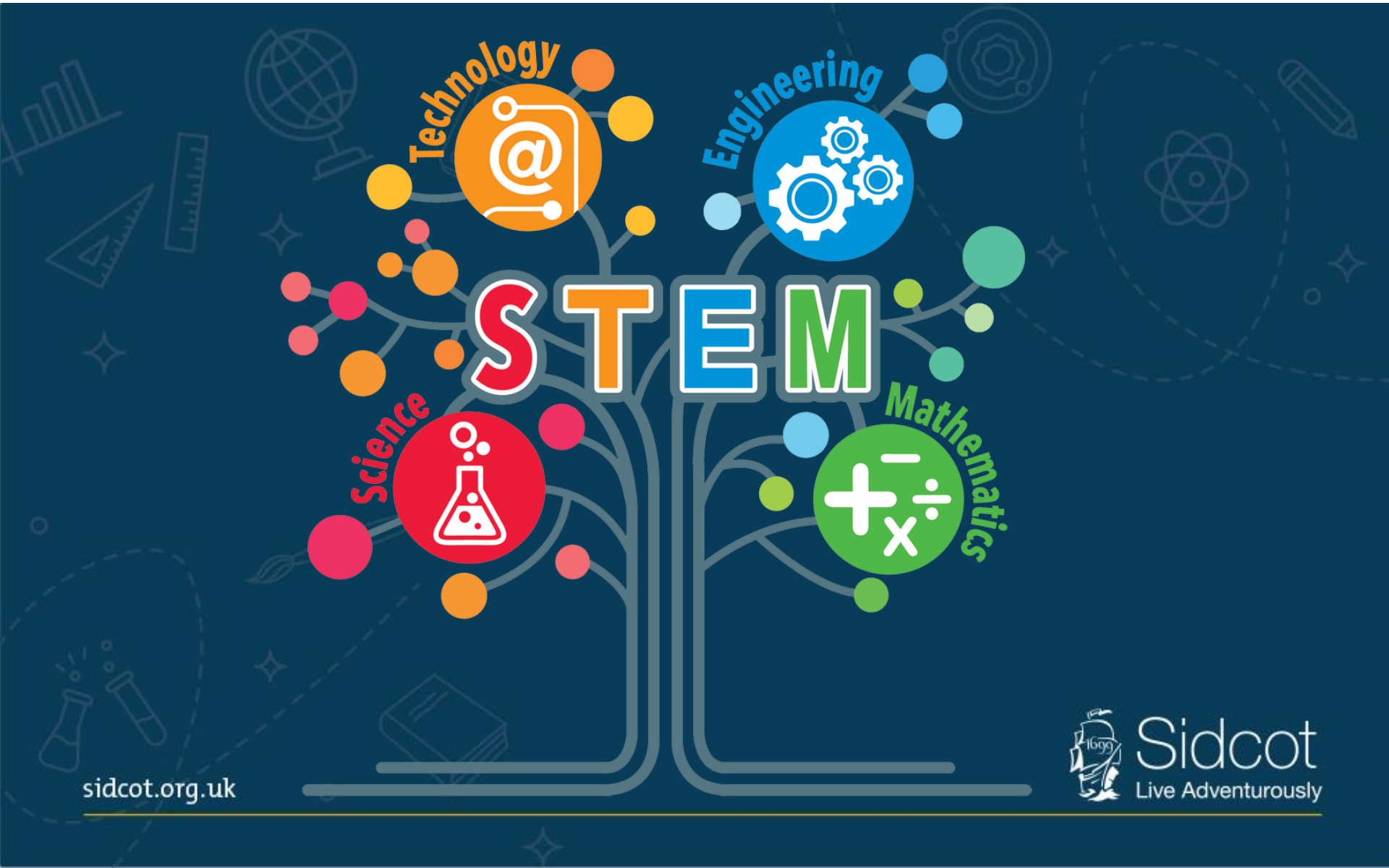
STEM in the UK

Christian Hughes
Vice-Principal

Sidcot School
UK



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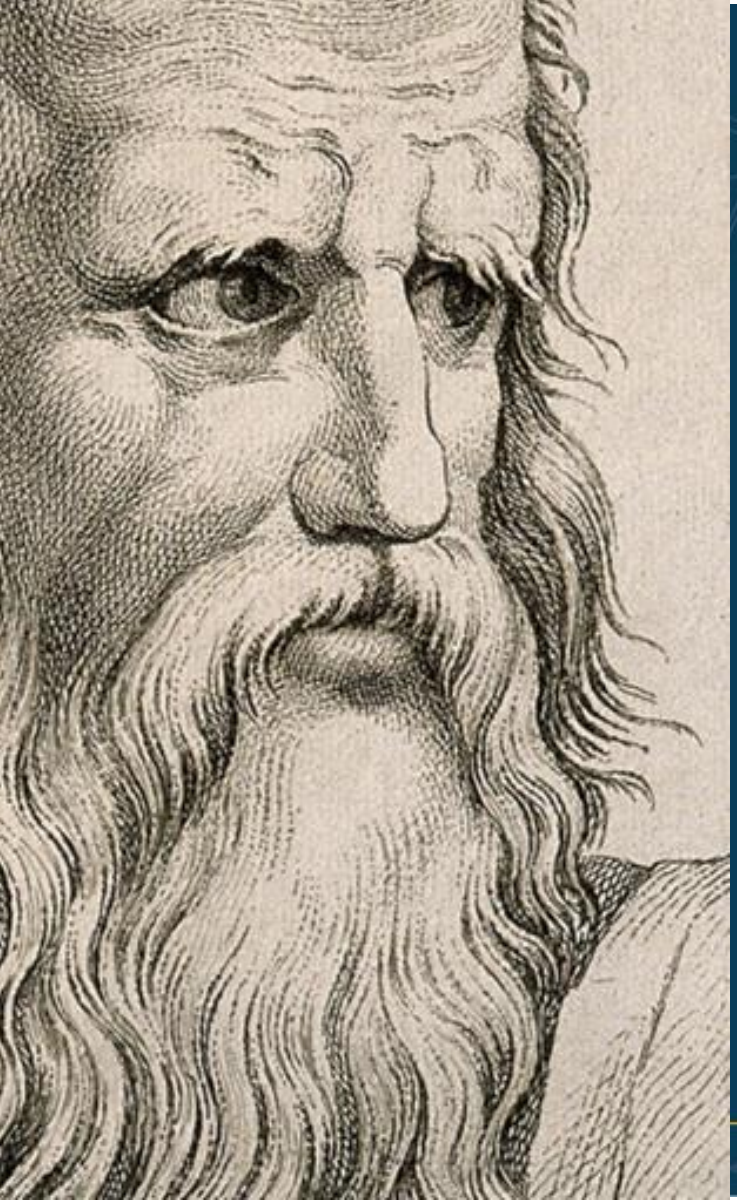

