A step-by-step guide to running successful Clubs related to science, technology, engineering and mathematics (STEM)

This guide is for:

- **Clubs** based in primary schools, secondary schools, youth groups, FE colleges and sixth form colleges as well as other settings
- **STEM**, science, design and technology, mathematics, engineering and computing Clubs, and other STEM Clubs
- **Leaders** setting up new Clubs, and those seeking to enhance existing Clubs
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Benefits of running a STEM Club

Clubs can be a powerful and enjoyable way to engage young people with STEM (science, technology, engineering and mathematics) subjects, and deliver a wide range of benefits. They can ignite a new interest in STEM subjects for some and provide a platform for others to extend their learning. They can give a deeper understanding, offer real-world experiences and suggest different ways to learn and engage in STEM subjects. Most importantly, they are fun and exciting and allow all involved to explore STEM subjects in imaginative and inventive ways.

STEM educators

There are proven benefits for those involved in running a STEM Club, from enriching subject knowledge to enhancing and revitalising teaching skills. Club leaders gain increased confidence and enthusiasm in their ability to teach STEM subjects in new and exciting ways. A Club leader can help students relate to STEM subjects by using real-world contexts and role models which can improve engagement with future employers. Involvement in STEM Clubs benefits both the individual and their organisation, helping with career progression, improving leadership and management skills.

Students

Any student involved in a STEM Club has the potential to improve their confidence, learning and understanding of STEM subjects, which increases skill sets and levels of attainment. Through their enjoyment and enthusiasm in taking part in Club activities students can challenge their abilities and learn more about STEM subjects and the influence they can have on their life and the world around them. Participation in a STEM Club helps students realise that STEM subjects can be for them, increasing their confidence and overall employability skills.

STEM employers

Employers can greatly benefit from STEM Clubs, not only through direct involvement, supporting a Club or releasing staff to be STEM Ambassadors, but also through the improved skill sets of both current and future employees. The potential workforce of skilled and knowledgeable employees can be increased, as they will have enhanced desirable skills as well as a much wider knowledge of STEM subjects and their place in society. STEM Clubs help to close gender representation issues, with students feeling confident in their abilities and excelling in their chosen career.

Primary schools

STEM Clubs for primary-aged children can stimulate pupils’ excitement about STEM subjects at a formative age and prepare them for next steps at secondary level. They can support pupil attainment, helping them to learn about group and independent working whilst boosting key skills and confidence levels.
Introduction

Secondary schools

STEM Clubs offer an opportunity to excite students about STEM subjects, as well as developing practical, teamwork and leadership skills that will support their classroom learning and boost their employability skills. They allow students a rare opportunity to direct their own learning and explore their own interests with teacher support. They are also a chance to give them an insight into STEM-related careers.

FE and sixth form colleges

FE and sixth form colleges often have extra resources and technological facilities available to them. In conjunction with the academic courses offered, running a STEM Club can benefit students in their applications to onward higher education courses and enable them to get real insights into different industries. Clubs in these settings have a unique opportunity to strengthen links between education and industry and can benefit from involvement by STEM Ambassadors.

Youth groups

Community groups are a great opportunity for young people to develop an appreciation of STEM subjects, particularly those from disadvantaged backgrounds who might be challenging to involve within a mainstream school setting. Opportunities outside of school also enable young people to see more of the real-world aspects of STEM subjects.

Home educators

Home educators can really benefit from setting up a STEM Club as it’s an opportunity to link together with other parents in their home-schooling community, either face to face or virtually, and use museums and other organisations that provide facilities, workshops and public events. Home educators are also able to set their own agenda and can more easily tailor the Club to their children’s specific interests.

The UK STEM Clubs programme

This guide has been created by STEM Learning, the largest provider of STEM education and careers support in the UK. Part of STEM Learning’s remit is to support the UK’s many diverse STEM Clubs.

Visit the STEM Clubs web pages for:
- further information and videos about setting up and running a successful Club, including a template scheme of work
- activity resources
- information about CPD to support STEM Club leaders
- information about how STEM Ambassadors can support your STEM Club

About this guide

Who is this guide for?

This guide covers everything from the practicalities of setting up a STEM Club, to measuring the impact once you are up and running. There is no fixed formula to running a successful Club, however, a key ingredient for any STEM Club is fun! Each Club is unique in its purpose, setting, focus and approach, and the benefits that it delivers.

This guide is for Club leaders running any STEM Club for young people based in primary schools, secondary schools, youth groups, FE colleges and sixth form colleges, as well as other settings. You can read through each step if you are in the early stages of setting up a STEM Club, or jump to the relevant section if you are looking to enhance a certain aspect of your Club that is already up and running.
Defining objectives and measuring success

Defining your objectives

Why are you running a STEM Club?

The reasons for running a STEM Club can be varied, from wanting to improve student attainment, assist with personal CPD, to the enjoyment of just having a huge amount of fun with STEM subjects in exciting and creative ways. Club leaders have the opportunity to explore STEM subjects in ways that a classroom session may not be able to. By encouraging students to have fun with STEM, their appreciation for STEM subjects grows, their knowledge base and skill sets expand and a Club leader can achieve many objectives.

Identifying, establishing and documenting a Club’s objectives can be key to its success. You can do this at the outset if you are setting up a new Club, or as part of an evaluation of an existing Club.

A clearly defined set of objectives will help you to:

- give focus to your planning
- communicate your vision to others and get them involved
- get approval for your Club from the headteacher, senior leadership team, governing body or parents (if you are in a school setting)
- evaluate your success and check that you are achieving what you set out to achieve

Setting objectives will be most helpful if you make them SMART (specific, measurable, achievable, realistic and time-based).

Possible Club objectives could be to:

- raise awareness of STEM subjects
- raise student attainment levels
- raise the profile of STEM subjects in the school and in the wider community
- enable the school (Club) to compete in STEM-related competitions and challenges
- enable students to better understand potential careers
- increase opportunities to liaise with industry

Objectives should enable a STEM Club to measure whether it is achieving what it set out to do. A Club leader can help monitor this by setting outcomes or goals to be achieved within realistic time frames. For example:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Measurement mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>To raise awareness of STEM subjects and increase student attainment levels.</td>
<td>Use questionnaires to assess the status of students at the start and end of the designated study length. Record observational comments on students’ progress at the end of each Club session.</td>
</tr>
<tr>
<td>Students show increased knowledge of STEM subjects and marked improvement in STEM subjects.</td>
<td>Six weeks.</td>
</tr>
</tbody>
</table>
Defining objectives and measuring success

Measurable objectives are:

- increased enjoyment of STEM subjects
- increased confidence in STEM subjects
- increased knowledge and understanding of STEM subjects
- increased key employability skills
- increased awareness of STEM-related careers

By measuring student status at the start and end of the designated study length, a Club leader can see the correlation between the STEM Club and the progression of the students. The assessment enables the Club leader to measure the success of the Club and the positive impact it has on students, demonstrating that the Club is meeting its objective(s).

Once you have established your Club objectives and how you will assess the Club against them, it is useful to review them regularly, perhaps annually.

What is your Club’s focus?

Once you have established or updated your objectives, you will need to decide upon (or review) the focus for your Club.

Clubs with a narrower focus

You may want your Club to focus on one particular STEM subject or study topic, such as mathematics, design and technology (D&T), biology, energy production or the environment. This may be a response to a particular priority or a local need. A narrower focus can make it easier to decide on appropriate activities, enable intensive study of a particular subject, minimise resources and equipment required, and can help you recruit Club leaders and assistants who otherwise may be less confident at taking on a wide range of activities.

Clubs with a broader focus

Alternatively, you may want to broaden your Club interests to include content from a range of subjects or topics. This will enable young people to experience a broader range of activities, and help Club members to recognise the links and contributions made by different STEM subjects. For example, a Rocketry Club utilises a number of skills and knowledge from physics, maths, chemistry, and design and technology.

Utilising skill sets and knowledge

Whatever focus you decide for your STEM Club, single subject or cross curricular, a Club leader should consider the potential for students to utilise cross-curricular skill sets. Opportunities to integrate learning with concepts and knowledge from a broad spectrum of STEM subjects can have a very positive effect on the outcomes of student learning.

Students often don’t see how knowledge or techniques learned in one subject could have an impact or affect another. Combining knowledge and identifying links between STEM subjects can only benefit the success of the STEM Club. This does not mean all Club activities should aim to be cross curricular. Combining knowledge and creating context for a project or experiment can assist students to better understand not only the primary subject being taught but how it can relate to other projects and activities.
Measuring your impact

How can you measure your Club’s impact?

Evaluation should ideally be planned at the outset (although it is never too late to start) and should happen throughout the lifetime of your Club.

Taking time to reflect on the activities done throughout the year and get feedback from your Club members about what they have enjoyed and what could have been improved is an important part of building a successful Club.

Benefits of evaluation

Education is about improving the outcomes for young people and it’s important that we evaluate teaching practices and school activities to ensure these outcomes are successfully and efficiently achieved. In a current climate of reduced school budgets and increased accountability measures, operating a STEM Club may have its challenges. Compared to teaching curriculum subjects this work may be seen as lesser priority and value. Evaluation can help you identify ways to improve what you do and to achieve more outcomes and higher impact with less resources. It will also generate convincing evidence of impact that could help you increase the profile and popularity of the Club in school and bring more resources and support from the school leadership as well as from colleagues and parents.
Defining objectives and measuring success

Evaluation can bring many benefits, including:
- helping you find out if your Club’s objectives are being achieved and if resources are being used effectively
- influencing decisions about the direction of your programme of activities
- providing evidence of success for others, such as school leaders, funders or prospective parents
- helping Club facilitators improve their skills as reflective practitioners and facilitate the use of evidence and research-informed professional practices

Ways to measure your impact

Baseline surveys
Baseline surveys for students, Club leaders and helpers, measuring Club member enjoyment, staff confidence, levels of engagement, interest in pursuing a future in STEM-related careers or study etc.

Regular repeat surveys
You could repeat the survey termly or annually, using exactly the same questions to identify any impact that you have made.

Feedback forms
It can be useful to ask members to complete a feedback form at the end of each activity or project. These can be very simple, such as three to five questions asking the students to rate their enjoyment levels, whether they learned something useful, would they like to do more activities, learn more about a subject, topic or a related career.

Other measures
Depending on your objectives, you may also wish to measure:
- who is participating (for example, number of members, mix of boys and girls, ability levels, the dropout rate in attendance, attainment of Club members)
- who is involved in running the Club (for example, number of Club leaders, Club leader backgrounds, participation in CPD courses)
- new relationships developed (for example, with businesses, universities or STEM Ambassadors)
- profile-raising activity (for example, features in local newspapers, social media posts)

There are useful tools such as feedback forms and models of change diagrams that can help you measure the impact of your STEM Club, evaluate an activity and generally help you assess the success of your STEM Club.

They are available to download from the STEM Clubs web pages, additional information is available from the STEM Learning website.

How will you use the data that you collect?
You may want to use the data you collect to refine your approach as you go along, or build up a file to be used at a later date, for example, at a termly or annual Club review. In other words, is your evaluation going to be formative or summative?

Consider how you will analyse the data, and whether there is value in presenting it to a wider audience. If you decide that your evaluation could be used to attract further funding or additional members, you may want to put together a folder including images, reports and samples of your Club’s outputs.
Measuring impact at Pool Academy, Redruth

Pool Academy’s STEM Club is evaluated by staff on a regular basis. Exit slips are used at the end of each session to document what students have enjoyed, what they found useful and their suggestions for improving future sessions. This is combined with teacher thoughts and reflections.

A mid-term assessment takes place using a short questionnaire, combining a range of tick boxes, ranking and short answer responses. For example:

**STEM Club has a good balance of science, technology, engineering and maths**

- Strongly agree / Agree / Neither agree or disagree / Disagree / Strongly disagree

This generates a quantitative output which staff compare with the short answer questions and use to measure the success of STEM Club.

