STEM CLUBS

NUMBER 1 FOR STEM

A Future STEM

STEM Learning activity resources

SUBJECT LINKS:

STEM careers, PSHE, employability and digital skills.

A Future STEM

STEM Learning activity resources

Introduction

This programme has been created by STEM Learning, the largest provider of STEM education and careers support in the UK. It has been developed with the assistance of Club leaders to support schools implementing the Gatsby Career Benchmarks. Further information on careers, employability skills and the Gatsby Benchmarks is available at: www.stem.org.uk/stem-careers

A Future STEM

There is a world of opportunities in STEM. In this programme, students discover STEM heroes who have made a difference in our lives, think critically about how STEM careers are portrayed in films and TV, and explore different ways to get into a STEM career. With a strong focus on PSHE and careers, students will be able to develop essential skills and recognise their own potential for a future STEM linked career.

Developing Essential Skills

This resource has been linked to the eight essential employability skills mapped out in the Skills Builder Framework: Listening, Presenting, Problem Solving, Creativity, Staying Positive, Aiming High, Leadership and Teamwork. The Skills Builder Partnership has developed an easy to use free support programme that enables teachers and club leaders to support student learning and empowers young people to develop critical skills throughout their learning that will prepare them for college, university and future careers.

Skills Builder Framework:
www.skillsbuilder.org/framework

Key information

AGE RANGE: 11-16

SUBJECT LINKS: STEM careers, PSHE, employability and digital skills

DURATION: A range of activities lasting approximately 60 minutes – roughly 6 hours in total.

FLEXIBILITY: Complete the whole programme over a half term or choose individual activities to suit the needs of your club. These activities are also suitable for use in curricular lessons.

RESOURCES: Each activity includes a list of the resources required and a comprehensive set of club leader and student notes.

ESSENTIAL SKILLS: Age-appropriate essential skills have been identified which can be enhanced through these activities.

IMPACT MEASUREMENT: Each set of resources is designed to help evaluate and assess the progress of Club members. A free student assessment toolkit can be requested from: STEMclubs@stem.org.uk.

ACHIEVEMENT: Students can be rewarded for successfully completing activities by downloading free STEM Clubs certificates from https://www.stem.org.uk/stem-clubs/impact-and-recognition/stem-club-certificates. Students may be able to use these resources to work towards a CREST Award.

APPROPRIATE VENUES: Club leaders can run most activities in general spaces e.g. classrooms, halls, and outdoor areas. Some activities need to be conducted in labs and workshops – these are marked clearly in the Club leader guide and in the table below.

SAFETY: Each activity includes details about health and safety considerations. Club Leaders should ensure that all equipment is handled with care, particularly sharp instruments. Advice and guidelines are available from CLEAPSS and SSERC. We recommend that practical activities are risk assessed before commencing and Club Leaders should follow their employer or organisation's policies.

OTHER ACTIVITIES: Discover other exciting STEM Club activities: https://www.stem.org.uk/stem-clubs/activity-sets#secondary

STEM CLUB SUPPORT: Find lots of ideas, support, training and advice at: https://www.stem.org.uk/stem-clubs

Activities

STEM CLUBS · NUMBER 1 FOR STEM

A Future STEM

1 STEM Heroes

Objective

Students will look at how some STEM heroes have made discoveries and invented technologies that have changed our lives for the better.

TOPIC LINKS
🔗 STEM careers

ESSENTIAL SKILLS SUPPORTED
Listening, presenting, aiming high, teamwork

TIME
⏰ 60 minutes

RESOURCES AND PREPARATION
- Internet access
- STEM hero photo cards and info sheets based on the links below

Incorporating Digital Skills

Consider:
- **Use internet for research into STEM Heroes and new technologies.**
- **Use of PowerPoint to present research.**

HEALTH AND SAFETY:
No issues so long as safe internet usage is observed.

DELIVERY

1 Start with some photos of our STEM heroes. Ask students to think about what each one might be famous for.

Helen Sharman https://en.wikipedia.org/wiki/Helen_Sharman - first British astronaut and first woman to visit the Mir space station

Claudia Alexander https://www.space.com/30006-claudia-alexander-nasa-jupiter-mission-obituary.html - guided the Gallileo space mission

Stephen Hawking https://en.wikipedia.org/wiki/Stephen_Hawking - theoretical physicist Researched black holes.

Tim Berners Lee https://en.wikipedia.org/wiki/Tim_Berners-Lee - inventor of the early version of the internet

Alan Turing https://en.wikipedia.org/wiki/Alan_Turing - computer scientist and codebreaker

Elon Musk https://en.wikipedia.org/wiki/Elon_Musk - engineer and entrepreneur

Dr Ayub Ommaya https://en.wikipedia.org/wiki/Ayub_Ommaya#Many_firsts - developed chemotherapy methods

Larry Page https://en.wikipedia.org/wiki/Larry_Page - wrote the algorithm that powers Google

Jocelyn Bell Burnell https://en.wikipedia.org/wiki/Jocelyn_Bell_Burnell - astrophysicist who discovered radio pulsars

Sarah Gilbert https://en.wikipedia.org/wiki/Sarah_Gilbert - British vaccinologist who is Saïd Professor of Vaccinology at the University of Oxford who led the development and testing of the universal flu vaccine

2 Have some match up cards with a brief history of each STEM hero's achievement. They should be anonymised so it's not an easy match up. Ask students to match up each photo with each resume. Ask them to justify why they think that.

3 Further STEM profiles can be downloaded here: https://www.thebigbangfair.co.uk/stemheroes

4 Ask students to think about how each STEM hero might have impacted directly or indirectly on their lives. Extend this with some deeper thinking around the difference that these technologies have made to society. You are looking at the difference STEM Heroes make, then at what makes them different – if anything, because we all can be a STEM hero!