Plato, Greek philosopher

"Do not train a child to learn by force or harshness;

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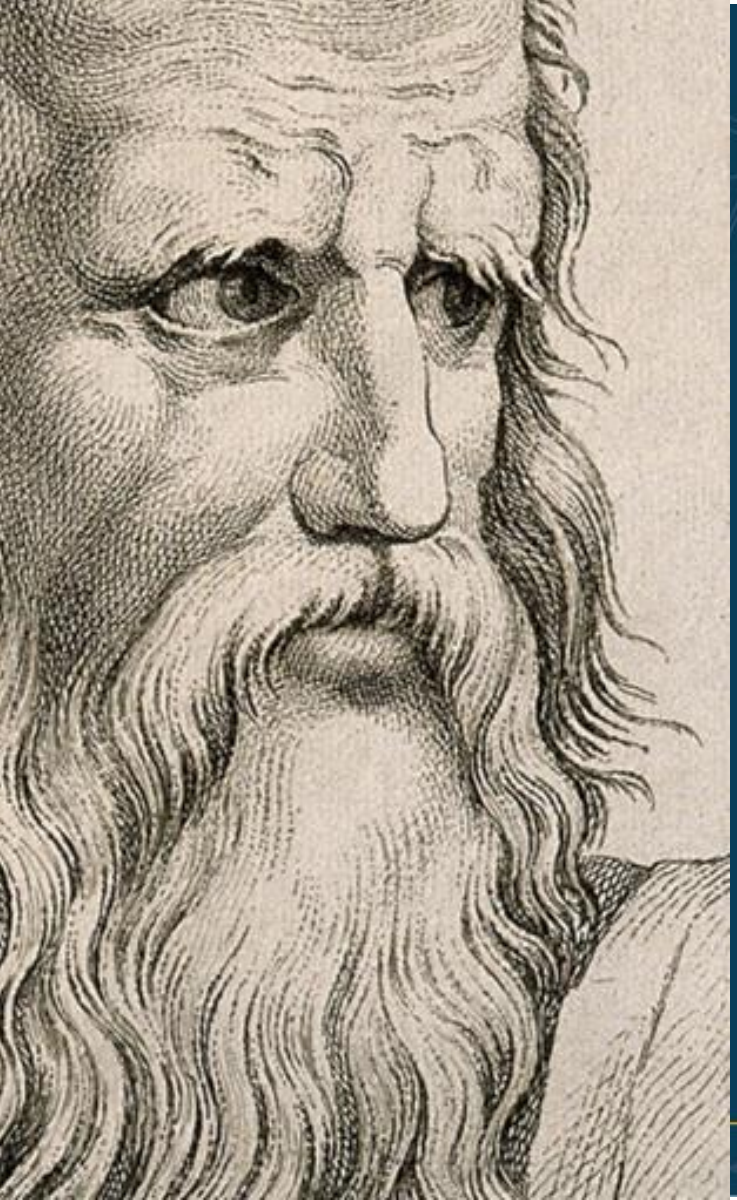

Plato, Greek philosopher

Plato understood the importance of:

- ENGAGEMENT of students in the classroom.
- As through engagement, a teacher can positively influence the way his or her students view learning.

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STEM in the UK – Context:

- As a society we are increasingly dependent upon technology
- and our economy reflects a growing dependence on technology based businesses.
- UK businesses compete in a global economy.
- We are challenged daily by reports of climate change and by moral dilemmas on issues, such as: stem cell research, genetically modified food and renewable energies.

STEM in the UK – Context:

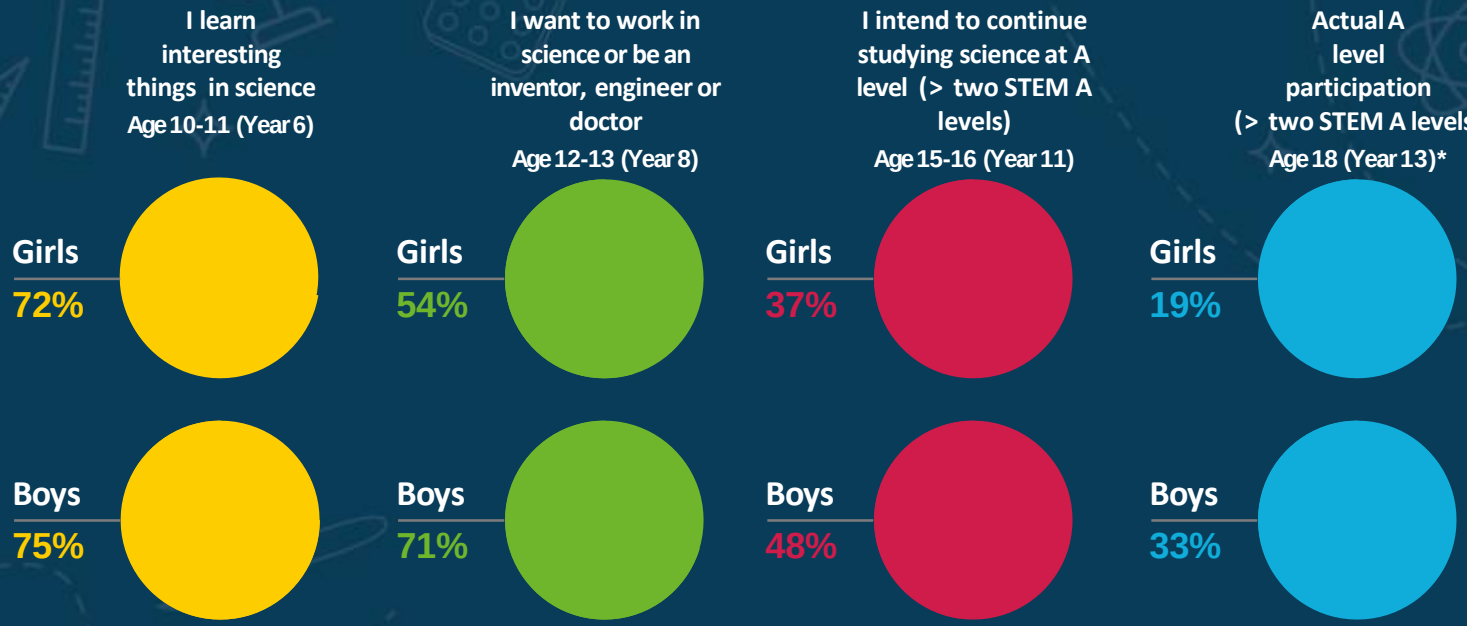
- As a society, we rely increasingly on a good education in STEM to help us understand all of these issues and
- to manage the rapid rate of technological change which we see around us.
- The UK needs a workforce with STEM qualifications if it is to sustain growth in the economy.