Additionally, students complete an end-of-year STEM Club questionnaire, which is analysed in a similar way. It is combined with the weekly staff and student testimonials and targets are set for the next year on the basis of this data.

The school also looks at students who have decided to undertake a STEM subject at A level and asks these students to complete another brief questionnaire describing the extent to which STEM Club inspired, helped or motivated them to undertake further study.
Who should lead your Club?

If you are setting up a new STEM Club, think about who will form part of the Club leadership team. If you have an existing Club it is worth thinking about expanding your team.

STEM Clubs can be led by a wide range of individuals. Whoever is leading, Clubs are most successful when Club leadership responsibilities are shared between people with a range of expertise from the outset.

Although a driving force from an individual is key to starting a Club, collaboration is at the heart of making it successful and sustainable. As well as lightening the load of planning and delivering Club activities, working in a team also provides a source of creative ideas and helps ensure continuity should a Club leader leave the school.

Club leader responsibilities can include:

- planning an appropriate programme
- providing new ideas for the Club
- ensuring kit and space is available
- risk assessments, health and safety, and child protection
- budgeting and other financial considerations
- attending relevant CPD (for school staff)
- reporting to and liaising with key partners

Leadership for school or college STEM Clubs

Staff collaboration

In schools, Club leaders are often teachers or support staff.

Primary schools: club leaders could be any member of staff with an interest in your Club’s area of focus.

Secondary schools or FE and sixth form colleges: teachers of other STEM subjects might be the obvious choice, but schools are full of people with relevant interests and skills – teaching assistants and support staff included. Aim to engage technicians from the outset, as they will be central to making your Club a success.

Some Club leadership teams also include individuals in the community who are passionate about aspects of STEM, for example, STEM Ambassadors, other representatives from local industry, colleges or universities, parents, governors or even students themselves.

Sharing the load at Musselburgh Grammar School, Musselburgh

Musselburgh Grammar School has a STEM Club run by a team of four members of staff on rotation, which helps to share out the workload and planning.

The team plan activities by brainstorming together, researching online and using guest STEM Ambassadors. They plan practical activities that students won’t come across in class, often directed by things that they have seen on social media, for example, testing out a new ‘slime’ recipe that was being shared online.

They are supported by a group of Senior Science Ambassadors, older students who can request to run activities, allowing opportunities for leadership and peer-to-peer learning.
Getting others involved

Peer-to-peer support

Involve student representatives in the early stages of setting up a Club, encouraging them to take ownership of their learning and provide leadership for other students. Student mentoring is a great way to consolidate learning. Students who take ownership of the types of activities that happen will help develop their social skills and ensure a successful Club in which students will want to take part.

Giving students responsible roles within the Club will give them a sense of pride in the Club and help with recruitment of other members.

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Student leadership at Knightswood Secondary School, Glasgow

Knightswood Secondary School uses student representatives to great effect to help support the running of their STEM Club.

Four older students have been trained up to be Junior STEM Ambassadors and they are responsible for supporting less able pupils during the Club, as well as helping to demonstrate experiments and lead sessions.

A final year student who wants to be a science technician is also being trained by school technicians during free periods, allowing him to act as a Club technician and support the staff.

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A student-led approach at Harris Academy Greenwich, London

Harris Academy Greenwich hosts a STEM Club that meets at least twice a week, covering a range of subject areas and focuses on being fun, inspiring and student-led.

Supported by staff, older students take responsibility for both running and planning the Club for younger students. This allows students the opportunity to develop leadership skills and take ownership of their own learning; they regularly come in during their own time to develop their ideas further.
Who else can help?

The benefits of working with helpers and volunteers

Other adults outside the core Club leadership team may be able to offer regular help or volunteer one-off support, reducing the burden on Club leaders and enhancing Club activities by bringing invaluable real-world experience and fresh ideas that can really inspire and enthuse students.

Helpers offering ongoing support

Helpers willing to offer ongoing assistance can be invaluable in reducing the burden on Club leaders and enhancing Club activities. Helpers can:

- give expert advice to students
- assist with preparation and clearing up
- organise and keep a log of specialist activities
- advertise and promote the Club
- maintain membership records
- update the website, if you have one

Helpers offering one-off or ad hoc support

Volunteers offering one-off or ad hoc support can bring invaluable expertise and experience to your Club, and really inspire and enthuse students. They can:

- speak to students about their area of expertise
- put activities into a real-life context
- provide more hands to run a specific activity
- bring their own activity to run
- judge competitions
- act as an audience for presentations of Club members’ work

Finding helpers and volunteers

Helpers and volunteers might be the parents or family members of Club members, members of the community in a STEM-related profession, including STEM Ambassadors, former Club members or (in schools and colleges) governors or ex-students.

You could approach individuals or organisations which could provide support in different ways, including supplying helpers or volunteers. This could include local businesses, universities, a museum or other linked institutions, for example, school or college Club leaders could work with feeder schools or schools within the same academy chain.

 Helpers and volunteers may be motivated to help with your Club for a range of reasons, such as an opportunity to influence the next generation of scientists, engineers and mathematicians, the chance to work with students who enjoy STEM subjects, to gain experience in the STEM education sector or just to have fun!

Ask around and you might be surprised at the interest and expertise out there. There may be people using their STEM skills and knowledge right under your nose who can be valuable assets to your Club!

You could include a parent questionnaire with your Club member application form, or send home a questionnaire to find out who has parents or other family members in STEM-related industries who might be willing to help.

STEM Ambassadors – who are they?

STEM Ambassadors are volunteers from a wide range of STEM careers and STEM-related jobs in the UK. Anyone running a STEM Club, whether in a school, youth group, home or community setting can access the network of STEM Ambassadors free of charge. STEM Ambassadors can provide resources, help with activities and give career talks amongst other things. At the heart of what they do is sharing their knowledge, experience and passion for STEM subjects.
Getting others involved

Working with helpers and volunteers – checklist

Make sure that helpers and volunteers:

- are happy with their level of commitment
- know the size and make-up of the Club
- know what resources are available if they are running their own session
- feel able to provide advice and ideas
- are aware of inclusion arrangements for students with special educational needs and disability (SEND)
- are not put in situations where they are not confident
- are DBS checked

89% of teachers reported that their students’ awareness of the importance of STEM had increased as a result of working with STEM Ambassadors.

STEM Ambassadors: making an impact
STEM Learning, 2016

- are never left alone with Club members
- are thanked for their time

Check to see whether they:

- want more or less involvement with the Club
- need advice on working with young people
- need more information on how the Club is doing and future plans
- know of all risk assessments and health and safety information

The value of supporters

It is important not to underestimate the importance of supporters. Supporters are people who aren’t directly involved with the Club but who are necessary for its continuing success.

In a school environment, they can include those within and outside of the school, such as the senior leadership team, school governors, parents and other members of staff. Supporters can help ensure the Club maintains a profile, both within and outside of the school.

In other settings, supporters can provide much-needed funding, help with competition preparation and a variety of experiences for Club members to experience.

Parent advocates

“We have a parent governor who works for Rolls-Royce and he lets us know of opportunities such as funding, trips, careers advice or workshops. In the past we have received £800 to put towards STEM Club activities.”

Jake, St Christopher’s CE High School, Accrington
STEM Club models

**Teacher-led model at Terence Road Primary School, Liverpool**

Terence Road Primary School’s Maths Club is run after school by class teacher, Jenny, at least twice a week. It focuses on creativity and differentiates activities for every pupil in order to cater for different abilities.

As a result of attending the Club, pupils’ enjoyment of and attainment in maths has improved. They are given the opportunity to direct their own learning from a young age by maintaining their own learning materials and checking a maths dictionary when they don’t understand a concept or a term. They are encouraged to engage in peer-to-peer learning and to help each other to understand new activities.

The Club has engaged parents and pupils alike, and as a result of running it, Club leader Jenny feels more able to stretch and challenge more advanced pupils during class time as well.

**Student-led model at Tring School, Tring**

Tring School STEM Club encourages students to take the lead and choose their own projects through independent research. Key to the success of this Club is that staff try not to set boundaries on students’ exploration and encourage them to participate in practical work that is not possible during class time.

Students design the practical from the beginning based upon what they are interested in and what they can discover.

One student was interested in cars so he researched catalytic converters. This led him to find out that carbon dioxide, a greenhouse gas, is not removed from emissions. He designed a practical where he produced carbon dioxide and then tried different methods to absorb it all.

As a result of investing their time in their own projects, students display an increased confidence in their area of investigation and much improved practical skills. They take part in CREST Awards and track their progress by completing successive levels of the awards.
Timetabled Club at Ditcham Park School, Petersfield

The new weekly STEM Club at Ditcham Park School is timetabled into the school day as compulsory for all students and runs half-termly projects. It is run by STEM staff and parents, and aims to encourage more students to take STEM subjects post-GCSE.

The staff enjoy teaching outside of the scope of the curriculum and setting new challenges for students. Students are enjoying the new hands-on approach to STEM subjects and having the opportunity to learn new skills. Parents are also enthusiastic about the new approach and are excited for the opportunity to use their own expertise and take part.

To celebrate the first year of the new initiative and promote future engagement, the school will be hosting a ‘STEM day’ in the summer for the wider community.

“We are lucky to have great support from parents who liaise with the school often and are involved in our development plan.

"Parents offered to help with STEM Club and as such have been coming in regularly to teach a small group of students to code.

“This benefits students as they are learning current, relevant skills that are needed in the workplace. It also helps to build upon and develop the relationship between parents, students and teachers.

"In the future we hope to develop this further by inviting parents to host small STEM challenges for students and taking part in a STEM day."

Laura, Ditcham Park School, Petersfield
STEM Ambassador support

Corbridge Middle School, Corbridge
Corbridge Middle School STEM Club regularly uses STEM Ambassadors to run all sorts of workshops in order to enrich the students’ learning experiences, as well as supporting them through Bronze CREST Award projects.

STEM Ambassadors they have worked with include the Newcastle University STEM Outreach team and a microbiologist from Northumbria University.

To be matched up with STEM Ambassadors, the school requests help through their Education Relationship Manager at their local STEM Hub.

St Christopher’s CE High School, Accrington
St Christopher’s CE High School STEM Club uses a STEM Ambassador to both help plan activities and help out with the actual running of the Club in person.

Planning is carried out via email between the Ambassador and staff on a weekly basis, with much of the programming based around the particular skills and expertise offered by the STEM Ambassador.

Competition focus

The Castle School, Thornbury
The Castle School in Thornbury has more than eight regular Clubs, run by approximately six members of staff, with regular visits from STEM Ambassadors, reaching over 100 students throughout all year groups.

Many of the Clubs have a competitive element, for example, taking part in The Flying Start Challenge, which is free and supported by STEM Ambassadors. BAE Systems support The Castle School’s STEM Club and each year the same Ambassadors come into school, helping the school to form a great, ongoing relationship.

Entering competitions encourages students to attend STEM Clubs because not only do they want to win but they will get a day out of school to compete in a new learning environment.

Most of the Clubs run for approximately 12 weeks, making recruitment easier as students do not need to make a year-long commitment.
Working with local universities

**Ramsden Primary School, Lindrick**

The Ramsden Primary School STEM Club has developed a good relationship with the University of Lincoln and the University of Sheffield and works with their outreach support officers.

Club members have benefited from laboratory visits and talks from visiting lecturers, introducing topics and bringing in specialist equipment, such as planetariums or pond sampling equipment.

The University of Lincoln gifted some daphnia shrimp and loaned a microscope to the Club.

The children have learnt about famous scientists, robotics and electronics. They benefit from a wealth of expertise, the use of high-tech equipment that the school would not otherwise be able to afford, as well as exposure to practitioners who widen their horizons and raise aspirations.