SECOND ACTIVITY

You're going to discuss the impact of new technologies with the students.

Two choices:

1 Driverless trucks. https://www.youtube.com/watch?v=Qs69m9T-4Rk

2 Mission to Mars https://www.youtube.com/watch?v=zSv0Y7qrzQM

Show either (or both) and ask students to consider the following questions: Why was it invented? How will it work? What will the knock on effects of it be to the world if it is successful? You want to encourage links to positives; more free time, safer roads, new worlds being open up as well as negatives; autonomous vehicles/robots taking our jobs, energy crisis, planet Earth in terminal decline etc.

Ask students to carry out some brief research then carry out a SWOT analysis of one of the new technologies. They should consider Strengths, Weaknesses, Opportunities and Threats especially in relation to the impact on humans.

DIFFERENTIATION IDEAS

Support: give the students more detail on each STEM hero profile at an early stage. Ask the students to think of the pros and cons rather than a SWOT analysis of the STEM development.

Challenge: ask students to research independently to find STEM superheroes from within 50 miles of their home and to present back to the group. Ask students to consider diversity in STEM and how this reflects on current attitudes. How would they like to see this change?

EXTENSION IDEAS

1 Consider Boston Dynamics and the use of robots in civil policing or warfare. What are the risks of Artificial intelligence if humans lose control over it? https://www.youtube.com/watch?v=rVlhMGQgDkY

Idea!

Invite a STEM Ambassador to give a presentation about innovation - how do new ideas, methods and products come about?

A Future STEM

1 STEM Heroes

Briefing

How many STEM heroes would you recognise? How many of them have impacted on your life and how will they change your future?

WHAT YOU NEED TO DO

First activity

1. Have a look at the photos your teacher will show you. Do you recognise any of them? Do you know why they are a STEM hero? Can you explain their most important developments?

2. Now look at the profiles your teacher will give you - match them up to each STEM hero photograph. Can you explain why you think that? Can you judge what someone's amazing achievements are just by looking at them?

3. If you have time, go to the Big Bang website (your teacher has the link) to look at a range of other STEM heroes.

4. Choose a few of the STEM heroes whose amazing discovery or development has had a **direct impact** on how you live today. Are there any who might have **impacted indirectly** on your life? How have their ideas changed society as we know it?

5. What makes these people different to you? Anything? What amazing ideas might you have that could change the world? **Could you be a STEM hero?**

Second activity

1. The future is exciting and one day soon you will be sat in a driverless vehicle, having parcels delivered by drone and with wars being fought by robot soldiers alongside human soldiers.

2. How will this change your life? Are you happy with the changes - will they make your life easier and more efficient? Or do you worry that if robots start to take human jobs, then mass unemployment could be a real problem in the future?

3. Watch the clips your teacher will show you then start to discuss and think about the future will be different if these technologies become mainstream.

4. You're going to carry out a SWOT analysis so you're looking for the:

   Strengths - how could this change your life for the better?
   Weaknesses - what are the problems with the current visions for future tech?
   Opportunities - how else could we benefit from these tech advances?
   Threats - how could this be harmful to the human race in the future?

5. Get your ideas down on paper and be ready to present them back to your group.

FUN FACTS
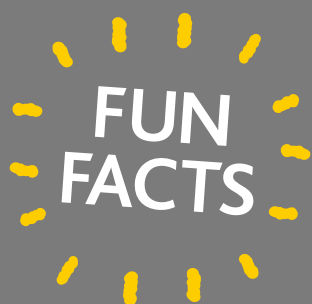
1. If you move to Mars your weight will fall dramatically since Mars has less gravity than Earth, you would weigh 62% less than you do here on our home planet!

2. Google's self-driving car has had only 13 minor accidents in more than 1.8 million miles of autonomous and manual driving — not once was the self-driving car the cause of the accident!

3. As some jobs disappear with more AI and automation, other jobs will be created. Ever fancied being a 'Data Detective' or a 'Genomic portfolio Director'? Google them and look at what they are!

STEM CLUBS

NUMBER 1 FOR STEM

A Future STEM

2 STEM Stereotypes

Incorporating Digital Skills

Consider:

- Students could use internet access to research their given character and movie.
- Share selected trailers or clips that students find.

TIPS

- This activity is a good way to help students identify and challenge unhelpful stereotypes about women, BAME people and people with disabilities in STEM, using movie and TV portrayals to highlight wider issues.

Objective

Students consider some famous inventors, engineers, scientists or computing experts from the movies. They identify what's good, bad and interesting about these people and explore what the movies have to say – good and bad – about people in STEM.

HEALTH AND SAFETY:
No issues so long as safe internet usage is observed.

TOPIC LINKS
🔗 PSHE, STEM Careers

ESSENTIAL SKILLS SUPPORTED
Listening, creativity, teamwork

TIME
⏰ 60 minutes

RESOURCES AND PREPARATION
- Large paper and pens
- You may wish to prepare other movies and characters instead of those suggested

Idea! 💡
Invite a panel of STEM Ambassadors in to discuss how their STEM specialism is portrayed in the media.

DELIVERY

1. Give students two minutes to list as many movies as they can name with a STEM theme or STEM characters like designers, engineers, programmers, scientists or mathematicians. Share ideas and make a list.

2. Ask students to discuss in small groups how a typical STEM character, e.g. 'scientist' or 'computer genius' might look, sound and act in a movie. Share ideas and identify helpful and unhelpful aspects. Explain that movies can tell us a lot about how society views STEM careers.

3. Ask students whether they had noticed that most STEM characters in films were white, male and able-bodied. Could they think of any who didn't fit this stereotype?

4. Assist students as they work through the student sheet.

5. Share each group's thoughts, identify what students think are the best and worst portrayals of STEM-related characters. Highlight diversity again here.