"The UK's economic future lies in high value, innovative and knowledge-intensive activities. To pursue this course, a highly skilled science, technology, engineering and mathematics workforce is essential."
UK Commission for Employment and Skills (2015)

STEM in the UK – Context:

- However, like many other developed countries,
- our young people are often disengaged from STEM,
- which results in reduced uptake in courses in those STEM subjects which will be critical to our future economic growth.

STEM in the UK:



Notes: STEM is science, technology, engineering and mathematics.
* Percentage is based on pupils entered for at least one A level.
Sources: ASPIRES 1 and 2 studies, King's College London, UPMAP study, UCL Institute of Education.

STEM in the UK – Context:

- The UK government has taken action to address these issues.
- A variety of strategies have been implemented based upon the recommendations of government-led research.
- One of the UK governments key objectives has been to establish a business-led STEM framework,
- to enable businesses to engage directly with schools, colleges, universities and government to focus on growing STEM across the education service and the promotion of STEM within UK society.

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

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‘Stem Learning’ – a good example:

- STEM Learning is the largest provider of education and careers support in STEM in the UK.
- They work with schools, colleges and others working with young people across the UK.
- They are supported by a unique partnership of Government, charitable trusts and employers, and are dedicated to raising young people’s engagement and achievement in STEM subjects and careers.


STEM @ Sidcot School
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Stem @ Sidcot School:

- Is primarily delivered within our:

- Technology Faculty
- &
- Science Faculty

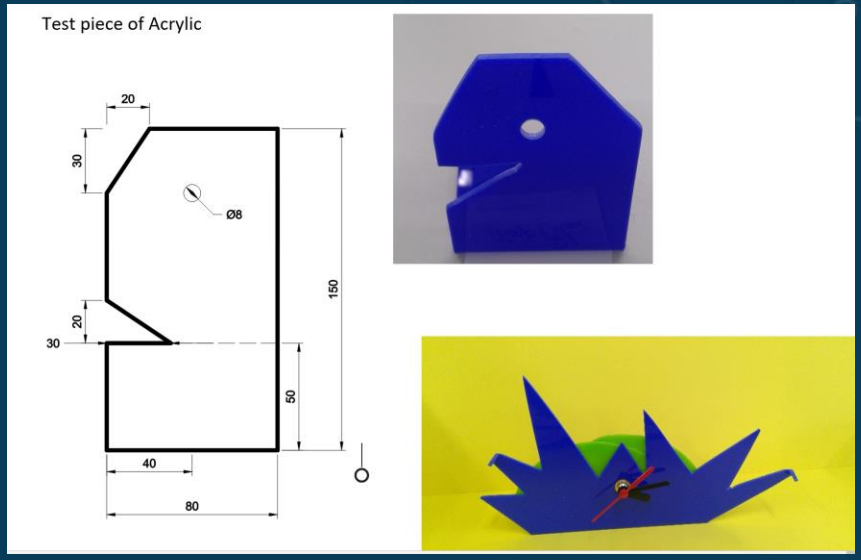
STEM in the Design & Technology Curriculum

- In Years 7, 8 & 9 (ages 11-14) we run 8 week projects in each specialist area of Product Design, Computing, Textiles & Food Nutrition.

- In Product Design, the projects aim to enthuse and utilise the skills of our young designers and encourage them to develop links within the STEM curriculum.

In Yr7: Product Design:

- Our students design a clock based on the Memphis design movement.
- They investigate the mechanical and physical properties of acrylic plastic and the effects of plastics in the environment.
- The students use hand tools to skilfully cut out, file and smooth their individual design.
- Students also develop skills using a practice piece to get a feel of cutting out, drilling and line bending a piece of acrylic.
- Students use an engineering drawing to work out how to mark out the piece accurately using maths & engineering skills.



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In Yr8: Product Design:

- Year 8 students work on producing a piece of jewellery from a CAD design and then casting the design in Pewter.
- All designs are linked to a Quaker value.
- Students investigate the properties of Pewter as an alloy, plus the advantages of 3D printing and 2D laser cutting.

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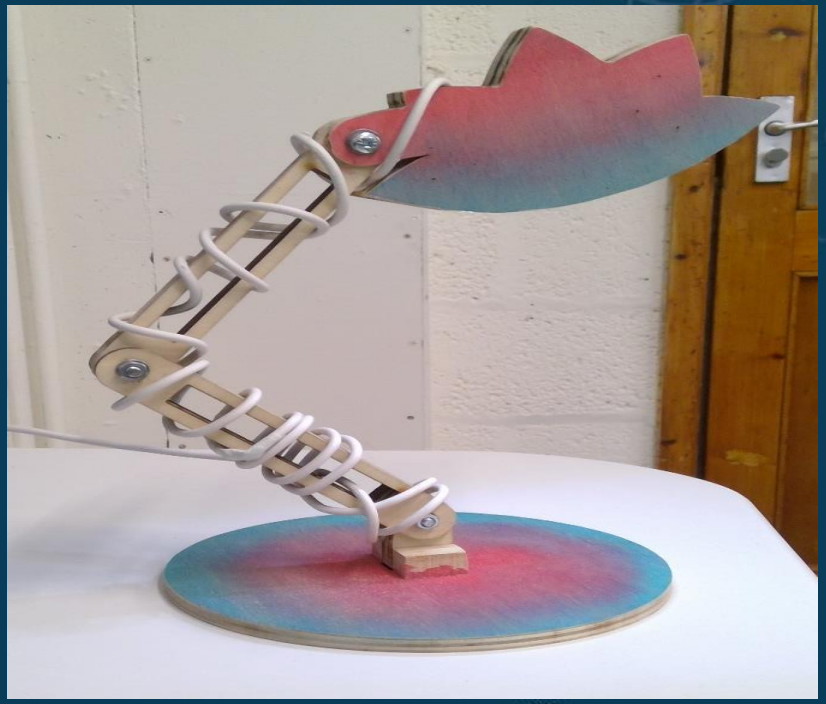
In Yr9: Product Design:

- Year 9 students research woods and look at how plywood can be used to manufacture a USB lamp.
- Students investigate the technicalities of layering 3mm plywood and inserting a LED cable with USB fixing.
- Soldering techniques are taught, along with the ability to draw a CAD design in proportion.