Working with other local schools and ex-students

**Millom School, Millome**

Peter, Head of Technology at Millom School in Cumbria, ran a project to enthuse local primary schools about STEM subjects and gave students access to STEM activities and equipment. He also wanted to develop a bespoke Ambassador programme, working with Sellafield Ltd, for his own students in STEM Club to help them work with the primary school pupils.

He formed an arrangement with BAE Systems to allow past students working there to come into school to help with the project and act as positive role models.

Working with industry mentors

The Met Office runs a series of outreach programmes visiting youth organisations such as the Scout Association, Girlguiding UK or other groups to encourage interest in STEM careers and increase interest in STEM subjects. They have over 270 STEM Ambassadors who go out to STEM Clubs, fairs and festivals.

“The Solutions for the Planet programme provides industry mentors to visit schools and give advice on how to take an idea, use STEM to create a solution and produce a business plan.”

**Meryl, Corbridge Middle School, Corbridge**
Where will your Club take place?

Location, location, location

Your STEM Club’s location will be a key factor in determining the number of Club members that you can accommodate, and the types of activity that you can run. It can make a difference to the visibility of your Club, and the appeal to existing and potential members.

It is worth giving location careful consideration at the outset and reviewing it regularly. Often a simple change to the environment you are in can improve attendance and retention of members.

When choosing a location for your new Club, or reviewing the location of your existing STEM Club, think about:

- the types of activity you will be running
- how much space you will need
- any equipment that you will need to access
- where any Club resources will be stored (possibly from one week to the next)
- whether you can use a ‘special’ venue, such as a room usually reserved for older students, to help raise the status of the Club if you are in a school or college

Where there is more than one option, using a mix of locations can add excitement and interest, and reinforce the connection between your Club’s activities and the real world. Outside space is great for messy or large demonstrations (although this may not be possible in winter).

If you can, arrange some events at special locations such as science centres, museums, libraries or STEM-related businesses.

“Hold the Club somewhere where other students can see that it is going on.”
Rachel, The Castle School, Thornbury

Club locations in schools and colleges:

Primary schools can consider asking a local secondary school whether their facilities could be used. In a school setting, consider which room will provide you with the most options for your chosen activities: perhaps a classroom with a sink. Take advantage of outside space when the weather and season allows.

Secondary schools are likely to have more choice. If you are running a STEM Club with a strong cross-curricular ethos in secondary schools, this could help reinforce the links between the various subjects.

Colleges often have more options for where to run their Club than schools; exact venues will depend on the focus of the Club of course. If you are covering robotics and coding, the ICT suite would be most appropriate, however, crystal growing may be better confined to a lab!
Club locations in youth groups

Youth groups should consider using outdoor space, parks and other free venues for running experiments and nature-based activities.

You could consider asking your Club members’ schools for access to school facilities occasionally, perhaps to complete badges. Scouts, cadets and Girlguiding UK all offer science or technology badges and are ideal for including a STEM Club as part of their offering to their members. Public libraries have become a great opportunity for youth groups or non-school-based clubs to operate at.

Club locations for home educators

For regular STEM Club sessions, it can often make sense to choose a space with easy access to a sink and where cleaning up will be easy. Depending on the number in the group, it may be worth renting a community space such as a village, school or church hall if there is one nearby.

If you have access to outdoor space, such as a garden or local park, make the most of it for messy experiments, or any topics relating to the natural world.

Try to take advantage of as many events that are available as you can to enhance your Club’s focus, for instance workshops at local museums and galleries, or open days at local businesses related to STEM subjects. Research and approach national science centres and planetariums eg Winchester Science Centre and The Observatory Science Centre. Many of them run home educator days, events and shows that are often financially supported by the centre. Many organisations, such as the Met Office, run science camps for STEM groups and other organisations run tech and science camps during school holidays.

STEM Club at the library

Brent Culture Service offered a STEM Club for local children aged 8+ in the library, making key fobs from recycled materials.

Check Eventbrite for events in your area to get children and parents involved in community STEM Club groups.

When will your Club run?

Most STEM Clubs are after school or (in schools and colleges) at lunchtime. Some schools timetable their Clubs so that all students can take part.

Decide how long each session will last – most Clubs last between 35 minutes and 1.5 hours. Consider the age of your students. Up to an hour is about right for primary school pupils, Clubs for older students could last longer.

If you are holding your Club in the evenings, take into consideration the pick-up and/or transport arrangements of Club members and their personal safety.

Club leaders in school or college settings may need to consider the following points:

- when are other Clubs running? Try not to clash with too many of them to maximise participation
- if you are holding your Club at lunchtime, will members have enough time to eat their lunch and take part in some meaningful activities
What health and safety procedures do you need to put in place?

Remember to carry out a full risk assessment before attempting any practical activity, and share the risk assessment with all adults who will be involved in running the activity. You should keep a file of risk assessments in case you need to refer to them later.

If you are in a school or college, you may wish to share your risk assessments with the senior leadership team, to make sure that they are happy with the activities you have chosen and the measures that you have put in place.

Some activities may require support from additional adults to ensure adequate supervision.

Further support and guidance is available online:

- CLEAPSS supports practical science and technology in schools and colleges
- example risk assessments on the Health and Safety Executive website
- SSERC supports practical science and technology in schools and colleges in Scotland
How will you source equipment and funding?

Running a STEM Club with limited resources

If equipment and funding are limited or non-existent, you can still run a great STEM Club! It’s all about choosing the right activities.

You may find it useful to undertake an audit of the resources and equipment that you already have, which you can refer to when planning your activities.

If you are in a school or college setting, and there is a specific piece of equipment that would be useful for the STEM Club, consider how else the school could use the equipment if you were to invest in it, or whether you could share with other schools or colleges in your area. You may be able to borrow equipment from other schools, colleges or local universities, or perhaps local businesses.

If you are in a youth group setting, you could consider asking your members’ schools to loan you equipment occasionally.

Consider asking students to bring in items that may be lying around at home, for example, plastic bottles or old CDs.

Finding funding

Receiving funding will broaden the options available to you.

Consider whether you will charge members a compulsory or voluntary participation fee. Look at what other STEM Clubs offered by your organisation or in your area charge.

You could approach local businesses to ask for a one-off donation of money or equipment, or an ongoing contribution, or do some research online to see whether any grants are currently available, perhaps through your local council or one of the organisations listed below.

Club leaders in a school or college setting could talk to the senior leadership team about whether any funding could be made available. If members are being charged a participation fee, could the school subsidise it or cover costs for pupils receiving the pupil premium? If your PTA or PSA is engaged with the Club, they may be able to help raise funds.

Working with external organisations

"Once every half term we contact Cubs and Brownies to ask if we can support pupils towards gaining their badges through lunchtime STEM Clubs. "We look at the learning objectives we are covering to see if they match any of the badge descriptions. For example, in order to gain the Brownies investigator badge we could set the following challenges:

- try four foods (for example, lemonade, toothpaste, water and yoghurt) and decide which is most acidic. Now make an indicator to test your ideas
- in a group build a structure, for example, a bridge or tower. Could your structure survive an earthquake?"

Manette, Bielefeld School, Catterick Barracks, Germany
Logistics and practicalities

Applying for funding

“We applied for the Royal Society of Chemistry Inspiring Young Chemists funding. This allowed us to develop our Broad General Education course by including new practicals and demonstrations on smart alloys and novel materials.

“The application involved a written document indicating how the money would be spent, the intended impact on pupils and also a section on health and safety. This was submitted along with a breakdown of costs. It was a fairly simple process.”

David, St Joseph’s Academy, Kilmarnock

Grants

Arkwright Engineering scholarships
Funding for schools affiliated with Arkwright.

British Ecological Society
The BES provides funding of up to £2,000 for projects that promote ecological science.

British Science Week Community Grant Scheme
This scheme offers £500 to £1,000 for community groups that work directly with audiences who are under-represented in science activity.

British Science Week Kick Start grants
Funds for schools in challenging circumstances to organise events for British Science Week.

The Centre for Alternative Technology bursaries
Grants are available for schools and colleges in North Wales.

Engineering Education Grant Scheme
This scheme provides support to any UK-based educational projects that aim to increase engineering knowledge in young people aged 5 to 19. Funding is provided by The Institution of Engineering and Technology (IET) and the Institution of Mechanical Engineers (IMechE) in the form of £5,000 and £15,000 each year.

ENTHUSE bursaries
Bursaries are available to all state-funded schools and colleges in the UK to help teachers and technicians attend CPD courses offered by the National STEM Learning Centre and its partners.

ENTHUSE Partnerships
ENTHUSE Partnerships are groups of between four and eight schools and colleges located in England. These groups can apply for a bursary of up to £12,000 and can use this money to work together to address local issues of underachievement in science, technology, engineering and/or mathematics (STEM) subjects. ENTHUSE Partnerships aim to support collaborative activities over two years to develop and strengthen local partnerships which can subsequently continue independently.

Institute of Mathematics Education Grant Scheme
Individuals in secondary schools and FE colleges in the UK can apply for a grant of up to £600 to help with the costs of running or attending an educational activity relating to mathematics.

The Naturesave Trust grants
Funding for UK-based environmental, conservation and community renewable energy projects.
Logistics and practicalities

Rocket Fund (By Nesta)
Rocket Fund is a crowdfunding platform for schools, designed to enable more students to access the latest technology and give teachers the opportunity to try new things. It enables schools to raise money from local businesses and their wider community, in order to buy new technology that would be beyond the reach of their budgets, such as VR headsets and 3D printers. After the schools have used the products for a few months, Rocket Fund asks for a review to help other teachers choose in the future.

Rolls-Royce Science Prize
If you have a great project idea, apply to Rolls-Royce for a science prize to bring it to fruition.

Royal Society of Chemistry
The RSC gives small grants to schools for chemistry-related projects, particularly off-timetetable and Chemistry Clubs.

The Royal Society Partnership grants
Grants of up to £3,000 are available to schools that enable students to carry out STEM projects. Since November 2000, over £1.3m has been awarded to over 800 schools and colleges.

School Grants Scheme
Jointly funded by the Institute of Physics, The Institution of Engineering and Technology and the Science and Technology Facilities Council, a number of grants of up to £600 are available to schools for physics or engineering projects that require finance not covered by normal school budgets.

The Worshipful Company of Armourers and Brasiers
Grants to support funding for science in schools.

Local funding opportunities for the Gilberd School, Colchester

The Gilberd School, runner-up of the Young Engineers STEM School of the Year, uses their local STEM programme unit at Essex County Council as a source of funding and support to sustain and enhance their STEM provision.

The Essex and Employment Skills Board has provided large-scale industry events for students to attend, grants, industry liaison ambassadors who run STEM sessions in schools and CPD opportunities for staff through large forums such as the Royal Institution Shows.

Beverly Maloney, Developing Excellence in STEM Coordinator, and a team of STEM teachers across the school, have continually showcased the STEM provision at the school, allowing it to grow progressively stronger across all of the STEM Clubs that go on.
5 Attracting members

How will you recruit members?

Who will you recruit?

Think about how many STEM Club members you can accommodate, bearing in mind the space you have available, the types of activity that you will be offering and how many adults you are likely to have to supervise. If your Club is new, it can be helpful to start small and build up slowly.

Think about your Club’s objectives (see page 5) and decide who will be eligible to join, and what your selection criteria will be if you are oversubscribed. For example, your Club might be looking to achieve one or more of the following:

- provide stretch for high achievers
- support students with SEND
- support and encourage a particular age group as they prepare for the next stage of their education, eg moving to secondary school or choosing examination options
- encourage a broader range of young people to consider a future in STEM-related careers or study, perhaps specifically targeting girls or from backgrounds under-represented in STEM subjects
- support students who already have an interest in STEM subjects or target those who don’t. In this case, it can be helpful to include a few basic questions on your enrolment form, such as “Who is your favourite scientist?”

