging and information.
- ★ Evaluating media for unconscious bias, and ensure diverse representation in media.

EFFECTIVE MESSAGING

WISE Campaign - Careers information packs



Techbridge - Training materials

KEY ACTIONS

- Establish a national coordinated strategy for building teacher capacity in STEM.
- Map Australia's STEM ecosystem, identifying key stakeholders, programs and best practice.
- Develop a STEM framework, building on the report benchmarks.
- Establish a Celebration of Women in STEM conference - modelled off the Grace Hopper Celebration.

KEY ACTIONS CONT...

- Expand industry research partnerships into STEM education, into targeted STEM topics.
- Develop, in collaboration with industry, a national student STEM mentorship program, including real-world placement experiences.
- Develop STEM engagement resources, tailored to the Australian STEM context and for STEM disciplines.

START SMALL

Pick one problem/challenge that you would like to address or expand. Build from there.

LEVERAGE

Build on what is already freely available. Find programs/people who are working in the space. Seek partnerships.

SCALE

Consider ways to scale existing programs. Use resources (people and finances) creatively and efficiently.

THANKS!

Any questions?

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REPORT: tinyurl.com/STEMfuture
SLIDES: tiny.cc/ACDICTstem2017

CREDITS

Special thanks to all the people who made and released these awesome resources for free:

- Presentation template by SlidesCarnival
- Photographs by Pixabay

University of Sheffield, Faculty of Engineering

The university work together, with a shared goal, to increase female participation and leadership in engineering, and to raise the profile of engineering.

Women in Engineering, HR, Recruitment & Careers, Communications, Engineering Student & WIE President

UNIVERSITY OF SHEFFIELD

Women in Engineering

Student-run initiatives.

Staff support & males.

Developing family resources and outreach.

Enhancing Visibility

Opening up lab spaces.

Raising profile of Engineering areas.

Visibility of support and network groups.

More female leadership on-campus.

Carefully designing Open Day spaces.

Institutional processes

Changing recruitment and promotion processes.

Adopting unconscious bias research.

Support for female leadership.


The University Of Sheffield.
Engineering at Sheffield.
Project Space & Machine Shop.
Experienced by students studying:
• Aerospace Engineering
• Civil and Structural Engineering
• Electronic and Electrical Engineering
• Engineering Foundation Year
• Interdisciplinary Engineering (MEng Engineering)
• Materials Science and Engineering
• Mechanical Engineering
In the Project Space and Machine Shop, students have access to a wide range of engineering equipment, including hand tools, drills, saws, casting, milling machines and laser cutting.
The Project Space features state-of-the art apparatus, including a range of 3D printers, which are available for course-related activities and extracurricular projects. It also includes workstations for learning workshop fabrication skills and a flexible workspace for design-and-build activities.
The Machine Shop features 16 manual lathes, as well as CNC machines and band saws, allowing students to get hands-on experience, whilst receiving support from a team of dedicated technicians with specialist machining skills.