Technology & STEM @ Sidcot:

- As our students progress into the latter stages of the Senior School:
- They are able to choose GCSE and A-level courses (nationally accredited qualifications) in:
- Product Design
- Computing
- Textiles.
- They further develop their skills & knowledge-base in preparation for university degree courses or apprenticeships.

- Our STEM Club in DT have been working hard to prepare their radio controlled 4x4 vehicle for the Regional Finals at The Bristol and Bath Science Park.

- The team are required to design, build and test their own radio controlled car to successfully navigate and complete obstacles on an off-road test track, whilst competing against other local schools! The vehicle must emulate the capabilities of a full size 4x4 vehicle.

LAND ROVER
ABOVE & BEYOND

4 x4
IN SCHOOLS
technology challenge

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- On the day the team will race their car and discuss their design features with the judges.

- Alongside the racing elements, they will also have to deliver a presentation and design a variety of information boards to create a team display area.
- If successful in the Regional Finals, the team will compete in the National Finals and then the National Champions from each country are invited to compete at the Land Rover 4x4 World Finals in Dubai.

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- The project raises interest and enthusiasm in engineering through the practical application of Design & Technology, Mathematics and Science.
- This project replicates a 'real-life' work situation where specialists come together to resolve a complex problem.
- The challenge is an excellent opportunity for students to work in design teams, as well as linking with engineering companies through STEM Ambassadors from companies including Jaguar Land Rover, who support the team by acting as mentors.

LAND ROVER
ABOVE & BEYOND

4 x4
IN SCHOOLS
technology challenge


GAP

STEM in the Science Curriculum

- STEM activities are embedded throughout our Science Curriculum.
- Our schemes of learning include well-planned & resourced practical activities and experiments, plus assessment opportunities that develop students' STEM capabilities.
- During the UK's National Science Week our Yr7-9 students take part in specific STEM activities throughout all of their Science lessons.
- Students are able to study Biology, Chemistry and Physics at **GCSE, A-level and IB** in preparation for university admission, further training or employment (ages 16-18).

SQUASHED TOMATO CHALLENGE

Can you design and make a model to transport tomatoes down a mountainside in Nepal without squashing them?

Practical ACTION

Nepal is a landlocked country in South Asia. It is located mainly in the Himalayas, but also includes parts of the North Indian River Plain.

A problem for farmers

Many families living in the mountainous areas in Nepal grow crops to feed their families and to sell at local markets.

Suchana Mijar is 20 and lives in the village of Mana, in the far west of Nepal, with her daughter Sonisa. Like many rural women, Suchana had to carry heavy loads to market whilst she was pregnant and once, she slipped, falling around 25 metres.

Look at the pictures of where Suchana lives and think about some of the problems she might have living in the mountains.

Question: How would this affect her day-to-day life?

Question: How does this make life hard for her as a farmer who needs to sell her crops at the market at the bottom of the mountain?

Your challenge!

Challenge: **Imagine you are a group of engineers working together. You need to find a way to help farmers in Nepal transport their tomatoes down the mountain to market.**

Rules:

- The tomatoes must be transported a minimum of one metre, not touching the ground.

- The tomatoes cannot be touched whilst they are moving, catapulted or 'flown' in any way! They must be moved in a controlled way.

Design, make and test a model of a system that can transport tomatoes in a way that won't squash them!

At the end of your challenge you will have three minutes to present or 'pitch' your work on the Squashed tomato challenge.

Remember to leave time to work out how you are going to do this.

Feedback

Team work
How well did you work together?

Research
What did you find out?

Developing ideas
What ideas did you try out and how did you change your design as a result?

Final design
How successful was it?
How would you improve it if you had more time?

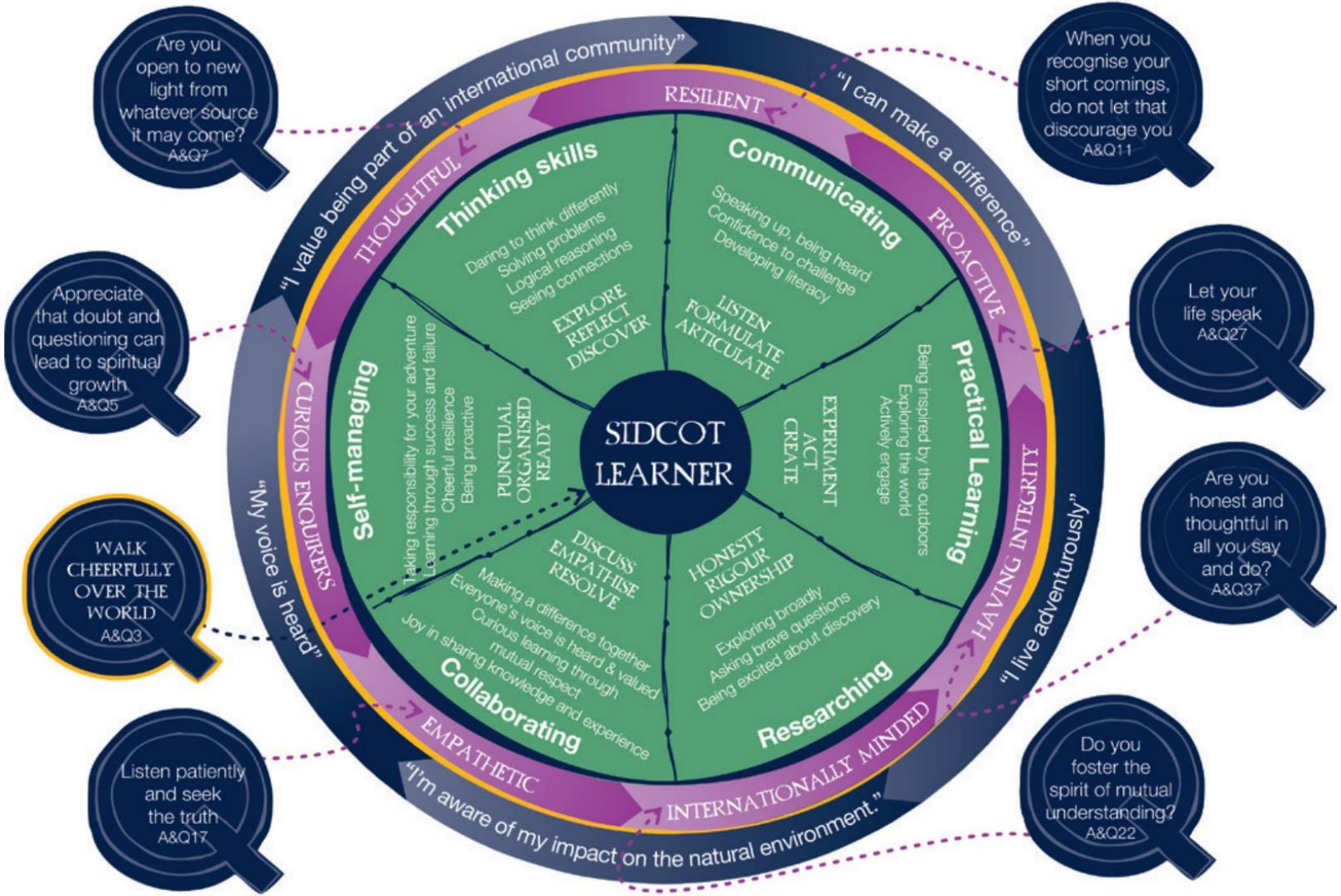
How do they do it in Nepal?