Some schools have built STEM Clubs into the timetable, so that everyone participates (see page 15). However, for most at STEM Clubs in school or other settings, attendance is voluntary, and places may be offered on a first come, first served basis to all or a subset of students (for example, particular age groups or classes), or selection criteria may be in place.

If you are in a secondary school, it can be easier to begin with younger students, who are not yet focused on exams.

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Recruiting winners at Sandbach High School and Sixth Form College, Cheshire

Sandbach High School and Sixth Form College’s STEM Club is focused on entering competitions and uses the competition prize money to fund their activities. They were chosen as the 2017 Young Engineers STEM School of the Year for their inspirational Club work and for working across interdepartmental collaboration.

The STEM Club is open to students from Year 8 (13 year olds). During British Science Week students create their own projects for the annual school science fair and this event is used by the STEM Club to recruit new members for next year.

Students can be of varying ability levels to join – it’s all about commitment!
Attracting members

How will you spread the word?

When recruiting Club members, consider the following:

• where are your potential members or their parents looking for information? Can you put information about your Club in an email newsletter or on noticeboards

• could a launch event or a special assembly generate interest? Where will you hold it to reach the highest number of potential members

• what would really appeal to the young people that you are targeting, or their parents, and make them keen to join? Even if you have chosen to open your STEM Club up to everyone, you can still choose to tailor your promotional information and activities to appeal particularly to the interests and needs of a particular group that you wish to target

• how could supporters help (see page 14)

• have you made sure that the enrolment process is clear and easy for both students and parents

How will you retain your members?

Members should enjoy belonging to a STEM Club – it’s fun! You may want to ask them to help develop a club identity by thinking up a name or giving their Club a logo. Consult students about their interests regularly, and build these into your planning – perhaps building questions relating to this into your application form or a termly survey.

Spreading the word at the Gilberd School, Colchester

Beverly Maloney, STEM Clubs leader at the Gilberd School, used an innovative concept to spread the word about the new Clubs and attract members.

A form time competition was set up for students to design a ‘STEM badge’ for students attending a STEM Club. The badge was publicised further using a PowerPoint presentation display in social areas around the school and soon students began approaching staff to find out more about getting involved.

The badge evolved into something of a school trend and students became engaged, with many wanting to join STEM Clubs and achieve the badge. Now the Clubs are very established and staff don’t actively recruit members – students come to them.
Promoting diversity in STEM subjects

Attracting members from disadvantaged backgrounds

The STEM skills gap

STEM Clubs can be a powerful tool in making STEM subjects feel inspirational and more accessible to students from disadvantaged backgrounds.

It is widely known that in the UK there is a STEM skills gap, which will have a negative impact on the economy. The ASPIRES report identified that girls and young people from economically disadvantaged backgrounds are put off STEM subjects and careers because they are perceived as being male dominated and middle class.

| Role models |

Interacting with role models helps to build students’ science capital, and can help them visualise STEM careers as being accessible and relevant.

Using STEM Ambassadors and volunteers from industry can therefore really enhance your STEM Club and the impact it has on students, particularly if their backgrounds reflect students’ own.

| Communication |

Teacher or school expectations are key to whether young people from disadvantaged backgrounds participate in STEM subjects.

Often schools inadvertently have lower or biased expectations, which reinforce disadvantaged young people’s own perceptions of STEM subjects as not being ‘for them’; reaching out to these students and inviting them to participate in STEM Club can address this.

- when promoting the STEM Club in your school or community make sure any images used reflect a diverse group of young people
- consider activities that are likely to be of interest to a wide range of young people, including those who don’t see themselves as future scientists, for example, activities linked to music, sport or fashion. The Science Capital Teaching Approach pack offers guidance on building activity around students’ interests

There is widespread concern that the profile of those who do go on to study STEM subjects and pursue STEM careers is too narrow, with women, working-class and some minority ethnic groups remaining under-represented, especially in the physical sciences and engineering.

ASPIRES Report, King’s College London, 2013

Students from disadvantaged backgrounds are less likely to take up STEM subjects at school and progress on to STEM degrees or careers. This group of students tend to have lower ‘science capital’, ie family and community connections with science, and may perceive STEM options as not being ‘for them’.

STEM Clubs can help to address this by presenting STEM in a fun, informal and less intimidating way; for a really effective approach it is important to try to get to know your students, their backgrounds and their specific needs in order to find the style that will work best with each individual.
**Youth clubs**

Youth clubs are in a unique position to reach and support young people from disadvantaged backgrounds outside of a school setting.

The Wellcome Trust works with youth clubs to encourage them to offer informal STEM education and activities as part of their programmes. A study carried out by the Wellcome Trust found the following guidance for delivering informal STEM education:

1. **Collaboration** – it’s important to involve young people in the planning, design and execution of activities, ensuring they are young person-centred and not adult or organisation-centred. Collaborating in this way means that activities are developed with the skills and needs of young people at their heart and so are much better placed to foster sustained engagement.

2. **Variety** – variety in the activities available helps to sustain interest and allows for young people to choose what appeals to them.

3. **Planning** – successful activities are also well planned and well managed, with careful consideration given to group composition, leadership, goals and links with other organisations.

4. **Practicalities** – activities need to be accessible and held in a safe environment as well as recognise and overcome common barriers to engagement such as lack of resources, the role of parents, lack of role models etc.

5. **Showcase achievements** – reward achievements and provide opportunities for young people to share and be proud of their accomplishments.

**Curiosity** is a £2m funding scheme partnership between the Wellcome Trust and BBC Children in Need. It aims to help youth organisations develop and deliver inspiring science activities for disadvantaged children and young people in the UK.

**Engaging parents**

Consider engaging parents with STEM Club activities by inviting them in to a ‘STEM day’ or fair, or a special session where students can show parents what they have been working on and even attempt an activity together.

Making parents aware of the range of STEM careers available can offer students from disadvantaged backgrounds a vital supportive influence at home; parental encouragement makes it more likely that students will progress on to STEM careers and prevent them from identifying as ‘non-STEM’.

**Inclusion of girls**

Encourage female students to join STEM Clubs as much as possible.

In 2016, women made up just 21.1% of the core STEM workforce in the UK (WISE Women in STEM workforce report, 2016). The UK needs 100,000 new graduates in STEM subjects every year until 2020 just to maintain the current employment numbers – encouraging girls to enjoy STEM subjects at an early age is key.

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**Challenging stereotypes**

STEMETTES tackles the challenge of stereotyping by making women in science more visible to young people. They have developed ‘STEM in a day’ school trips and, so far, they have taken over 300 girls into five industries. To find out more about opportunities visit the [STEMETTES](https://stemettes.org) website.

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Attracting members

STEM Clubs can be inclusive by engaging in activities that show that STEM is about creativity, imagination and changing the world and that anyone can achieve these outcomes. STEM Clubs have a huge role to play in bridging gender gaps by helping members improve confidence and engage in real-world science; ultimately, even STEM careers.

If you have a lack of interest from girls in your Club, consider:

- undertaking a survey to find out how girls perceive STEM Clubs and what might make them want to attend
- changing the activities to reflect inclusive interests
- checking that promotional materials reflect both genders
- engaging helpers and volunteers that are both female and male

Female role models at Millom School, Millom

At Millom School a former student STEM Ambassador, who is now an instrument apprentice engineer at GSK, helps out and acts as a positive female role model.
Attracting members

Members with SEND

If your STEM Club has members with specific needs, it is important to consider how the Club can be adapted to be as inclusive as possible.

It may be helpful to consider the following:

• having flexible, small groups
• using a range of methods to explain concepts eg simulation and role play
• ensuring any instructions are clear and appropriate for understanding
• using props to explain a concept
• using a wide range of communication methods eg video, images, computers
• labelling items
• having wall displays
• using flashcards and symbols to explain scientific concepts
• having a ‘safe’ area for children with autism
• incorporating members’ interests into lessons
• grouping members in particular ways
• having consistent routines eg timings, clearing away, safety aspects
• the positioning of equipment and tables
• accessibility and lighting arrangements

For more detailed information, read Supporting Access in Science from The Association for Science Education. Teachers will already be aware of SEND requirements, but if you are from a non-school setting, ensure you have collaborated fully with Club members’ parents to ensure all needs are met.

Members with differing ability levels

Most STEM Clubs have a wide mix of members and ability levels can differ widely. This will, of course, depend on your initial recruitment strategy. Often, members have different levels of knowledge of topics, as STEM Club activities are usually extracurricular in nature and therefore do not reflect classroom work students undertake. An individual’s knowledge around a topic will reflect their personal interest levels.

Many Clubs find that by getting members to select some of the topics covered, they become more engaged and enthusiastic and this will lessen any potential challenges from having a varied ability group.

Other Clubs report that it is often helpful to mix children of different abilities to help all group members with the important skills of teamwork, problem-solving and practical skills gained when learning from each other.

Many activities are practical in nature which encourages less able children who may not be as engaged in STEM subjects at school which can often have less practical aspects. More able students also benefit because these more practical tasks add another dimension to their learning.

• if you do encounter challenges with the range of abilities in your Club, and you have the luxury of a technician, ensure that they are aware of any children that may require additional support practically
• think carefully about the groups the members are in and the topics undertaken. The activities outlined on page 32 have challenge and support ideas for Clubs
• finally, depending on your setting, it may be worth running two STEM Clubs: one for lower ability members that are more self-contained, with activities that are shorter but that excite members, and another that can focus in more detail on longer-term projects
Planning top tips to get you started

Plan ahead
- develop plans to suit different time scales. Short term (one or two weeks), medium term (one term) and long term (one year)
- make sure some activities are either medium term or built around a theme for several weeks to avoid needing new ideas every week
- choosing a theme which runs over a number of weeks is also a great way to channel your ideas
- you may find it helpful to use STEM Learning’s scheme of work template and look at the completed example

Start strong
- begin with some activities that you feel confident with and only progress to more challenging activities when you are ready
- start with a bang – a really fun, high impact activity can help to hook members in and keep them coming back for more

Share the load
- ask your colleagues and fellow Club leaders for ideas, or ask your Club members to suggest themes or activities that they would like to do
- allocate the organisation of some future activities to other people to avoid doing everything yourself

Go online
- you will find a wealth of ideas online and there are a wide range of ideas on the STEM Learning website – or see pages 50-51 in this handbook

Know your students
- attendance at the Club is voluntary so focus on keeping it fun for students – this is your chance to do exciting activities you can’t do in class and that go beyond the curriculum
- find out about what interests your students, particularly if there is a common interest amongst different groups, for example music, sport, movies
- think about making student interests your Club focus or term-long theme
- for older Club members, introduce links to industry and careers
- you may want to use this as an opportunity to support class learning. While this is a chance to go beyond the curriculum, it will be beneficial to everyone if your sessions support class topics. This approach may also help achieve buy-in from the senior leadership team
- the Science Capital Teaching Approach pack offers guidance on building activity around students’ interests

Find something to work towards
- working towards a competition, awards entry, certificate, display or presentation of work, or a reward day can help keep Club members engaged

Think CPD
- look for relevant CPD courses which could give you fresh ideas and new skills - STEM Learning website

Stay flexible
- a certain activity may capture the imaginations of your students, so what was originally a one-off activity can develop into a term-long project. Having the flexibility to follow your students’ interests is a great way to keep Club members engaged
## Planning activities

### Keep records

- keep a log of the activities you do so that you can refer back to them during evaluation and planning for the following year
- it might be that you can repeat some activities, or if you have the same Club members you can extend activities that you have previously done

Think about how you will break topics up over a fixed time period, such as a year. Anything goes, but it is worth considering in advance how long a topic will take if you plan to cover various topics and possibly include one or two visits and/or competitions. If you are doing one-off topics, perhaps consider running six-weekly or termly themes.