6. Highlight that students may become ambassadors for STEM and set examples for the next generation of school students. How would they like to be remembered after a visit to a school?

EXTENSION IDEAS

1. Students use the internet to find out more about each movie and character.

2. Students could research more movies that explore aspects of STEM, including classics from the past. How are the portrayals different?

3. Students could edit clips together under 'fair use' and add their own interviews, delivery to camera and voiceovers, to create a short documentary exploring how STEM is portrayed in the movies.

DIFFERENTIATION IDEAS

Support: focus on fewer characters, for example Mark Watney and Jillian Holzman.

Challenge: ask students to create a 'STEM charter' for film-makers, which lists key things to do and avoid in order to present STEM characters in a positive way. Include a discussion about some of the themes and ideas about the future we tend to see in films with strong STEM content. Are these positive, negative, hopeful? Is STEM being used for good or for personal enrichment or evil?

How are women in STEM portrayed? Other than those given, can you think of any BAME or disabled STEM role models in TV or film?

USEFUL LINKS

🔗 IMDb, Wikipedia and YouTube are all good sources of plot details, trailers, character information and clips for student research and to share during the session.

🔗 Top STEM movies
www.learningliftoff.com/hollywoods-top-stem-movies/

A Future STEM

2 STEM Stereotypes

Briefing

What do the movies have to say – good and bad – about people in STEM careers?

YOUR TASK

Discuss and present back your ideas about how a film portrays a character with a STEM career.

WHAT YOU NEED TO DO

1 Choose one character and film from the list below, or use your own idea.

Clarissa Mullery – Silent Witness
Clarissa is the forensic examiner that the investigators rely on to solve the crimes.

Emmett Brown – Back to the Future
An inventor, Emmett creates the DeLorean car-based time machine.

Tony Stark – Iron Man
An engineering genius, Tony creates the Iron Man suit.

Amelia Brand – Interstellar
A botanist, Amelia is the chief scientist on the expedition through the wormhole.

Mark Watney – The Martian
Mark is a botanist who is part of the Ares III team, presumed dead after a violent storm on Mars. Watney is forced to use his ingenuity and wit to survive until he can be rescued.

Q – Skyfall
MI6's tech expert, Q hacks Silva's laptop but lets it take over MI6's servers.

Ryan Stone – Gravity
Ryan is a medical engineer who must get back to Earth from the ruined ISS.

Bruce Banner – Avengers
A nuclear physicist, Bruce is turned into the Hulk by the Gamma Bomb test.

Jillian Holtzman – Ghostbusters (2016)
A nuclear engineer, Jillian started Ghostbusters.

Grace Augustine – Avatar
An expert on plants from other planets, Grace runs the avatar programme.

Shuri – Black Panther
Shuri is the tech genius that runs the innovations lab and creates the amazing crime fighting tech.

2 Using a mind map explore the following questions about your character:

a. What role does the character play in the film or show's plot?
b. What's good or helpful about the character's look, personality and role in the film?
c. What's negative or unhelpful?
d. What do you think this film has to say about people with a STEM background or career?
e. Did you notice that most STEM characters in films were white, male and able-bodied? Other than those above can you think of any who didn't fit this stereotype?

3 If you have extra time, search fandom http://fandom.wikia.com/topics/movies to find out more about the character.

FUN FACTS
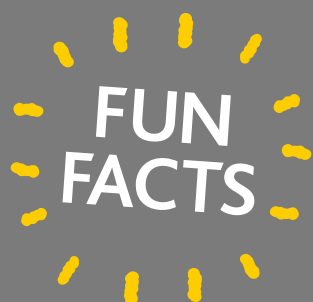
1 'La voyage dans la lune' ('A trip to the moon') was the first science fiction film, made in 1902! You can find it in full on YouTube.

2 Armageddon (1998) is considered by many to be one of the worst ever movies for getting science and technology wrong. It's so bad, NASA were once said to use it in training, to see if trainees could spot the apparent 168 inaccuracies it contains.

3 A page of the Script from 'The Martian' actually travelled on NASA's Orion Space flight!

STEM CLUBS

NUMBER 1 FOR STEM

A Future STEM

3 Careers behind the scenes

TIPS

This is a great way to reinforce that STEM careers can be creative. Use these questions to help students explore each role's career information:

1. What personality type does this role suit?
2. What department is it in?
3. What does this person do?
4. What skills and qualities do they need?
5. What qualifications and experience are necessary?

Objective

Students use internet research to find out about a 'hidden' or unusual career in Design and Technology, Engineering or Computing in the film or TV industries and share their discoveries with their peers in a 'living credits' presentation.

TOPIC LINKS

🔗 PSHE, STEM Careers

ESSENTIAL SKILLS SUPPORTED

Listening, presenting, creativity, teamwork,

TIME

⏰ 60 minutes

RESOURCES AND PREPARATION

- Internet access (if not available, find and print the role information for each job from the web link below)
- You may wish to print or write each career on a card to hand out at random

HEALTH AND SAFETY:

No issues so long as safe internet usage is observed.

DELIVERY

1. Explain that the world of STEM careers is like an iceberg: some are visible, but the majority are hidden from view. In film and TV lots of people with design, engineering and computing careers work in creative roles behind the scenes. And like an iceberg, these roles are really cool!

2. Refer students to https://www.screenskills.com/careers/job-profiles/ to look at a variety of roles within film/TV/theatre.

3. Assist students as they work through the student guide.

4. Get students to take turns reporting back on their role, creating a 'living credits' roll - like at the end of a movie. They can explain what their role is and what it involves.

5. Ask students to say if they have discovered a hidden STEM role of interest to them. You could also hold a vote to find the most popular hidden roles that students have researched.