Now that you've had a go at transporting tomatoes yourselves, we'd like to show you the **aerial ropeway systems** Practical Action has worked with farmers in Nepal to develop that help them transport their produce to market.

Top picture: this is the ***up station*** where tomatoes are loaded into baskets ready for their trip down the mountainside on the aerial ropeway.

Bottom picture: this is the ***down station*** at the bottom of the mountain where the tomatoes arrive ready for a short journey to the market.

Question: Can you see the basket of tomatoes on its way down?



A&Q: ADVICES AND QUERIES FROM QUAKER SOCIETY OF FRIENDS

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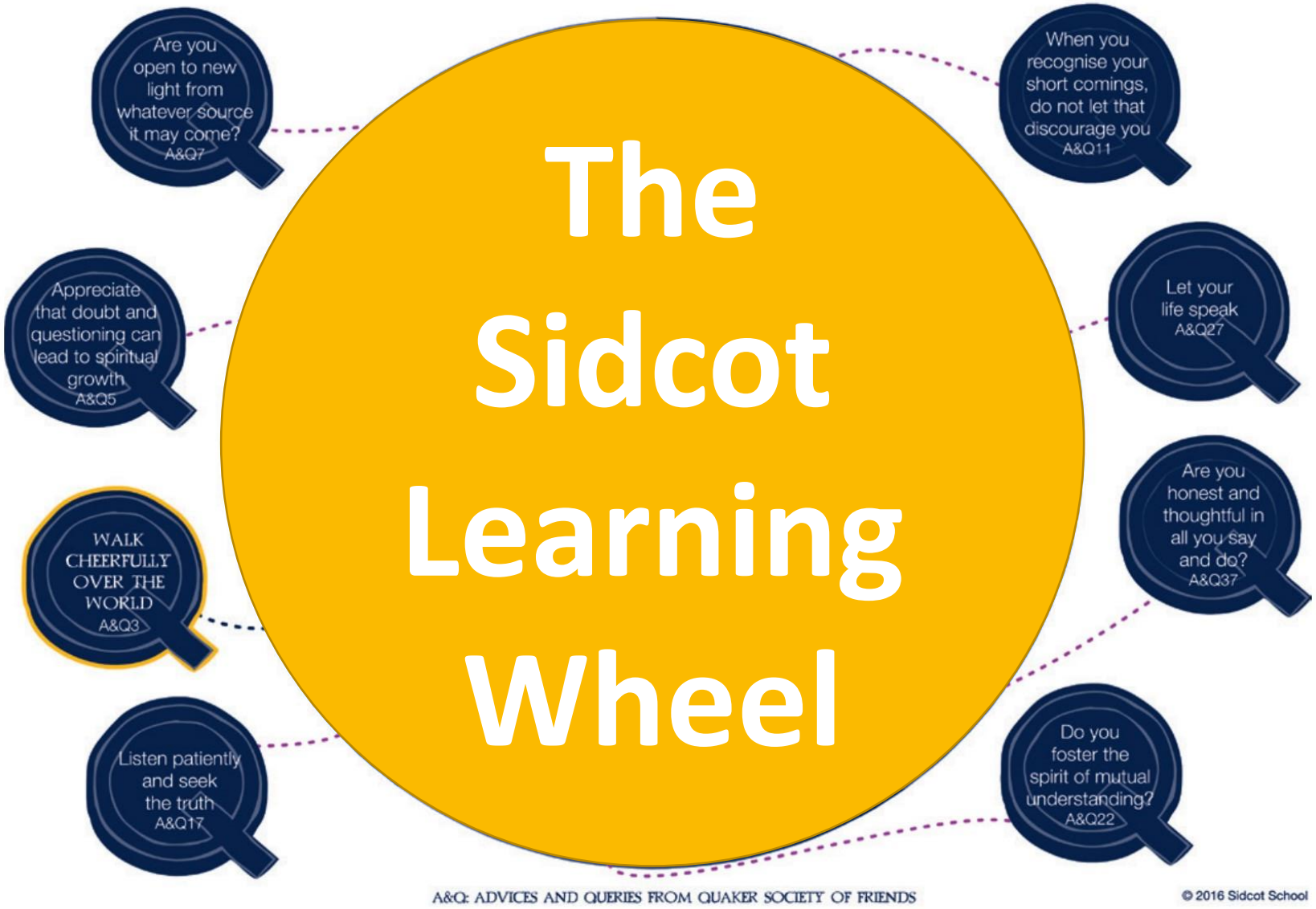