### Innovative activities at Bielefeld School, Catterick Barracks, Germany

Bielefeld School used the WeDo LEGO computer package to enable pupils to:

- think creatively to make a working model
- develop vocabulary and communication to explain how the model works
- follow 2D drawings to make 3D models

Once they understood the software pupils could design their own moving models such as robots and racing cars. One pupil designed her car to move over different surfaces and climb up and down levels. The pupils worked independently but would bounce ideas off each other and support each other to achieve their final outcome.

After eight weeks, parents were invited in so that pupils could teach them the software and work together to build a family model, which was a great success.

At the end of term the pupils presented their working models at the Christmas Fayre and were keen to talk to guests about the process they had been through and how much fun it had been.

### Pupil quotes

"I felt so excited the first time I got my Ferris wheel to move!"

"I felt really proud teaching my dad how to use LEGO Education. He’s an engineer and had never played with it."
Where can you find ideas?

STEM Learning activity resources

You will find a vast array of STEM-related activity resources that are suitable for use in a STEM Club setting on the STEM Learning website.

Club leaders can browse through a range of downloadable resources across all STEM subjects. The support programme has identified several hundred exciting and inspiring activities for STEM Clubs that can be carried out both inside and outside the classroom or Club setting. Club leaders can search the resource listing by subject, age range and activity type to identify the perfect activities for your Club. The activity listing is updated regularly so there is always something available to interest your Club members.

Club leaders are welcome to amend or adapt activities and provide new ones they have written or come across. We encourage Club leaders to recommend activities, challenges and opportunities that other Clubs can get involved in through the community group. The more content we can add, the better it is for STEM Clubs in general. Club leaders can easily add adapted or new activity content to the resource listing by contacting stemclubs@stem.org.uk in the first instance.

There are a mixture of activity types, including:

- **one-off activities**, suitable for completion in one session. They are highly engaging and can have a real wow factor
- **short projects**, which will take two to three sessions to complete. Many of the shorter projects will include demonstrations or experiments that can be used as one-off activities
- **long projects** that will fill half a term or more. Completing a long project can be very rewarding, especially if there is an award or prize involved

Featured resource – ESERO-UK

ESERO-UK, also known as the UK space education office, provides free resources, support and information for teachers to enhance the teaching and learning of science, technology, engineering and mathematics (STEM) using space as a context.

Visit the ESERO-UK page on the STEM Learning website for more information.

STEM Learning themed activity resources

Working with experienced STEM Club leaders, STEM Learning has developed a set of flexible, themed six-hour programmes for Clubs. These will help build teacher confidence and enthuse students. They are suitable for any type of STEM Club, whether focusing on a single subject or cross curricular, and are ideal for new and experienced Club leaders. Primary teachers running a Club who may not have a science background, or secondary Club leaders seeking to run a STEM Club with a broad focus that takes them outside their area of expertise, may find them especially beneficial. Each activity has student differentiation built in, ensuring students of all ability levels can take part. The fun themes can help bring STEM subjects to life and encourage students to think about the world outside the classroom.

The activities in each programme last around 20 to 60 minutes, and stand alone or can be used together in any order over the course of a half term. Students that complete at least two of the activity sets can seek CREST Awards accreditation for their work.
7 to 11s

There are three six-hour themed programmes for pupils aged 7 to 9, which encourage children to have fun exploring STEM subjects.

A further three six-hour themed programmes for pupils aged 9 to 11 retain the sense of fun and exploration, but start to introduce more real-world contexts.

<table>
<thead>
<tr>
<th>7 to 9s</th>
<th>9 to 11s</th>
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<tbody>
<tr>
<td>Fact finders</td>
<td>Movies and magic</td>
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<tr>
<td>Animal adaptations</td>
<td>Future world</td>
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<tr>
<td>Extreme elements</td>
<td>Sounds amazing!</td>
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</tbody>
</table>

11 to 16s

There are nine six-hour themed programmes for students aged 11 to 14, which encourage young people to apply their STEM skills to real-life and imaginary contexts. Three of the programmes focus on science, three on D&T and three on STEM subjects.

Three six-hour programmes for 14 to 16s encourage young people to go a step further, and think about STEM skills and their own future. Again, each programme focuses on either science, D&T or STEM subjects.
STEM sets

Some of these fun-filled and exciting themed sets for the 11 to 16 year olds are designed to be cross curricular, which enable STEM Club leaders to work with other subject specialists on the activities they have less experience with. These STEM-based activities are a perfect opportunity to work closely with STEM Ambassadors, using their expertise to help you deliver a thrilling range of activities that allow students to combine and integrate their knowledge and skill sets from a broad range of STEM subjects.

Career links

The 14 to 16 year old sets combine employability skills with hands-on experimentation and build projects to help students see beyond the confines of the ‘classroom’ and link their ever broadening skills to the real world and to potential careers. These activities are again ideal to link with STEM Ambassadors and with local employers and industry. These activities will help students think ‘outside the box’ and will enhance their softer skill sets by using them in unique ways that will benefit any future project or piece of work they are involved with.

All of these programmes are available on the STEM Clubs website.
7 Finding support

Where can you find support?

STEM Clubs Programme

One of the best support mechanisms available to a STEM Club is the STEM Club Support Programme itself. The programme brings together a wealth of assistance from the STEM Club Coordinator, the STEM Learning subject specialists, STEM Ambassadors and, of course, Club leaders. The programme is available to any STEM-based Club, whatever the subject, Club network, age or ability of the students. The support programme is here to provide Club leaders with the comprehensive help they need.

The STEM Club Coordinator can help Club leaders find information, answer questions, point in the direction of resources and generally be on hand to help. Calling on expert knowledge from subject specialists, STEM Ambassadors and partner organisations the support programme will help all Club leaders expand and sustain a successful STEM Club. Club leaders can email: stemclubs@stem.org.uk to directly access the support team.

The STEM Club community group

Many Club leaders have a wealth of knowledge and experience which can really benefit other Club leaders. The STEM Club Community Group is an excellent way to share best practice, hints and tips on activities, find resources, post ideas and engage in lively chat and know that whatever help you need a friendly member is there to help. Club leaders can use the community group to collaborate and network with each other, or even work on joint projects and share mutual interests.

The Community Group is available through the STEM Clubs website and is monitored throughout the day so there is always someone around to offer advice and assistance. It is also a great way to find out about upcoming opportunities such as CPD courses, challenges, competitions and new activities and resources being released.

STEM Club videos

The support programme has a number of helpful videos to assist Club leaders to set up and run a successful STEM Club. These videos cover topics from the benefits of setting up a Club, the practical considerations, through to what to do and how to do it. Club leaders from across the UK share their experiences and advice.

In addition to the Club videos are a series of supporting videos that accompany the STEM Club themed activities. These show subject specialists and Club leaders working on some of the activities with hints and tips to get the best result.

You can find the video resources on the STEM Clubs website.
Finding support

Science Learning Partnerships

Our Science Learning Partnerships (SLPs) combine local expertise in teaching and learning in science, facilitating CPD and providing school-to-school support. They are led by local teaching school alliances, schools and colleges with excellence in science, higher education institutions and other local partners with cutting-edge expertise in science.

They are a valuable resource for STEM Clubs and Club leaders can find their local SLP [here](#).

STEM Ambassador Hubs

The regionally-based STEM Ambassador Hubs can help STEM Clubs find activities and resources within their local areas, as well as finding a STEM Ambassador to help take part in Club activities. The Hubs are able to link schools, colleges and STEM Clubs with local employers and access the STEM Ambassador programme. STEM Clubs can contact their local Hub contact through the [STEM Ambassador website](#).

STEM Directories

The [STEM Directory](#) is a database of providers offering STEM enhancement and enrichment to schools and colleges locally and nationally. Teachers can easily search for shows, workshops, debates, challenges, visiting speakers and more. Here you will find exciting opportunities for in-class support, memorable days out and engaging projects to motivate your students.

Local industry

STEM Clubs are surrounded by opportunities to liaise with local businesses and industry. Not only can they provide STEM Ambassadors, resources or funding, they can also provide the added benefit of site visits, student mentoring on bespoke projects and even the use of facilities or equipment. Often the parents of your Club members will have links with the local employers and can help you develop a relationship. They may even help your Club members with their employability or key skills, providing opportunities to present a project or idea to them. Contacting local newspapers to support a Club activity or local radio station can raise awareness of not only STEM subjects and their benefits but also how hard you and your students are working. Raising your profile will help raise awareness with local industry and help the sustainability of your Club in the long term.

STEM Learning offers a wealth of case studies, resources and other information useful for STEM Club leaders, in addition to this handbook. There are many other organisations that can provide you with support, some of which are listed over the next few pages.
Finding support

The Association for Science Education (ASE)
The ASE is the largest subject association in the UK. It runs CPD conferences, TeachMeets and regional events, and members can access journals written by exciting and experienced science educators in the UK and beyond. ASE publications provide advice, support and information to all those involved in science education.

The Big Bang Fair
The Big Bang UK Young Scientists and Engineers Fair is the largest celebration of STEM education for young people aged 7 to 19 in the UK. Held in Birmingham each year, the fair is an award-winning combination of exciting theatre shows, interactive workshops and exhibits, and careers information from STEM professionals. The Big Bang Fair also hosts national competitions, inviting young people from across the UK to compete for, amongst other things, the title of UK Young Scientist and UK Young Engineer of the Year. In addition to the main fair, The Big Bang Near Me events take place around the country all year round.

Centre Bloodhound
The BLOODHOUND Project centres on BLOODHOUND SSC, a supersonic car that is designed not only to go faster than the speed of sound (supersonic) but to over 1,000mph (1,600km/h). It will cover a mile in just 3.6 seconds. Their Ambassador programme aims to inform, advise and enthuse teachers, students and the general public about the project.

BLOODHOUND Blast is an online place to share and explore the BLOODHOUND Project and also science and technology in general. It is open to everyone and completely free.

Centre for Industry Education Collaboration (CIEC)
The CIEC produces classroom resources and teacher guidance to help highlight the links between classroom science and science-based industry.

Code Club
Code Club is a global network of volunteers and educators who run free coding Clubs to inspire the next generation, reaching an estimated 85,000 young people each week (November 2017). The network provides everything you need to run engaging and fun coding Clubs for 9 to 13 year olds in schools, libraries and community venues.

Code Club’s projects are easy-to-follow, step-by-step guides which help young people learn Scratch, HTML/CSS and Python while creating games, animations and websites. Active Clubs registered on our website also have access to extra resources, such as certificates and posters, and they get the chance to take part in exclusive competitions and giveaways.

CoderDojo
CoderDojo is a global network of free, volunteer-led, community-based programming Clubs for young people. Anyone aged from 7 to 17 can visit a Dojo where they can learn to code, build a website, create an app or a game and explore technology in an informal, creative and social environment.
Finding support

**CREST Awards: rewarding STEM project work**

The CREST Awards scheme is the only nationally recognised accreditation scheme for STEM project work, providing science enrichment activities to inspire and engage young people aged 5 to 19.

CREST offers educators an easy-to-run framework for curriculum enhancement, it is widely recognised as a mark of high quality for STEM project work, and is student led, encouraging young people to take ownership of their own projects.

CREST gives students the chance to participate in hands-on science through investigations and enquiry-based learning, supporting them to solve real-life STEM challenges through practical investigation and discussion.

“Completing a CREST Gold Award project in 1997 was not only a tremendous amount of fun, it set the course of my life in science. It was so exciting to experience how biological research was done in academia and industry, and what scientists really did in the world outside the classroom.”

**A CREST alumni now working for the University of York Science Education Group**

“The CREST Award scheme provides students with many opportunities for growth mindset, development and learning, and I feel privileged at having the opportunity to foster students’ interests in science, engineering, technology and maths.”