6. Highlight that there are hidden STEM roles in almost every industry. Discuss and share ideas for how students could find more hidden roles in their preferred area of STEM. Reinforce the importance of staying open to opportunities to find out about hidden STEM careers, for inspiration and to broaden the range of opportunities available when looking for a job.

DIFFERENTIATION IDEAS

Support: Choose a limited number of roles to research. Have the web link or QR code for each role at Creative Skillset ready for students to follow. Use questions to help students report back the right outline information.

Challenge: ask students to find a suitable training course or qualification that can help them enter the career they are researching. Can students identify what school qualifications they might need in order to get a place on this course?

Idea!

Request a STEM Ambassador who can demonstrate a way in which technology is being developed for entertainment, e.g. a games designer or for special effects.

Incorporating Digital Skills

Consider:

- **Internet access (if not available, find and print the role information for each job from the weblink below).**

- **Print each career on a card to hand out at random.**

EXTENSION IDEAS

1. Students could watch the credits from a favourite movie and identify other roles that may have a strong STEM dimension.

2. Students can take on 'real' roles if producing their own video content or helping to produce a school play or musical event.

USEFUL LINKS

🔗 **Internet Movie Database**
www.imdb.com/

🔗 **Creative skillset job roles in the film and TV industries**
https://www.screenskills.com/

🔗 **The Big Bang Fair**
https://www.thebigbangfair.co.uk/careers/careers-quiz/

A Future STEM
3 Careers behind the scenes

Briefing

STEM careers help bring your favourite TV shows, performances and movies to life. These are some great examples of 'hidden' careers: cool STEM jobs you may not know exist. How many more are out there?

YOUR TASK

Research a STEM career in the film and TV industry and report back what you discover.

WHAT YOU NEED TO DO

1. Choose a role from the list below.

2. Use the Creative Skillset https://www.screenskills.com/careers/job-profiles/ to find your role (you'll find many more to explore, as well).

3. Find out some key facts about this role. Each guide explains the personality, skills and qualifications needed.

4. Use these questions to help explore each role's career information:

   a) What personality type does this role suit?

   b) What department is it in?

   c) What does this person do?

   d) What skills and qualities do they need?

   e) What qualifications and experience are necessary?

5. Report back as part of a 'live credits' roll!

Costume designer	Visual effects designer
Director of photography	Matchmover
DCP author	Compositing artist
Makeup artist	Sound designer
Model / prop maker	Caterer
Prosthetics artist	Construction draughtsman
Re-recording mixer	Steadicam operator

FUN FACTS
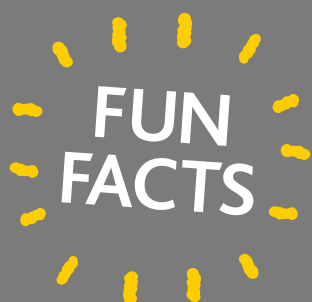
1. The Lumiere brothers were among the first to show moving pictures, with a short film of a train arriving at a station in Paris. People ran away because they thought a real train was coming!

2. 'Green screen' technology is now so common you can even get green screen apps for your phone! But in fact, green screens date back to the 1940s when a scene would be shot twice, with and without a coloured filter, and then composited together one frame at a time.

3. The first computer-generated imagery in a movie was a rendering of a robot cowboy's vision in Westworld (1973).

A Future STEM

4 Get into STEM

TIPS

- Students don't need (and won't have time) to click on every course with the title they are given, but should try a few to explore the range of entry requirements, locations and content. Why not set up your room so it's more like a careers fair?

Objective

Students research a design, engineering, physics, computing or maths course that would provide the education and training for entry into interesting STEM jobs and present their ideas at a 'STEM course fair'.

TOPIC LINKS

🔗 PSHE, STEM Careers

ESSENTIAL SKILLS SUPPORTED

Staying positive, aiming high, leadership

TIME

⏰ 60 minutes

DIFFERENTIATION IDEAS

Support: focus on just one course title to demonstrate how to browse the UCAS website and then visit the provider's own website. Write or project some prompts for students to follow, such as a list of key information to find.

Challenge: ask students to explore several examples of courses that offer entry to students with different entry qualifications, e.g. BTEC or A Level.

HEALTH AND SAFETY:

No issues so long as safe internet usage is observed.

DELIVERY

1. Ask students to suggest some routes into a STEM career. Highlight that options include university study or if appropriate for some of your students, an apprenticeship. Explain that students are going to research one entry option and promote this to the group, to expand everyone's awareness of the wide range of courses and locations on offer. Which course will prove most interesting?

2. Assist students as they work through the student guide.

3. Announce your STEM course fair! Students promote their course: which institutions (or employers, for apprenticeships) offer it, what you might need to get in, some idea of the course content – and why it sounds great! After students have presented, see how many students would be interested in each course on offer. Which is the most popular, and why?

4. Emphasise that this is just a taster of the range of courses and locations on offer. There's lots more to design, engineering, physics, computing or maths than just these courses!

5. Encourage students to continue to explore what training is on offer - this helps them plan to study the right A Levels, BTEC or apprenticeship that will enable entry to the higher level courses of interest to them.

EXTENSION IDEAS

1. Use case studies of real ex-students who have passed through the school. E.g. Jane was into engineering and maths but didn't want to go to university – what were her options? Let them explore and come up with ideas then tell them what Jane actually went on to do. Invite ex-pupils in to talk to students about routes to careers.

2. Students can register at each site to store any search results of interest. However, students should take care when registering as they may in the future wish to use the sites to plan and manage their real applications, so should take care to get their personal information correct and to create usernames and passwords they will remember.

3. Students could create posters to display a range of course opportunities around your biology and chemistry labs.

Idea! 💡

Invite STEM Ambassadors in to talk about their career pathway. Where possible include graduates, apprentices and STEM entrepreneurs.