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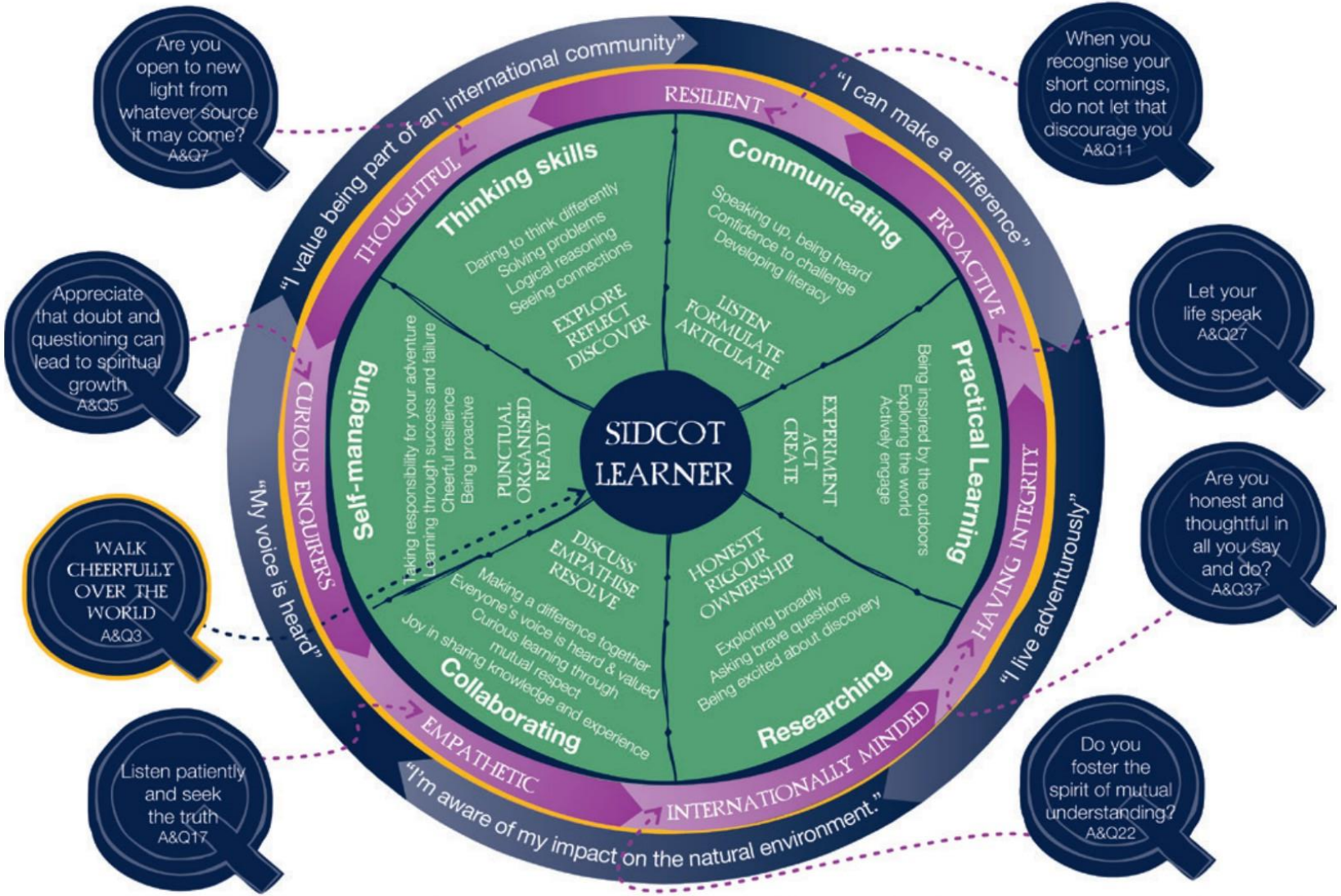

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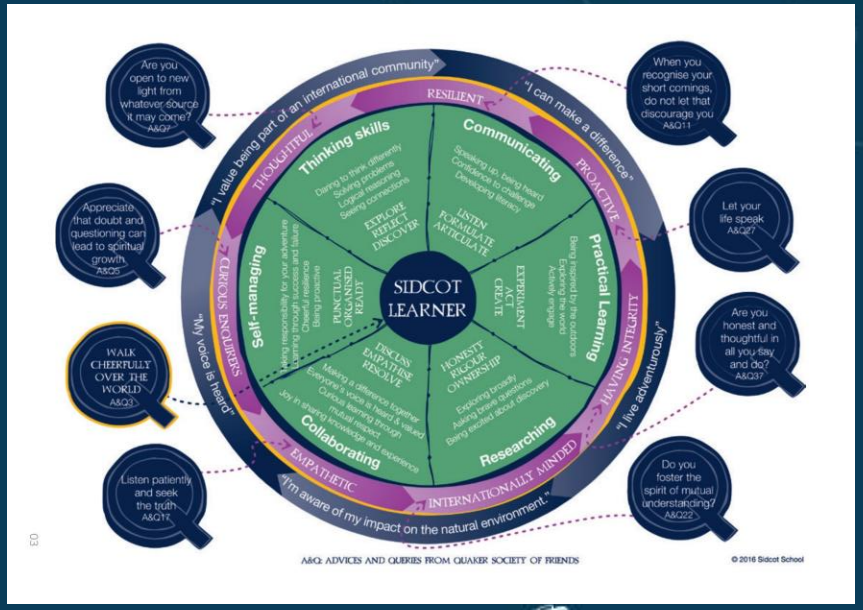
Sidcot Learning Wheel:

- Links Quaker testimonies to the teaching and learning that goes on throughout the School every day, including STEM activities.

- The Wheel succinctly identifies the principal aims of our pedagogy in developing transferable skills in our students, which will equip them for life at and beyond school.



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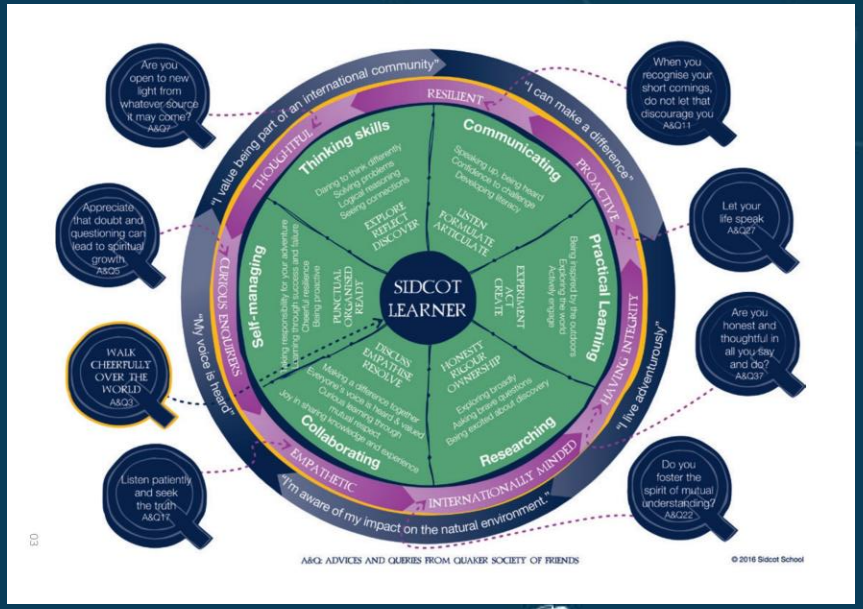
Sidcot Learning Wheel:

- These skills form the basis of important employability skills which are developed throughout the whole school curriculum and pastoral provision.
- Alongside speaking, listening, literacy and numeracy skills, the development of the 'Wheel skills' is embedded in our Teaching and Learning pedagogy.