**A CREST teacher**

**ESERO-UK**

ESERO-UK has been established at the National STEM Learning Centre through funding from the European Space Agency (ESA) and the UK-Space Agency (UK-SA). ESERO-UK promotes space in the UK and the use of space to enhance and support STEM teaching and learning in the UK. ESERO-UK offers a wide range of resources, CPD and support to use space as a context to engage with STEM subjects.

The **Engineering Development Trust (EDT)**

The EDT delivers over 40,000 STEM experiences each year, for young people aged 9 to 21 across the UK, including:

- First Edition hands-on STEM activity days
- Open Industry in-company education experiences
- after-school family STEM events
- non-residential Routes into STEM courses
- residential Inspire skill development courses
- Headstart STEM experience courses at university
- Go4SET themed ten-week STEM projects
- Engineering Education Scheme real-life six-month STEM projects
- Year in Industry paid career development work placements

EDT’s range of work-related learning schemes provide opportunities for young people to enhance their technical, personal and employability skills through industry-led projects, industrial placements and specialised taster courses.

EDT helps to develop partnerships, building links between educators and industry employers, helping organisations reach talent and connect with young engineers and scientists across the UK.

**Go Science Girls**

Go Science Girls has fun science activity ideas for home educators of children up to nine years old, focusing on girls.
The Institution of Engineering and Technology (IET)

The IET offers a wealth of free curriculum-linked STEM resources for teachers, community group leaders and parents to deliver to young people aged 5 to 19. Information provided includes grant funding, information on scholarships and training to support STEM Club delivery and careers information. The education programme booklet can be downloaded from the resources page.

IET Faraday resources

The IET Faraday resources give a real insight into what it’s like to be a scientist, technologist or engineer working at the cutting edge of technology. You’ll find out about the problems that engineers face and the technologies behind their solutions. Browse the resources section and search for classroom activities related to all four of the STEM subjects for primary and secondary aged students.

Imagineering

The Imagineering Foundation introduces young people aged 8 to 16 to the world of engineering and technology through fun, practical, hands-on activities. Their Clubs allow students to meet working or retired engineers, gain links to industry and indulge in practical learning in real-world contexts. One of the guiding principles of the Foundation is to teach pupils that engineers are problem-solvers who search for quicker, better and less expensive ways to use the forces and materials of nature to meet today’s challenges. They aim to enthuse engineers of the future through national fairs, in-school challenges and Clubs.

Learn by Design

Learn by Design bring education to life by providing curriculum and extra-curricular support workshops to schools which cover a number of areas: STEM, Enterprise, Motivation and Fit for Life etc. Learn by Design work with partner organisations on in-school delivery activities which can be free to schools.

micro:bit

The micro:bit is a powerful teaching and learning tool that helps younger children to start learning coding and programming, acting as a springboard for further learning and more advanced products such as Raspberry Pi, but is also a great resource for using in lessons across the curriculum including science, maths, D&T, art and music.

The Polar Explorer Programme

The Polar Explorer Programme is an educational programme linked to the RRS Sir David Attenborough polar research vessel, which will launch in 2018. STEM Learning is working with NERC, British Antarctic Survey (BAS) and others to use this historic occasion to inspire the next generation of scientists and engineers.

Primary Engineer/Secondary Engineer

Primary Engineer/Secondary Engineer has developed a ‘STEM by Stealth’ educational approach to bringing engineering and engineers into primary classrooms and curricula. They offer a range of courses and programmes to build the skills and confidence of teachers of students aged 4 to 18, from one-day CPD courses to a Postgraduate Certificate in STEM Learning.

The Raspberry Pi Foundation

The Raspberry Pi Foundation is a UK-based charity that aims to put the power of computing into the hands of people all over the world. It provides low-cost computers that people use to learn and have fun. It develops free resources to help learners, trains teachers to support them, and delivers education and outreach provision to help more people use digital technology to get things done. Raspberry Pi’s programmes include Code Club and CoderDojo.
Finding support

Salters’ Institute
The Salters’ Institute offers the Salters’ Institute Chemistry Club Handbook, ideas for chemistry practicals and advice on finding support from industry.

Science Made Simple
Science Made Simple brings the brilliance of science to life with amazing, high energy interactive shows for schools and festivals. From football to game shows to pop songs and everything in between, they take the world around us and show the science that makes it work.

Smallpeice Trust
The Smallpeice Trust aims to inspire and support young engineers in the making who are daring enough to imagine. Smallpeice Trust STEM Days and Think Kits give teachers the tools they need to bring engineering to life at school for students aged 12 to 17.

STEM Clubs
STEM Clubs provides support for schools to establish or maintain a STEM Club, linking into the STEM Ambassador programme. The support consists of dedicated resources and supporting material, prepared schemes of work aligned to STEM subjects, online support mechanisms, club leader community group, handbook, support videos and access to dedicated support staff.

STEMETTES
STEMETTES tackles the challenge of stereotyping by making women in science more visible to young people. They have developed ‘STEM in a day’ school trips and, so far, they have taken over 300 girls into five industries. To find out more about opportunities visit the STEMETTES website.

Royal Academy of Engineering
The Royal Academy of Engineering has a long history of delivering STEM enhancement and enrichment programmes in schools to inspire the next generation of engineers and technicians.

At the Academy, resources created by teachers and engineers that aim to engage school students with science, technology and mathematics by placing these subjects in engineering contexts.

The Connecting STEM Teachers (CST) programme has created a national network of support for teachers across all STEM subjects, ensuring they have the knowledge and confidence to engage a greater number and wider spectrum of students in STEM subjects.

The programme utilises a ‘train-the-trainer’ model to disseminate training. Expertise at the Academy delivers STEM-related continual professional development to the teacher coordinators (TCs) working on the programme. The TCs, who are responsible for setting up regional networks of support for STEM teachers in their areas, then cascade the training via termly CPD and network meetings within their regions.

Solutions for the Planet
Solutions for the Planet is a STEM programme with a focus on sustainability and entrepreneurship. It is delivered in partnership with energy, utility and construction companies who support teams of students (in KS3) to generate solutions or ‘Big Ideas’ to sustainability issues. These Big Ideas are submitted to our competition with semi-finals held at a regional university and finals at the Houses of Parliament in London.
Finding support

**Thames Water**

Thames Water offers a comprehensive STEM-focused education programme; the programme includes free site visits, resources for primary and secondary schools, and the community speaker programme. STEM Ambassadors are available to support activities, eg interview days or careers workshops. The Network Challenge is a hands-on award-winning engineering activity which challenges students to cost, build and test a real water network.

You can find information online about the diverse range of STEM-based careers at Thames Water, from laboratory scientists testing water quality and civil engineers constructing water networks and waste treatment sites, to innovators of green technologies producing biogas from waste.

**Tomorrow’s Engineers**

The Tomorrow’s Engineers programme, led by the engineering community, provides a platform for employers to work effectively with schools to inspire more young people to consider careers in engineering. They offer careers information and activities, in-school workshops, challenges and run Tomorrow’s Engineers Week.

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**STEM Careers information**

One of the many benefits of attending a STEM Club is that it gives members an insight into the applications of STEM in the real world, particularly if you are supported by a STEM Ambassador or other representatives from industry. Members who remain in STEM Club should be encouraged to consider a future in STEM-related careers and may ask about signposting to information about STEM careers.

The following links may help STEM Club members find out more about potential careers.

**Career Kids**

A listing of STEM careers with more detailed links to each.

**Cogent – Science Industry Partnership (SIP) Ambassadors**

SIP Ambassadors are a network of industry professionals who engage, inspire and enthuse young people into careers within the science-based industries.

**Engineering UK**

A website dedicated to promoting engineering careers containing lots of useful news articles and promoting the Year of Engineering, 2018.

**Futuremorph**

A site that aims to show young people that science and maths-related subjects can help them with future employability and help children explore future possible careers.

**Maths Careers**

A website dedicated to providing information on careers that are maths related.

**Science Buddies**

Science website linking to many overviews of science and maths careers.
Finding support

Space Careers
A website created by UKSEDS (UK Students for the Exploration and Development of Space) highlighting routes into a career in space.

Start
Start helps schools and colleges to meet their statutory duties around careers guidance, combining the most comprehensive source of information with a personalised student experience and tracking capabilities to help teachers monitor student progress and engagement.

STEM careers toolkit
Help for teachers to embed STEM careers advice into the curriculum.

Tasty Careers
A one-stop shop for information on careers in the food and drink industry.

Tomorrow’s Engineers
A website focusing on careers in engineering with downloadable free class resources, presentations and careers posters.

Royal Society of Chemistry
Find out all about a future using chemistry, including job profiles.

Where STEM can take you
A digital toolkit for students and teachers making the link between STEM subjects and the world of work by Rolls-Royce.

WISE campaign
Downloadable ‘People Like Me’ careers packs and posters for students, covering a range of STEM careers from various industry sectors.

Career inspiration

“Our STEM Club works closely with local and national businesses, universities and learned societies such as the Royal Society.

“We regularly invite representatives in to work with our students to discuss the range of skills and personal attributes required by STEM employers. Projects such as Greenpower are a great way for students to see a multidisciplinary team working together to solve problems.

“This integration of each individual STEM discipline is essential and really echoes what the STEM businesses tell us about their ideal applicants.”

Jack, Pool Academy, Pool
Finding support

Continuing Professional Development (CPD) opportunities

CPD is crucial in schools and colleges and is particularly important for STEM Club leaders and helpers. Evidence has shown that schools and colleges who pride themselves on being learning communities and who share best practice can really improve student and overall school outcomes.

CPD can be invaluable for primary schools, where one of the main challenges in running STEM Clubs is lack of confidence in science teaching.

STEM Learning offers a range of CPD to suit everyone’s needs: from online and residential courses to bespoke CPD and Science Learning Partnerships. There are so many programmes available on a variety of subjects, including:

• carrying out practical work
• setting up and running STEM Clubs
• original and engaging ideas for STEM Club projects
• incorporating creative arts in STEM Clubs
• training for secondary school technicians for class and STEM Clubs

The benefits of CPD for STEM Club leaders include:

• gaining new ideas
• becoming a more engaging and effective teacher or technician and Club leader
• building confidence
• sharing experiences with others
• learning new techniques
• increasing confidence in practical science

The benefits of CPD at Harris Academy Greenwich, London

Harris Academy Greenwich took part in the CanSat Competition and part of the qualifying process was to attend a CPD session at the National STEM Centre, York.

Staff were treated to a great session where they were shown the techniques needed to prepare students to build their CanSat and compete with it in the competition. This took the form of talks and discussions with a designate from ARES (Association of Retired ESA Scientists) and experts in electronic engineering and programming. Staff participated in practical sessions as well, where they soldered header pins to boards, programmed them and saw them work.

The sessions provided staff not just with new knowledge and skills, but also the confidence to pass it on to their students.

“CPD such as this is very important for both students as well as staff, learning and experiencing something new, outside of your comfort zone, enthuses and excites!”

Keith Jones, teacher, Harris Academy Greenwich, London
Types of CPD

Bespoke CPD

STEM Learning offers bespoke courses that can be created to suit your particular needs. There are bursaries available for state schools to cover the cost of the courses, including any residential needs.

Residential CPD

For a more intensive approach to CPD at the National STEM Learning Centre and the chance to work with state-of-the-art equipment with colleagues and experiences practitioners, these residential courses have been designed to really impact your teaching so you will see maximum improvement in students’ progress.

Online CPD

Online courses allow you to learn at your own pace from wherever you want. The free-to-access programmes range in topics from Assessment for Learning in STEM teaching to Practical Science teaching techniques and Approaches for technicians as demonstrators.

STEM Insight

Our research has shown that despite teachers being the major stimulus in a student’s career choice, 82% of teachers think they need more knowledge to offer advice. The STEM Insight programme provides placement opportunities in either an industry or university setting, providing school staff the opportunity to learn about careers for students studying STEM subjects from a fresh perspective.

IoP – Stimulating Physics

Stimulating Physics provides bespoke support for all teachers of physics – for specialists in biology, chemistry, maths – and physics.