USEFUL LINKS

🔗 **UCAS course search**
https://digital.ucas.com/search

🔗 **Find an apprenticeship**
www.gov.uk/apply-apprenticeship (click on 'Search the find an apprenticeship service', then on the 'browse' tab)

A Future STEM

4 Get into STEM

Briefing

Interested in design, engineering, physics, computing or maths? There are loads of university courses, and apprenticeships you might be interested in.

YOUR TASK Research a design, engineering, physics, computing or maths related course and promote where you can study, how to get in, and what you might learn. How many people can you persuade?

WHAT YOU NEED TO DO

1. Carry out some research in order to choose whether you want to start a university course or an apprenticeship.

2. For degree courses, go to https://digital.ucas.com/search. Once you find courses, click on 'view' to read an overview, and then on the link to the provider's own website to find out more.

3. For apprenticeships, go to www.findapprenticeship.service. gov.uk/apprenticeshipsearch. Click on 'Search the find an apprenticeship service', then on the 'browse' tab, where you'll find categories for engineering, sciences, IT and other STEM areas.

4. Note some examples of where you can study and the entry requirements for universities and the study and work required by employers for apprenticeships (especially if these differ between providers), include interesting details about the course content or job roles.

5. Share what you discover at your group's 'STEM course fair'! How many students can you persuade to find out more?

6. It's never too early to begin thinking about your future career. What subjects do you need to study? What grades do you need to make your future happen? Think about what you can do now to give yourself the best chance at your STEM future!

FUN FACTS
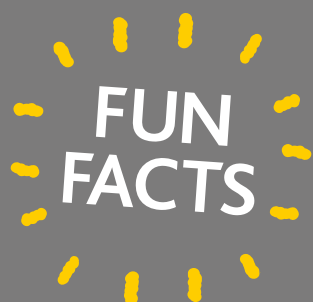
1. According to the Engineering UK 2018 report, engineering contributes 26% of the UK's economic performance as measured by its Gross Domestic Product (GDP)...

2. The UK Commission for Employment & Skills says that 43% of STEM vacancies are hard to fill because of a shortage of applicants with the right skills and experience.

3. From the same report – STEM graduates earn more than 20% more than graduates without a STEM related degree! Kerrching!

A Future STEM

4 Get into STEM

COURSE TITLES AND SUBJECT AREAS

Product design

Industrial design

Digital design

Animation

Architectural design

Design engineering

Medical engineering

Petroleum engineering

Energy engineering

Computer engineering

Biomedical engineering

Aerospace engineering

Data analysis

Systems development

Statistical computing

Forensic computing

Medical computing

Network engineering

Network security

Game development

Applied Biology

Chemistry

Pharmacology

Biophysics

Geophysics

Astrophysics / cosmology

Physics and philosophy

Nuclear physics

Particle physics

Earth science

Geology

Palaeontology / palaeobiology

Mathematics and statistics

Mathematics and economics / finance

Mathematics and psychology

Computing mathematics

Engineering mathematics

Data science

CLUB LEADER GUIDE: SUITABLE FOR AGE 11-16

A Future STEM

5 Save the world with STEM!

TIPS

- Students can build on their skill examples from 'Survival teams'. If you don't have internet access, omit researching more about each role. Link your delivery to your school's wider employability and careers preparation programme. You may wish to project the explanation or description of each skill you use in your own programme.

Objective

Students research a STEM job that might help humanity survive a future catastrophe and describe how their skills make them a great choice for that role.

TOPIC LINKS
🔗 PSHE, STEM Careers

ESSENTIAL SKILLS SUPPORTED
Listening, presenting, problem solving, creativity

TIME
⏰ 60 minutes

RESOURCES AND PREPARATION
- Paper and pens
- Job outlines on the student guide (you could also create additional job descriptions of your own that include other STEM sectors)

Idea! 💡
Invite a STEM Ambassador to be on the panel have them give feedback to each candidate.

HEALTH AND SAFETY:
No issues so long as safe internet usage is observed.

DELIVERY

1. Explain that this activity will help students explore some of the skills that underpin successful STEM careers.

2. Introduce a fictitious calamity, like a zombie outbreak, or ask students to suggest a big challenge facing humanity.

3. Students should name some real STEM careers that might be able to help. Discuss the contribution each career might make and ask students to name some specific employability skills that would be required.

4. Review the student guide. Students choose one role or assign roles at random.

5. Students research their job title online and reflect on how they demonstrate each skill.

6. Invite students to share their responses by reading them out or in a role-played interview to observe. The world is at stake, so it's vital they communicate their skills as best they can! Optionally, choose the 'best' student for each role.

7. Highlight the importance of being able to describe skills and personal qualities at every stage of a job application, from cover letter to interview. Convene a 'World Council' or intergovernmental panel to review students' 'applications' and select the best team to save the world. Students take turns to share their responses with the group. Invite students to highlight the best part of each student's response. Optionally, ask students to select the best responses, justifying their choices.

EXTENSION IDEAS

1. Ask students to take turns to share their ideas with a partner and suggest ways they could improve their 'pitch'.

2. Invite some other adults to form a 'World Council' to listen to students. This could include staff, governors or local STEM ambassadors.

3. Students could research additional roles that they think could help to save the world, and share what they discover.

4. Link to activities in your wider careers and employability programme, including drafting cover letters and application forms, and mock interviews.

USEFUL LINKS
🔗 STEM Learning secondary careers toolkit
www.stem.org.uk/resources/elibrary/resource/103814/stem-careers-toolkit-secondary-stem-careers-toolkit

DIFFERENTIATION IDEAS

Support: before students begin, choose one role to discuss as a group and then model a response together, organising your ideas in a simple table with a row for each skill. Ask students to describe fewer skills according to ability and time available.