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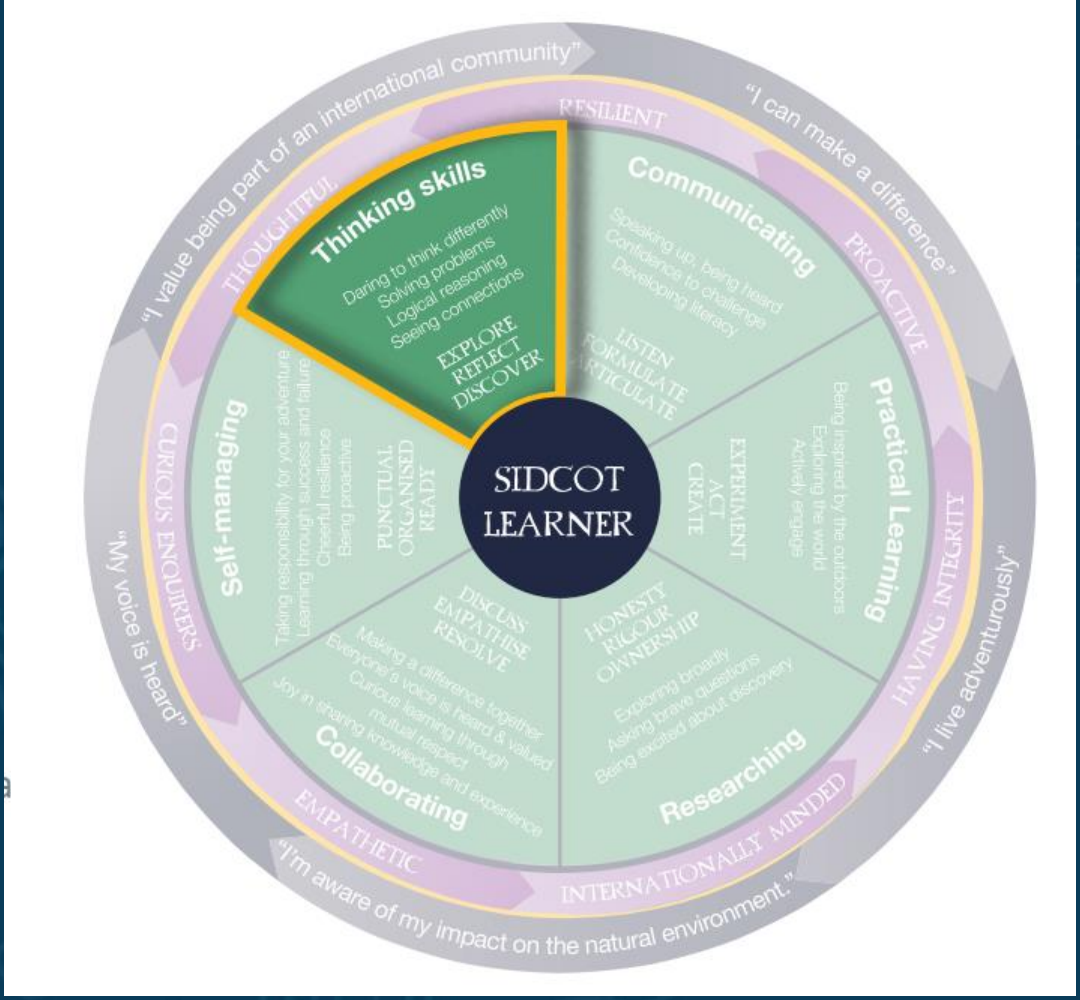

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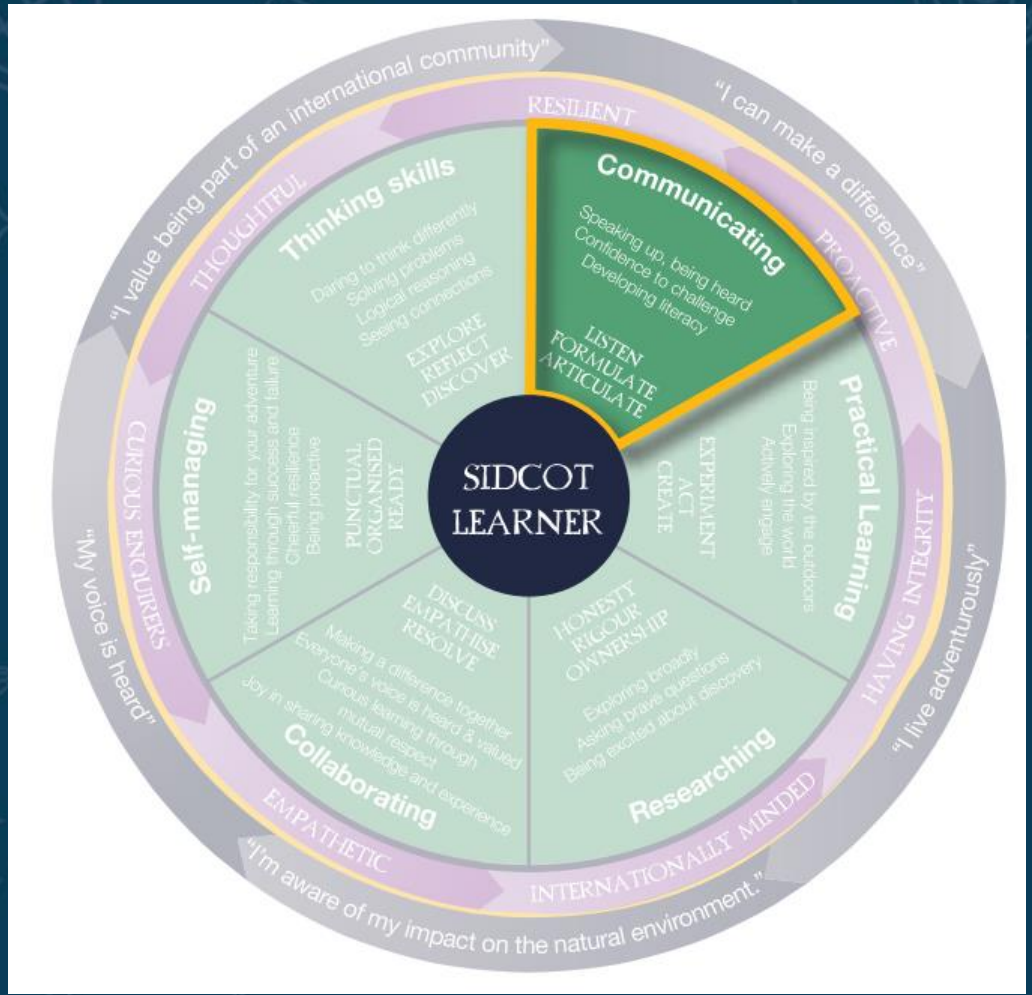