TalkPhysics is a place for STEM teachers, technicians and trainers (plus a few others) to share ideas, events, network, get advice, and more generally, talk physics. Managed as part of the Stimulating Physics Network, they offer Summer Schools, open to all non-specialist teachers of physics at Stimulating Physics Network Schools.

The Stimulating Physics Network also provides mentoring networking opportunities and support for physics teachers in the early stages of their career.

Science Learning Partnerships

Science Learning Partnerships enable schools and colleges to partner up with local institutions of excellence to develop their science teaching.

Teacher training days

Primary Engineer run day-long courses in industry settings to help with the delivery of engineering projects. Courses are also offered on many other subjects, ranging from coding to 3D printing.

The STEM Exchange matches teachers from colleges and training providers in FE with local industries who support in professional development opportunities.
STEM Ambassadors

Who are STEM Ambassadors?

STEM Ambassadors are volunteers from a wide range of jobs and backgrounds who are passionate about inspiring young people to pursue STEM studies and careers. With a community of over 30,000 volunteers, they are an invaluable, free of charge resource for STEM Club leaders, teachers and other individuals working with young people across the UK.

What do they do?

STEM Ambassadors help young people to understand why STEM subjects are important and how they can be applied in the workplace. They share their STEM expertise and experience of the workplace to enrich young people’s knowledge of the breadth of careers and opportunities available.

Evidence shows that STEM Ambassadors inspire young people to better engage with, and continue to study, STEM subjects and explore STEM careers.

How do STEM Ambassadors support STEM Clubs?

STEM Ambassadors get involved in a variety of activities, both in and outside of the classroom, including speed networking, large festivals, and fairs and careers talks. They can support your STEM Club in a range of ways, by offering:

- specific skills and knowledge
- resources and activity ideas
- careers and employability
- regular support

STEM Ambassadors can really enhance the Club experience, offering a link to STEM industry and helping leaders to deliver activities that they may not have the experience or capacity to provide.

How can I request a STEM Ambassador?

You can request a STEM Ambassador to help you inspire the young people you work with by registering here or by contacting your local STEM Ambassador Hub.
How can you sustain your Club once it is set up?

Once you have got your STEM Club off the ground, it’s important to keep momentum interest going. Ensure you have a full programme planned for forthcoming weeks and display this in your school or venue for all to see. If you are a school or college STEM Club try to ensure the Club is as integrated as possible within the school or college, to ensure that the benefits of the Club are visible to the whole school or college.

Ideas to consider:

- run one-off events and drop-in sessions to attract new members and staff
- review impact, progress and student satisfaction each term, and add in new ideas to keep sessions feeling fresh
- if students struggle or become frustrated with their long-term project, encourage them to take a break and work on something lighter and more fun, before they return to their project
- reward students for their continued engagement, for example, with field trips
- encourage students to spread the word by writing articles and newsletters, or by running a demonstration in assembly
- recognise students’ commitment by offering them positions of leadership, eg running STEM Club masterclass sessions or lunchtime clinics where the students advise younger students on STEM subject-related issues
- include sessions on cross-curricular, transferable skills, eg presentation skills, writing reports
- focus on making the Club a fun-filled, relaxed environment and celebrate all achievements – big or small
- apply for funding opportunities and reach out to local industries for support
- undertaking CPD helps Club leaders to think outside of the box and apply what they learn across all their work

How can you enhance your STEM Club?

Raising your Club’s profile

Raising the profile of your STEM Club across the school community is a good way to gain more exposure and support. If you are not a school STEM Club, share news of your Club with local press and via social media to spread the word and ensure continuing members.

Support on your doorstep

- share any news about successes with your senior leadership team and school governors. Any news about competitions entered, feedback received, visitors or improvements to attainment levels will be enthusiastically received
- don’t be afraid to ask for support. You may find that parents and governors have links to industry or universities, or have colleagues who may be able to come to the Club and support a session or provide opportunities for students to try outside of school
Enhance and sustain your STEM Club

Media coverage
- contact the local media about your STEM Club and its progress, especially if you are about to take part in an event and, if possible, create a relationship with a named person for future benefit
- print is an obvious media outlet but do not discount radio and TV. Spread the word and opportunities may become available
- you can also publicise the Club online and via social media. The more you spread the word, the more interest you will generate. Making links with local employers and universities becomes easier once the profile of the Club has been raised in some way and may provide opportunities for students, such as work experience
- youth groups should ensure STEM Club news is passed on to any national websites for your organisation

Displays
- ensure you have a dedicated space in your setting to display news from the Club
- ensure this is kept up to date, particularly around events such as parents’ evenings and open evenings at school or college or in any correspondence you make to parents

Raising the school’s profile at the Manchester Creative & Media Academy, Manchester
One of the favourite competitions of students at Manchester Creative & Media Academy was an Eco Competition where they had to design a greener school. Students really bought into the concept. The competitive edge made the students really up their game. They now take robots they make to competitions every year and this has really enhanced their teamwork skills and raised the profile of the school.

Raising your Club’s profile
“To publicise the Club, use posters, wall displays and PowerPoint presentations during assemblies, and set up in the main foyer.
“Twitter is a great way to connect with parents and raise awareness of the activities being carried out.”
Claire, Knightswood Secondary, Glasgow
Events, awards and competitions

Parents’ evenings and STEM fairs

- run a STEM fair, either as a standalone event or as part of a parents’ evening or open evening, so that students can present the work that they have done and hone their presentation and communication skills
- primary schools could hold a regular STEM Club evening, where parents can take part in some of the activities their children have been doing and help support them going forward. Many students’ views of careers start at home and having parents come into the Club enables students to show parents what they do and help home-school links at the same time
- secondary school or college Club members can develop their confidence by presenting their STEM Club activities in primary schools
- colleges and secondary schools should look into opportunities to visit conferences, such as The Young Scientists’ Journal Conference (for older students), which give students a unique opportunity to meet scientists and gain valuable feedback on their work

Awards

With the backing of your leadership team you can introduce an awards scheme in your Club, like the British Science Association CREST Awards, to recognise the achievements of Club members.

Deciding on an appropriate scheme of accreditation when you set up your Club will help embed activities into a coherent framework. Various schemes offer certification, qualifications or UCAS recognition.

Benefits of awards

- awards give students accreditation for their work, allow them something tangible to add to college or university application forms, raise confidence and show how they have progressed over time
- CREST Gold Awards can also raise school credibility and enhance school links with industry
- awards ceremonies sponsored by local businesses are a good way to secure additional publicity
- raise confidence and show quality of work students have achieved

Your school’s science department can even become accredited with a Science Mark in recognition of inspiring practice or a Space Education Quality Mark to reflect your achievements in using space to enrich the curriculum.

Competitions

There are so many competitions available for STEM Clubs to take part in. Students can use the experience and recognition to enhance university applications, meet other schools or colleges and STEM professionals, and gain transferable skills, such as presentation and time management skills.

Benefits of competitions

- competitions can give activities a focus and motivate students with a clear aim
- being involved in a competition can help with employability skills and help promote the school
- students are given the opportunity to excel and see what other schools do in the same situation
- development of employability skills
- development of confidence in public speaking
The benefits of trips and competitions

“We took our pupils to the regional Big Bang Fair and this year three of the teams have been put forward to the Big Bang Finals in Birmingham 2018. We also took part in Water Explorers – this encourages students aged 8 to 14 from across 11 countries and 2,800 schools to take bold and powerful action to save our precious water through fun, interactive water-saving ‘Missions’.

“We came in the top four schools by collecting points and were taken to London to the HSBC Headquarters in Canary Wharf in September 2017. We were judged to be the National Winners of Water Explorer and gained a place in the International Finals which were held in London in October.

“The two visits to London were an incredible experience for my STEM students and seeing their success adds to my personal job satisfaction immeasurably.”

Meryl, Corbridge Middle, Corbridge
Some inspirational challenges and competitions

**The Alu D&T Challenge**
The Alu D&T Challenge has been created to inform and enthuse young people about aluminium and the valuable contribution it can make towards a more sustainable way of life.

**The Better Energy School Awards**
A regional competition with 50 chances to win for primary schools with environmental projects.

**The Big Bang competition**
The Big Bang competition asks young people to showcase their STEM projects and recognises and rewards their achievements.

**The BP Ultimate STEM Challenge**
A competition run by BP, STEM Learning and the Science Museum, whereby students aged 11 to 14 choose a challenge and put their STEM skills to the test.

**British Science Week poster competition**
Annual competition to design a themed poster for schools and youth groups.

**CanSat**
The CanSat competition provides students with the opportunity to have practical experience working on a small-scale space project. Aimed at school and college students over the age of 14, CanSat is a European Space Agency competition.

**Cisco Little Big Futures**
Cisco and STEM Learning have launched Little Big Futures with a collection of five one-hour lessons across the STEM subjects and for STEM Clubs. These resources introduce upcoming technologies that will soon be part of everyday life and give your students the opportunity to be creative with their learning and explore careers education.

**Greenpower – Greenpower Education Trust**
Teams have to design, build and race their very own electric powered car in the four following categories:

- **IET Formula Goblin** (9 to 11 years old)
- **IET Formula 24** (11 to 16 years old)
- **IET Formula 24+** (16 to 25 years old)

**The F1 in Schools Technology Challenge**
F1 in Schools is the only global multidisciplinary challenge in which teams of students aged 9 to 19 deploy CAD/CAM software to collaborate, design, analyse, manufacture, test and then race miniature compressed air powered balsa wood F1 cars.

**The F1 in Schools – Jaguar Primary School Challenge**
This competition engages with primary school students and teachers across the UK in the same way as the Secondary School Challenge. The challenge is open to students aged 5 to 11 years old and involves designing and manufacturing the fastest car possible, emulating the design and engineering processes employed by real engineering companies, such as Jaguar Cars.

**First LEGO League competition**
This science and technology challenge asks teams of students to work together to explore a topic and design, build and program an autonomous robot to solve a series of missions.

**The Google Science Fair**
The Google Science Fair is a global online competition open to students aged 13 to 18.
Enhance and sustain your STEM Club

IET Faraday Challenge Days
An engineering-based competition for secondary schools to get students aged 12 to 13 competing against each other to see who can design, create and promote the best solution to a challenge.

Land Rover 4x4 in Schools Technology Challenge
The challenge involves between three and six team members (11 to 19 years old) working together to design and build a radio controlled four-wheel drive (4x4) vehicle, to set specifications. The vehicle must be able to successfully negotiate a specially designed test track emulating real life and it must perform as a full-scale 4x4 vehicle would do in an off-road situation.

Leaders’ Award
The Leaders’ Awards ask children to consider what they would do if they were an engineer.

Manchester University Animation competition
A competition for young people aged 7 to 19 to make a one-minute animated film on their computers.

The Scrub up on Science competition
A competition to get secondary students thinking about the chemical processes involved in cosmetics and personal care products.

STEM Ahead!
A competition from the University of Hertfordshire for STEM teachers to show how they engage students in STEM.

STEM Learning classroom display competition
An opportunity to share your classroom displays linked to STEM and win gift vouchers.

TeenTech Awards
A problem-solving and innovation competition for secondary students to see how they can apply science and technology to real-world problems. Schools can win up to £1,000.

UKRoC – The UK Youth Rocketry Challenge
A competition for students aged 11 to 18 from any secondary schools, colleges, educational facilities or youth groups to design, build and launch a model rocket with a fragile payload. The UK winners get the chance to compete against teams from France, the USA and Japan at the international finals.

Uncover copper
A chance to design posters around the applications of copper.

Vex Robotics
VEX competitions bring STEM skills to life by tasking teams of students with designing and building a robot to play against other teams in a game-based engineering challenge.

Other trips and events
Getting your Club out and about also makes others more aware of you and what you do.