Challenge: students can use the STAR model to describe examples of how they can demonstrate each skill, listing the Situation they were in, the Task they had to complete, the Actions they took that used this skill, and the Response that showed they had been effective.

A Future STEM

5 Save the world with STEM!

Briefing

Whether it's a zombie outbreak, an asteroid impact or a real challenge like climate change or food security, STEM roles and skills will help save us all. Can you convince others that you're the right person for the job?

YOUR TASK **Choose a world-saving STEM career and prove you've got the skills to save the world.**

WHAT YOU NEED TO DO

1 Choose one role below. If you have internet access, find out more about it.

Biochemist Biochemists could investigate the chemical processes inside a zombie and help create a defence.	**Plant biologist** Plant biologists could identify new crops to grow where climate change has changed the environment.	**Tropical disease doctor** Tropical disease doctors could help diagnose and treat new illnesses and infections.
Environmental engineer Environmental engineers could protect the environment and human populations from changes to our climate.	**Pharmacologist** Pharmacologists could create new drugs to help eradicate disease.	**Chemical engineer** Chemical engineers could develop new ways to turn raw materials into useful substances and limit our impacts on the environment.

2 Reflect on how you can demonstrate you have each skill below. What have you done at school, in a sport or hobby, or in another part of your life, that demonstrates you've got these six STEM skills?
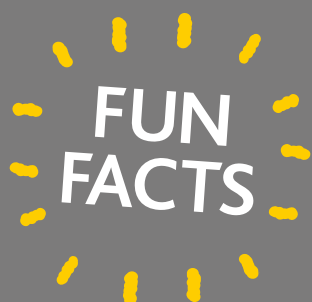
Communication

Application of Maths

IT and Computing

Improving own learning and performance

Working with others

Problem solving

3 It's time to apply for your chosen role. Remember, the world is at stake, so communicate your skills and passion as best you can. Sell yourself by explaining how your chosen role and skills would save the world!

FUN FACTS

1 The number of jobs in STEM careers is growing faster than jobs in other career areas.

2 However, there's a shortfall: there aren't enough people, especially women, with the STEM skills and qualifications to meet demand.

3 There are loads of ways to get into a STEM career, from an apprenticeship to a degree or postgraduate qualification. What career – and route – would suit you?

STEM CLUBS

NUMBER 1 FOR STEM

A Future STEM

6 Meet a STEM Ambassador

Incorporating Digital Skills

Consider:

- **Using Teams, Zoom or similar software to communicate with the STEM Ambassador.**
- **Record the interview, digital edit it and make available on the school digital platform to showcase content and increase careers awareness.**

Objective

Students plan to meet a STEM ambassador or ex-student who has gone on to a STEM career. Students label a simple silhouette with the personal qualities that might underpin a successful STEM career, or use sticky notes to label a real person.

TOPIC LINKS

🔗 PSHE, STEM Careers

ESSENTIAL SKILLS SUPPORTED

Listening, presenting, aiming high, teamwork

TIME

⏰ 90 minutes including meeting

RESOURCES AND PREPARATION

- Request a STEM Ambassador to attend the session (see top tip)
- Copy or print the student guide onto A3 paper, and use large sheets of paper off a roll to allow students to draw and label a life-size silhouette, or use sticky notes.
- Marker pens
- https://www.stem.org. uk/resources/elibrary/ resource/267373/stem-ambassadors-making-impact
  It's worth reading this report to look at the motivations of STEM ambassadors.

HEALTH AND SAFETY:

Remind students to be respectful and considerate towards the STEM Ambassador and of each other.

Ensure safe Internet usage is observed.

DELIVERY

Qualities and Skills session – 30 mins

1. Ask groups to plan an interview/meeting with an amazing STEM Ambassador – a real STEM hero, in fact, who has inspired students by being a role model for the kind of person they would like to become. What personal qualities would that person have?

2. Optionally, discuss the difference between a skill and a personal quality and identify one example of each. Share ideas. Suggest that one way to distinguish the two is that a skill is something a person can learn to do, while a personal quality is a characteristic or natural ability.

3. Review the student guide and if you are using, hand out large sheets of paper or sticky notes. Groups complete and label their silhouette with their STEM hero's personal qualities, or affix sticky notes to one of the group. Groups might wish to give their person a name and STEM career, to help bring them to life. You may wish to use an ex-student who has gone on to a STEM career.

4. Groups extend their ideas by adding to each quality one or examples that might illustrate how this person exhibits this quality.

5. Give groups time to present their ideas. Create a top five (or 10) list of personal qualities, based on what each group suggests.

6. Encourage students to use these qualities during their study and to develop the good habits that will help their own careers.

Planning for the interview session – 30–45 mins

1. Students need to think about what questions they might ask. General questions such as:

   a. What do you do, who do you work for and what does the company do?

   b. What education/training did you have before taking this role?

   c. How helpful was it in getting you the role and supporting you in the role?

TIPS

- **Personal qualities might include: attention to detail, courage, creative, curiosity, determination, focus, hardworking, humility, initiative, integrity, logic, methodical, organised, practical, patient, versatile.**

- **Book a STEM Ambassador well in advance as this will maximise interest and increase the chance of a STEM Ambassador being available. Find out how to request one at: https://www.stem.org.uk/stem-ambassadors/find-a-stem-ambassador**

d. Are there any other experiences – work or non-work related – that have supported your career?

e. If you could go back in time would you do anything differently in preparation for this career path?

f. What would you look for if you were recruiting for this post?

g. Are there any journals or career related web sites you think would be helpful in learning about this role?

h. Is volunteering a good way to gain experience that would be recognised at an interview?

i. What happened at your job interview? What should I expect?

j. What qualifications do you feel are important for your role?

k. What personal qualities do you need to succeed in this role?

l. When and how did you apply for this role?

