



# STEM By Nature: Skills and Enquiry

STEM (Science, Technology, Engineering, and Maths) is an important context for learning. The most urgent, challenging issues for individuals and society, locally and globally, have STEM and nature at their core, helping with our understanding of the problems and identifying potential solutions. Issues such as sustainability, climate change and managing the planets natural resources are all challenges that can benefit from the work of Mathematicians, Scientist and Engineers.

Taking learning outdoors engages people in active ways and gives opportunities for learning in real life contexts. Nature provides rich, multi-sensory experiences that can be a catalyst for curiosity and an important starting point and context for STEM learning.

Moving beyond 'STEM subjects' to STEM skills is perhaps a more inclusive approach to STEM Learning. 'STEM subjects' can be seen as exclusive, as technical areas where you have to be an expert yourself to engage with it. However, by looking at STEM skills, it becomes much more accessible and inclusive, and can really be related to almost any learning activity.

The important thing is to be explicit with learners about the development of STEM skills. This includes finding out more about STEM Skills, which skills learners are good at already or where they would like to make improvements. It is useful to consider how progression in STEM skills can be developed and observed as we engage in activities outdoors. We can also consider how STEM Skills relate to STEM subjects.

There are several different examples of identifying STEM skills:

## [STEM employability skills](#)

STEM Learning conducted a survey of STEM employers asking what skills they value in their employees. This is differentiated towards secondary schools and older pupils who are looking towards employment opportunities.

STEM By Nature has taken the STEM learning employability skills and simplified them to just single words to make connections with activities outdoors and make it easier to review skills development. Participants are asked to



reflect on an outdoor activity, identify which STEM Skill they are developing and their personal contribution.

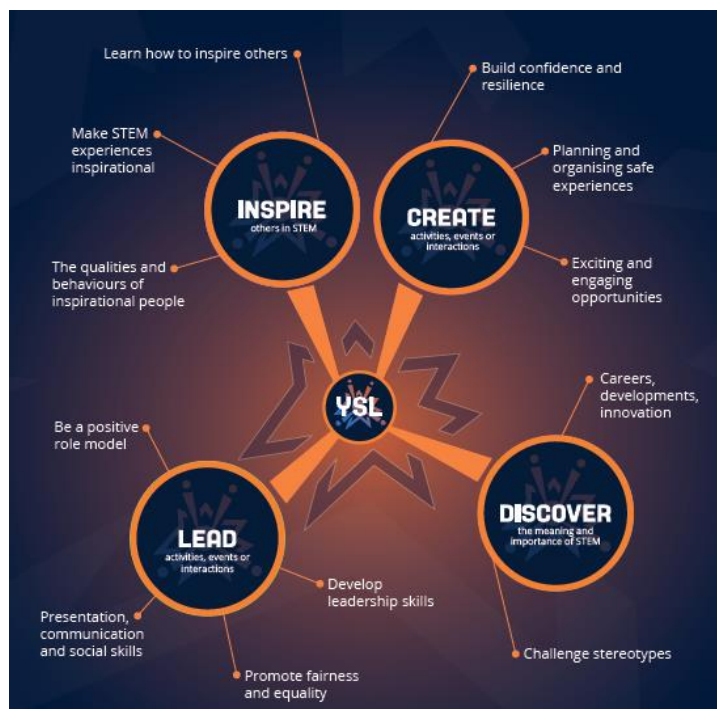
STEM Skills	Numeracy/ IT Skills	Problem solving	Valuing diversity
	Negotiation	Teamwork	Communication
	Deadlines	Adaptable	Organisational
Initiative			

### Young STEM Leader Award

The Young STEM Leader Programme (YSLP) aims to inspire more young people to develop an interest in STEM and pursue the study of STEM subjects and relevant future pathways.

YSLs to develop important leadership, communication and employability skills (see diagram below).

Working towards a YSLP Award motivated young people to continue to progress their STEM studies and perhaps eventually embark on a career in STEM. Above all else, this programme aims to promote STEM curiosity in young people and to encourage them to learn about the world around them in a fun and engaging way.



The programme is offered in two versions: Non-formal version, digitally badged or certificated and formal version, SCQF credit rated by SQA. See more information on the Young STEM Leader [You Tube Channel](#)

## Pupil/learner enquiry

Pupil enquiry refers to learners deciding for themselves, carrying out their own independent investigations, with teachers adopting a facilitator role to develop skills and nurture inquiring attitudes. The process of enquiry, when done well, makes any topic a STEM topic. Learning via the enquiry method is more of a student-centred approach, allowing them to take control of their learning. Learners gain not only a deeper understanding for the subject but also the knowledge development and leadership, critical thinking skills required for tackling complex problems in the real world.