• some locations will put on special events for you and some will let you organise your own event on site
• many destinations have risk assessments available for you to use when planning your trip
• events or competitions held by an external organisation allow your Club members to exhibit on a national scale, for example the National Science and Engineering competition held at the annual Big Bang Fair
• trips to local industry, special events, museums and science centres to keep students engaged
Linking up with others

Linking up with Clubs in other schools, colleges or groups is a great way to raise your profile as well as offering access to more staff, more space, more equipment and even possibly more funding. This can be particularly important for primary schools. You can organise joint events, such as STEM fairs or competitions, arranging to share equipment, holding joint planning sessions – they can all contribute to making your STEM Club more effective.

Linking benefits for primary schools
- ability to access more resources and funding
- opportunity for children to experience secondary science and prepare them with scientific thinking and planning
- joint funding may allow schools to collaborate on projects or in competitions
- opportunity to use space you may not have in your school premises
- boosting attainment and trying activities that are not always possible in a mixed ability class

Linking benefits for secondary schools
- ability to involve feeder primary schools and help in transition programmes
- sharing best practice with feeder primary schools
- promoting your school to potential future students
- linking to other secondary schools may allow access to more equipment
- joint funding may allow schools to collaborate on projects or in competitions

Linking benefits for colleges
- ability to access more resources and funding
- opportunity for members to experience other equipment and access resources not available to you
- joint funding may allow colleges to collaborate on projects or in competitions

Linking benefits for youth groups and home educators
- opportunity to share experiences and activities developed by others
- joint funding may allow groups to collaborate on projects or in competitions
- opportunity to share resources
- opportunities to learn from promotional activities
- opportunity to share best practice

Linking benefits for colleges
- ability to access more resources and funding
- opportunity for members to experience other equipment and access resources not available to you
- joint funding may allow colleges to collaborate on projects or in competitions

Linking benefits for youth groups and home educators
- opportunity to share experiences and activities developed by others
- joint funding may allow groups to collaborate on projects or in competitions
- opportunity to share resources
- opportunities to learn from promotional activities
- opportunity to share best practice
Over to you! Checklist for success

Hopefully this guide has inspired you and you are raring to go, either starting up or enhancing a STEM Club that will deliver an enriching experience for Club members and benefits for all involved.

Here is a checklist of ideas to keep you focused on the goal: starting and then maintaining a successful STEM Club.

- Think about your objectives – and how you will measure impact
- Collaborate: teachers, technicians, helpers, volunteers and supporters – individuals and from organisations
- Reflect on other Club models
- Think about how to get the right members involved
- Think about logistics – from exciting locations to resourcing and health and safety
- Plan an exciting programme of activities
- Enhance Club leader skills – think about CPD
- Raise your Club’s profile
- Organise trips and competitions
- Link up with others
- Get parents involved
- Spread the word
STEM Centre – Barking & Dagenham College, London

The STEM Centre at Barking and Dagenham College runs a diverse programme of activities for children and young people. It aims to “widen access and ensure that even the most disadvantaged groups have opportunities to undertake STEM-related programmes.”

The STEM Centre staff developed and piloted a three-week CSI programme for learners from the Flexible Learning programme, which is managed by Barking & Dagenham Borough. These are young people aged 14 to 16 who are no longer in mainstream education.

The STEM Centre worked with a cohort of ten learners for three weeks, each session lasted on average for two and a half hours. Each week’s tasks, whilst entirely self-contained, prepared the learners for the activities of the following week.

The programme

During the first week, the learners were given clear instructions about the programme and what the staff expected from them. In order to solve the murder ‘crime scene’, students were trained up in fingerprint techniques, blood spatter analysis and e-fits (electronic facial identity techniques). This was a hands-on activity where they played different roles such as crime scene investigators and forensic laboratory scientists.

In the second week, the learners worked as a team of investigators. They learnt how to dress appropriately when they enter a crime scene, the importance of crime scene preservation, forensic photography and how to collect and bag the evidence; also, the location of the different labs that the pieces of evidence should be sent to for analysis.

The third week was assessment week. All the skills and knowledge acquired during the previous two weeks were individually assessed in the form of a mock-up crime scene. Learners received instructions on the requirements for the successful completion of a prepared assessment sheet. This was a timed sequential summative assessment.

For the assessment, the learners were required to work independently. They donned their PPE and collected their tools. They had to photograph, draw, collect, bag and label their evidence, giving valid reasons why they were collecting that particular evidence.

They had to write up their crime report on specific headed paper, with complete justification of their decisions. Finally they had to interview different ‘witnesses’ in order to recreate the identity of the criminal using computer software.

Impact

The learners demonstrated an admirable degree of literacy and analytical logic. They were empathetic in their questioning and in listening. They also demonstrated other transferable skills such as time management, problem solving and initiative. At all times they showed respect and dedication to the task in hand.

It can be concluded that the STEM Centre in particular, and STEM Clubs in general, provide an invaluable source of development and enrichment in the lives of young people and children, including those excluded from mainstream education.

A STEM Centre or STEM Club may be able to focus resources, time and attention in a creative, specialised way not readily accessible to the teacher having to deliver a curriculum. Each session should celebrate the success of each individual, and inculcate an enjoyable feel-good atmosphere. The enjoyment and enthusiasm of the people leading out is critical and contagious; STEM Centres or STEM Clubs may play an important role in the well-being, attainment and success of children and young people.
Embracing 'chaos' in your Code Club

Code Club’s Senior Content and Curriculum Manager, Rik Cross, runs a Code Club in his local school in Leeds. He explains how his Club makes the most of the high energy and enthusiasm of the pupils.

1. Pupils work on different projects. They are personalising their learning, working on a project that interests them, at their own pace. I’ve known children skip projects that don’t interest them, or spend weeks on a project that captures their imagination. Some children may, after completing a handful of projects, decide that they have enough knowledge and skill to build something of their own.

2. Pupils move around a lot. They look around at what others are making, getting ideas and inspiration. They often invite others to play (ie test) their finished projects, and then make improvements based on feedback they receive. Pupils get a lot of motivation from seeing others huddled around their computer, playing with and enjoying a project they made. For this reason, pupils often make sure that their project is of high quality before allowing others to play with it.

3. It can sometimes get loud. Pupils ask each other questions, and move around the room to help each other out. They test each other’s projects, giving verbal feedback, sharing ideas or even just having fun with the things they’ve created. When pupils are motivated to create things that interest them, I think it’s important that they have time to enjoy the things they’ve made.

4. Children play games. My Club use online Scratch, and so as well as playing each other’s games they do get time to play other Scratch projects online. Obviously it’s important that this doesn’t dominate a Club, but I think children learn lots about what’s possible with Scratch – especially when moving past the basics. Posting their own creations online is also a great opportunity for children to get real feedback from the community.

What some volunteers call ‘chaos’ is in fact part of the fun, and part of the learning experience: it is how pupils show the excitement and enthusiasm they feel when making things with computers. All this differentiates a Code Club from regular computing classes, so I always advise volunteers to embrace it!
### CREST Awards best practice tips

Without being tied to the curriculum, a STEM Club offers the opportunity to be creative, and allows both you and your students to follow your passions.

L. Nickerson, a science teacher, has enjoyed running a CREST Awards STEM Club for many years. Here are her top tips:

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<th>Tip</th>
<th>Description</th>
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<td><strong>S: Start simple</strong></td>
<td>Make sure that everyone joining the Club enjoys taking part by running initial sessions based on tried-and-tested activities that you know will work successfully in the time available. Once the students are hooked, you can introduce bigger challenges.</td>
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<td><strong>T: Teamwork</strong></td>
<td>Work with others to share the load. Invite in other teachers, parents, STEM Ambassadors or local companies to help with activities or projects. Find a few keen older students to help on a regular basis. Never do anything a student can do – get them to take a register, carry the equipment, clear up, write thank you cards to visitors, write instructions on the board – so it becomes their Club, not just yours.</td>
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<td><strong>E: Enthusiasm</strong></td>
<td>Your enthusiasm will rub off on the students, so make time to get to know them, join in with the activities and share your enjoyment of STEM subjects.</td>
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<td><strong>M: Mishaps</strong></td>
<td>Cultivate an atmosphere where it is okay to fail and what is important is taking part. If something goes wrong, help students to work out why and then have another go, as that is what scientists and engineers do.</td>
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<td><strong>C: Competition</strong></td>
<td>Most activities can be turned into mini competitions: which paper plane can fly the furthest? Whose slime is the most stretchy? Which group’s hydrogen pop is the loudest? Let the students work out how to measure and record the results.</td>
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<td><strong>L: Low cost</strong></td>
<td>Activities don’t need to be expensive. You can have a best helicopter competition using scrap paper, paperclips, scissors and a stairwell. You can base activities on newspaper (building bridges), empty drinks cans (coke can racers, implosions), eggshells (what are they made of?) or conkers (making soap), or if it’s sunny you can make a solar cooker with cardboard boxes and foil.</td>
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<td><strong>U: Unexpected</strong></td>
<td>Once you feel confident, introduce some more open-ended activities where you don’t know what the outcome will be – now you are doing ‘real’ science and you and the students can experience the thrill of making your own discoveries.</td>
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<td><strong>B: Be prepared</strong></td>
<td>Anticipate potential problems – make sure you have plenty of equipment and supplies for an activity. The students will make more mess than you think, spill things and use up all of whatever you put out. Always do a risk assessment.</td>
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<tr>
<td><strong>S: Surprises</strong></td>
<td>Have plenty of variety. Follow several weeks of working on a group project or CREST Awards with a short, one-off challenge. Take advantage of unusual weather – use snow to make your own ice cream or in a heatwave run outdoor activities involving water. Try quizzes or treasure trails with a STEM theme. Just don’t be surprised when your STEM Club is successful!</td>
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“Give them the time and the space to wonder. Give them the means to be inspired by each other and to discover and question the world around them.”

Katy Hancock, science teacher
The Royal Academy of Engineering – developing engineering habits of mind

The ways in which young people learn about science, technology, engineering and mathematics (STEM) subjects has fundamentally changed in the past decade. More than ever, young people now have opportunities to learn STEM subjects in a wide variety of settings, including after school clubs, summer programmes, museums, parks and online activities.

At the same time, STEM-related learning outside of the timetabled day has become a focal piece of the education opportunities provided by many national organisations and education networks. There is growing evidence that opportunities to learn STEM subjects after school affects what is possible inside classrooms, just as what happens in classrooms affects out-of-school learning.

The values of an extracurricular and STEM-related cross-curriculum are well documented. These include:

- increasing advanced training and careers in STEM fields
- expanding the STEM capable workforce who serve as STEM educators, technicians and other STEM-related careers
- increasing scientific literacy among young people, supporting life-long interest and engagement with STEM subjects
- positioning STEM subjects as socially meaningful and culturally relevant
- supporting collaboration, leadership and ownership of STEM learning
- positioning staff as co-investigators and learners alongside young people
- engaging young learners intellectually, socially and emotionally

Engineering habits of mind

Learning to be an engineer presents a different way of framing the challenge of promoting the value for more young people to continue studying STEM subjects in and out of the classroom and to consider engineering as a suitable career for them. Essentially, the project suggests that in order to attract more young people into engineering three things need to happen in schools and colleges. We need to:

- move away from a focus on disciplinary knowledge (subjects such as mathematics and science) and develop a better understanding of the ways engineers think and act using engineering habits of mind (EHoM)
- describe the teaching and learning methods most suited to cultivating EHoM
- build teacher capability through professional development to embed EHoM into their everyday teaching

The Academy’s Learning to be an Engineer research project supported teachers to embed EHoM into their everyday teaching. Here, you’ll find some of the outputs of the project: case studies, resources created by the teachers and background information about the project and its partners.
STEM Learning is supported by a unique partnership of government, charitable trusts and employers. We are dedicated to raising young people’s engagement and achievement in STEM subjects and careers.

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