2 Students can research the role of the person they will be meeting and come up with more specific questions about that role.

3 Students should then prepare these on a sheet with space for them to write down answers.

The interview session - 30–45 mins

1 The STEM ambassador should give a 5-minute description of their role. A practical demo would be good if applicable, or maybe they could bring interesting items related to their role.

2 Students can then use their pre-prepared questions to form the basis of a conversation with the ambassador.

3 Ideally the ambassador can return to lead or take part in a hands-on practical activity with the students.

EXTENSION IDEAS

1 Ask students to turn their ideas into posters or a vox pops video to share.

2 Ask students to reflect on how well they show each personal quality and plan some actions they might take or opportunities (in and out of school) they could enjoy, which will develop these qualities.

3 Students can visit careers and job sites to research STEM careers and identify the personal qualities that are included in job descriptions and person specifications.

4 Link to activities in your wider careers and employability programme, including drafting cover letters and application forms, and mock interviews.

5 Ask students to research specific job task for their ambassador eg - mass spectrometry for an analytical chemist.

DIFFERENTIATION IDEAS

Support: write the personal qualities above on cards and distribute to groups. Play a 'blockbusters' game to identify each one: 'what 'A' helps someone focus on the little things?' Draw one large silhouette on paper, or ask for a volunteer to use with sticky notes, and complete the activity as a group.

Provide the list of general questions on cards and share them out to students to ask.

Challenge: can students create a more complete alphabet of positive personal qualities (excluding positive but vague terms like 'brilliant'!). Students extend their ideas more fully with examples and how the quality can contribute to success in a STEM career.

With enough preparation, students can carry out detailed research into the company and role the ambassador works for. These can then contribute to a more in-depth interview about the STEM role.

A Future STEM

6 Meet a STEM Ambassador

Briefing

OK, so you're going to meet a real-life STEM ambassador – what do you know about their job or how they got to be in the job they do? How could you find out?

Imagine you're standing with a STEM hero: someone who really inspires you and is a role model for you. What would she or he be like? What personal qualities might you notice?

YOUR TASK Create your own STEM hero with the personal qualities that inspire you, then prepare for an important interview with a STEM practitioner.

WHAT YOU NEED TO DO

What are the qualities and skills needed?

1 Use a silhouette, or use sticky notes to label a friend.

2 Give your hero a name, and if you want, a job title, to bring them to life.

3 Around (or on) your STEM hero, write down the positive personal qualities you think they would have, which help them in their STEM career.

4 Around each quality, write some examples that might show how this person shows or uses it. Think of as many ideas as you can! You might wish to split up and think about one quality each, and then swap to add more ideas to each one.

5 Present your STEM hero and explain the personal qualities you've chosen.

6 Create a list of the top five (or 10) personal qualities, based on what each group suggests.

Think about your own personal qualities. How many of these do you show? What steps could you take to cultivate each one and help your own STEM career?

FUN FACTS
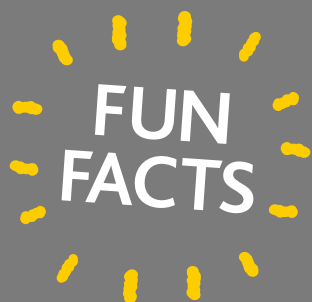
1 Personal qualities like the ones you listed are like muscles: the more you use them, the stronger they become!

2 What you could do each day to strengthen your own personal qualities?

3 In 2018 only 22% of the STEM workforce was female – but this represented an increase on the year before!

A Future STEM
6 Meet a STEM Ambassador

Prepare for the interview

Have you ever had an interview, maybe for college or a part-time job? What did they ask you? Why were they asking certain questions? What were the interviewers trying to find out? If you haven't been to an interview yourself, think of what you've heard from friends or family members, or what you've seen online or on TV.

You need to plan a series of questions to find out from your STEM ambassador:

1. How did they get into the role?

2. What qualifications did they need?

3. What personal qualities help in their role?

4. What do they 'actually' do?

5. How do they think their job makes a difference?

Your teacher can support you to write a series of questions to ask your STEM ambassador. Prepare a response sheet so you are organised and ready for your interview.

If you know exactly who is visiting you, do some detailed research about their role so you can ask some technical questions. They will be impressed that you have taken the time to find out about their job!

The interview session

The STEM ambassador visiting your school might be nervous so be sure to make them feel welcome – be friendly, make them a cuppa (not in the lab!) and smile!

Take turns to ask questions with you fellow students and write down their responses in brief details on your sheet. Remember to maintain eye contact and be friendly!

If the session goes well, why not invite them back to work with you on a practical project that's linked to their job?

A Future STEM

7 Get CREST Discovery Awards

By completing all six activities in this resource pack, your STEM Club members can get a CREST Discovery Award.

ABOUT CREST

CREST is a scheme that inspires young people to think and behave like scientists and engineers. It is student-led, flexible and trusted. CREST helps young people become independent and reflective learners. With no set timetable, projects can start whenever you want, and take as long as you need.

HOW TO GET YOUR CREST DISCOVERY AWARDS

It's easy to get your members' Discovery Awards, simply:

1. 🔗 Sign-up for a free account - https://my.crestawards.org/
2. Have each member complete a CREST Awards Discovery Passport
3. Create a project eg. "How do they make movies", "Movie music" or "Witchcraft and wizardry"
4. Upload names
5. Upload two or three passports and any accompanying work
6. Assess individuals, have they:
   a. Completed around five hours of work on the project?
   b. Participated fully in the project?
   c. Reflected on their learning?
7. Type in your delivery and payment details.

TAKING THEIR WORK FURTHER

If members want to take activities further, they can work towards a CREST Bronze or Silver Award.