The models of enquiry below are taken from various sources and show how enquiry can be differentiated for different audiences, but in essence the process is the same. Some of the models are shown as a cycle, leading to more questions, and more investigations rather than enquiry that is linear as a process.

### *Issues Tree*

A useful way of structuring an enquiry to encourage learners to explore the causes, effects and solutions of a given issue. You could do this outdoors using a real tree, drawing a large tree in the school grounds or making a tree outline out of natural materials. You could then use labels for young people to fill out with their ideas. Once you have your tree/outline, label the trunk with the chosen issue, the roots with the causes of the issue, the branches with the effects of the issue, and the leaves with possible solutions/ actions. Use this to prompt discussion about what is already being done internationally and in UK to combat climate change. Add these actions to the issues tree and consider how you can make a difference. See example [Climate Action Issues Tree](#) mini film.



### *Development Compass Rose Frame*

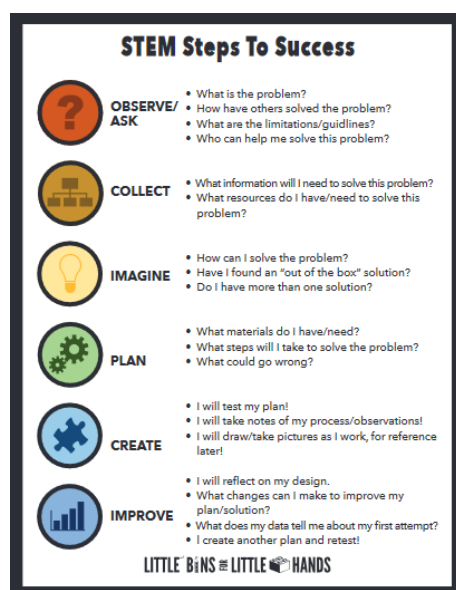
This [framework for raising questions](#) encourages various angles of enquiry about development issues in any place or situation. Look at a real landscape and ask questions around 'What has this got to do with me?' - personally, locally, globally. See below for Compass Rose sheets to run this activity outdoors. Cut out the middle square so that you can see a view of your surroundings to prompts questions. Quick review: ask what came up in discussions e.g. view of a car in the landscape might prompt a discussion around accessibility, pollution and air quality.

## Outdoor Journeys (Process of Enquiry)

Learners generate questions and answers about their local landscape, prompted by going on outdoor journeys outside the classroom. Outdoor Journeys involves three phases that can be repeated over and over:

- Questioning: Pupils begin by going on a journey outside the classroom. The purpose of this journey is to generate questions about the socio-cultural, physical and environmental nature of their schoolgrounds and local surroundings. Jotters and digital cameras are useful for making notes and taking photos about items to be researched. The questions can be posted on the classroom walls.
- Researching: Pupils search for answers to their questions. They can use a variety of sources, such as the internet, books, historical documents, museum catalogues, and photographs. They can invite local experts into the school to provide first-hand knowledge. Quite often, pupils may need to go on another journey to answer their questions.
- Sharing: Pupils share the knowledge they have gained in a variety of creative ways. Examples include drama, dance, song, art, poetry, podcasts, presentations, and posters. They can share with their peers, whole-school or local community.

Ref: [Outdoor Journeys in Secondary Schools](#)



### *STEM Steps to Success*

A STEM design process from start to finish with the following steps: observe/ Asks, Collect, imagine, plan, create and improve. Including lots of prompting questions for each step (appropriate for Primary and secondary ages [Little Bins for Little Hands](#) ).

### *Inquiry-based Learning*

This simple cyclical model can be applied to many subjects. When using this method with STEM subjects it can allow more freedom for learners to develop their own research interests and take responsibility. This flexibility and the focus in this model on active investigation and creation often leads to greater engagement from learners. For more info see [Royal Society of Chemistry](#)

Image Credit: <http://www.sagevista.org>



### *Geographical Route to enquiry*

Traditionally this has a more secondary/fieldwork focus. Geographical enquiry is a student-centred approach to learning that involves students in making sense of new information and constructing geographical knowledge. It encourages learners to:

- be actively engaged in investigating geographical questions and issues;
- collect, interpret, analyse geographical data of all kinds as evidence and present and evaluate it;
- make sense of information for themselves in order to develop understanding;
- develop well-evidence geographical arguments and reflect on their learning.

It is an *approach* to learning, where students extend their geographical knowledge and learn skills at the same time. When they undertake geographical enquiries, students build on their personal geographies and what they have already learned in school.

This process can be split up into six stages as per the diagram.

Time spent outdoors in the 'field' can act as a prompt for enquiry, providing opportunities to look at landscapes and ask some geographical based questions:

- What is happening here?
- How has this place changed in the last few years?
- How might this place change in the future?



For more example questions see [Geography Fieldwork](#)

For more information on the Geographical enquiry process see [Geography Association](#).