CREST Bronze Awards require around ten hours of enquiry, project-based work, and Silver Awards require thirty hours of work at GCSE or equivalent standard. Using one of the activities for inspiration, they choose a question or topic to investigate.

Guidance on how to run CREST Bronze and Silver Award projects is available on the CREST Awards website 🔗 www.crestawards.org.

A Future STEM
8 The Skills Builder Framework

Skills Builder
FRAMEWORK

The Activities and Employability Skills

Each activity within this resource pack has identified the essential employability skills it supports and develops in students.

These skills have been mapped to the essential skills identified by the Skills Builder Framework, which breaks down eight essential skills into 16 teachable and measurable steps. Club leaders and teachers can use the activities to promote good practice and enhance each student's individual learning curve. Helping to promote transferable skills key to their education and future employment.

ABOUT THE SKILLS BUILDER PARTNERSHIP

The Skills Builder Partnership brings together educators, employers and skills-building organisations around a common approach to building eight essential skills. Their programmes include training and resources, supporting schools and colleges to embed a rigorous approach to building skills and achieve the Gatsby Benchmarks. As an individual teacher or Club leader, you can freely access a suite of online teaching tools and resources, designed by their team of teachers to build essential skills. The suite includes learning activities, supporting videos, classroom resources, assessment tools and the Skills Builder Framework, which you can use in STEM clubs and classroom teaching.

THE SKILLS BUILDER FRAMEWORK

The Skills Builder Framework breaks down eight essential skills into 16 teachable and measurable steps, providing a common set of expectations and a roadmap for progression. Step 0 is for the least experienced learners and Step 15 represents a highly skilled adult. The Framework can be used by teachers and Club leaders to talk to students about their skill strengths and areas for development and is a useful tool for framing conversations about careers and employability. Focusing student learning through the Framework, enables students to recognise their own essential skill levels and work to master them over time. The Framework can provide a language for students to articulate this progress to helping to develop employability skills and prepare students for future careers.

Skills Builder also provide multiple online assessment tools, including a student self-assessment, student-by-student teacher assessment and class-level formative assessment through the Skills Builder Hub. This means that programmes can be differentiated and focused to meet individual needs.

A Future STEM

8 The Skills Builder Framework

EIGHT ESSENTIAL SKILLS

The eight essential skills broadly break down into four domains we know both teachers and employers value.

Communication

1. Listening – ability to listen and understand information.
2. Speaking - vocal communication of information or ideas.

Creative Problem solving

3. Problem Solving – ability to find a solution to a complex situation or challenge.
4. Creativity – use of imagination and the generation of new ideas.

Self-Management

5. Staying Positive – ability to use tactics to overcome setbacks and achieve goals.
6. Aiming High – ability to set clear, tangible goals and devise a robust route to achieving them.

Inter-personal

7. Leadership – supporting, encouraging and motivating others to achieve a shared goal.
8. Teamwork – working cooperatively with others towards achieving a shared goal.

You can find out more about essential skills and the Framework on the Skills Builder website, https://www.skillsbuilder.org/framework and you can access resources on the Skills Builder Hub https://www.skillsbuilder.org/hub

You can find additional support and information on careers and employability skills on the STEM Learning Careers pages, https://www.stem.org.uk/stem-careers. You can also download the free Skills Builder toolkit from the STEM Learning website https://www.stem.org.uk/rxfum6

A Future STEM
8 Digital Skills

UNDERSTANDING DIGITAL SKILLS

Digital Skills are the product of digital literacy that we are all emersed in, especially within educational settings. The rapid use of digital technologies over the last 10-15 years have impacted the way we live our lives within a modern technological society.

Within this STEM Club activity, they are vast opportunities to utilize Digital Skills, which will have been taught already within the schools curricula. It's important that the use of digital skills is not meant to replace traditional methods; but enhance and further develop your students STEM learning future.

Digital skills can be grouped, recognised and celebrated.

Cross Curricula Baseline Digital Skills	Computing curriculum baseline digital literacy	Computing curriculum specific skill	D&T/Engineering specific digital skills	Science specific digital skills	Maths specific digital skills
Communication tools	Safe technology use	Digital media	Digital design (CAD)	Modelling and simulation	Modelling
Presentation	Evaluative skills	Programming	Programmable embedded systems	Sensor-enabled data collection	Data analysis / data science
Word processing and DTP	Moral, ethical and lawful behaviour	Applied knowledge of systems and networks	Digital manufacturing (CAM)	Data analysis, inference and communication	Calculation
Data handling		Modelling and simulation		Digitally enabled explanation	Graphing
Devices, tools and applications		Software development			Dynamic geometry
Productivity and task management		Data manipulation			
		Cyber security			

EXAMPLES OF USE

When conducting experiments, recording results in Excel makes it easier to present those results in a graph. This is a good example of Cross Curricula Baseline Digital Skills. Within a design and making opportunity, it would be fantastic to develop this design using 3D Computer Aided Design (CAD) and outputting on Computer Assisted manufacturing (CAM) and Rapid Prototyping (RP) such as 3D Printing. This is obviously D&T/Engineering specific digital skills.

Within the guides opportunities are signposted, these aren't the extensive list. You may find alternative Digital Skill provision. Remember you know your pupils and what equipment and skillsets staff are equipped with. This could be a great opportunity to investigate staff CPD.
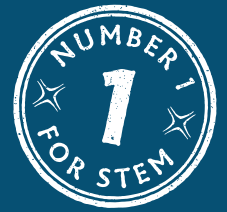
STEM Clubs Programme, led by STEM Learning

Achieving world-leading STEM education
for all young people across the UK.

For more information on the
programmes and publications
available from STEM Learning,
visit our website **www.stem.org.uk**