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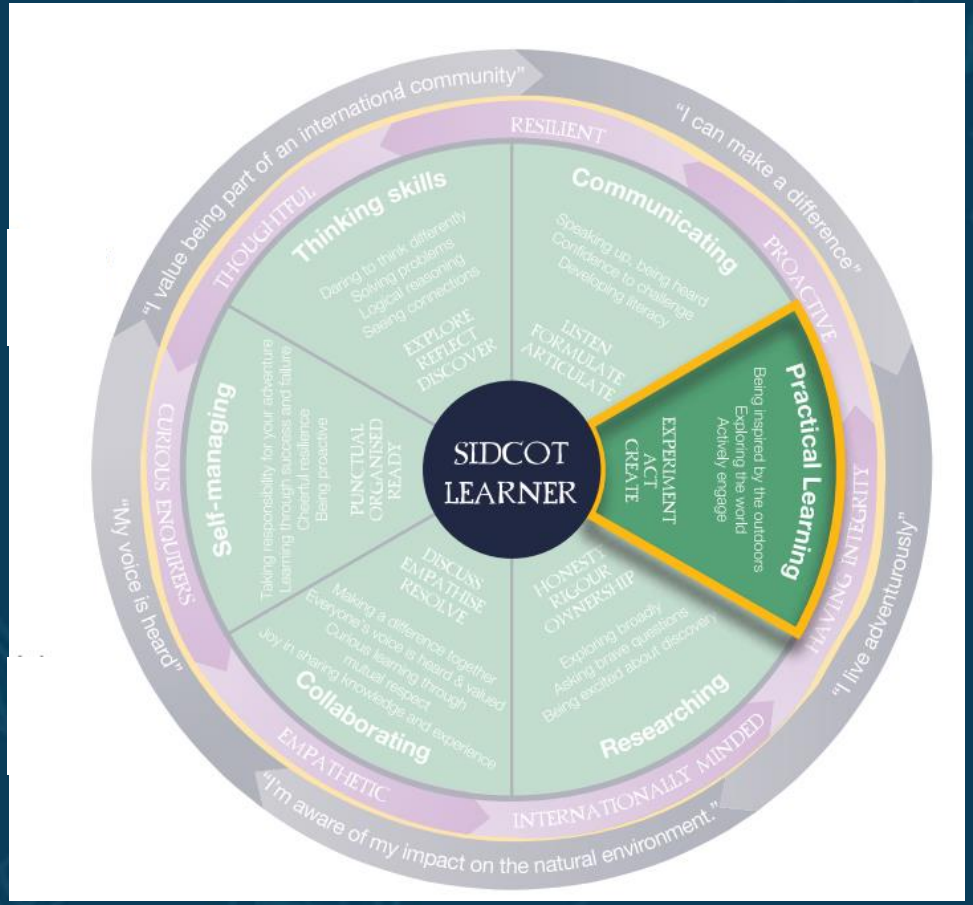

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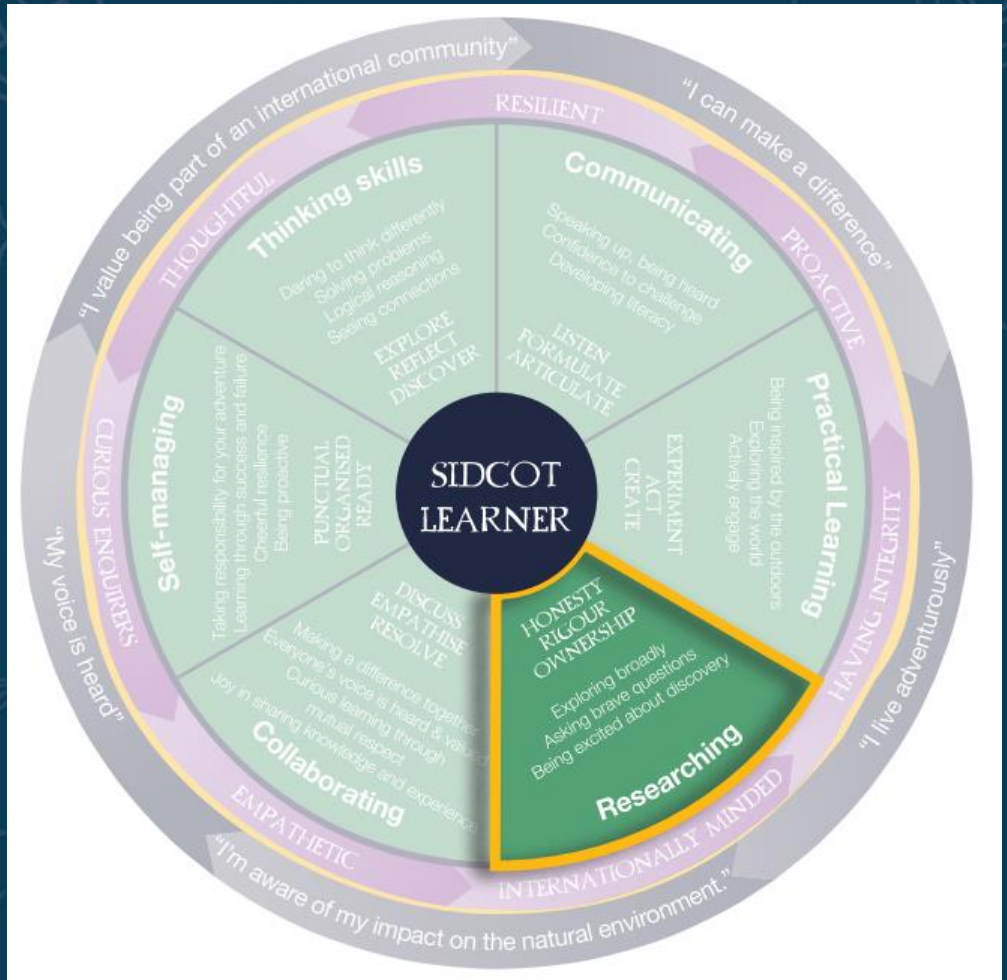

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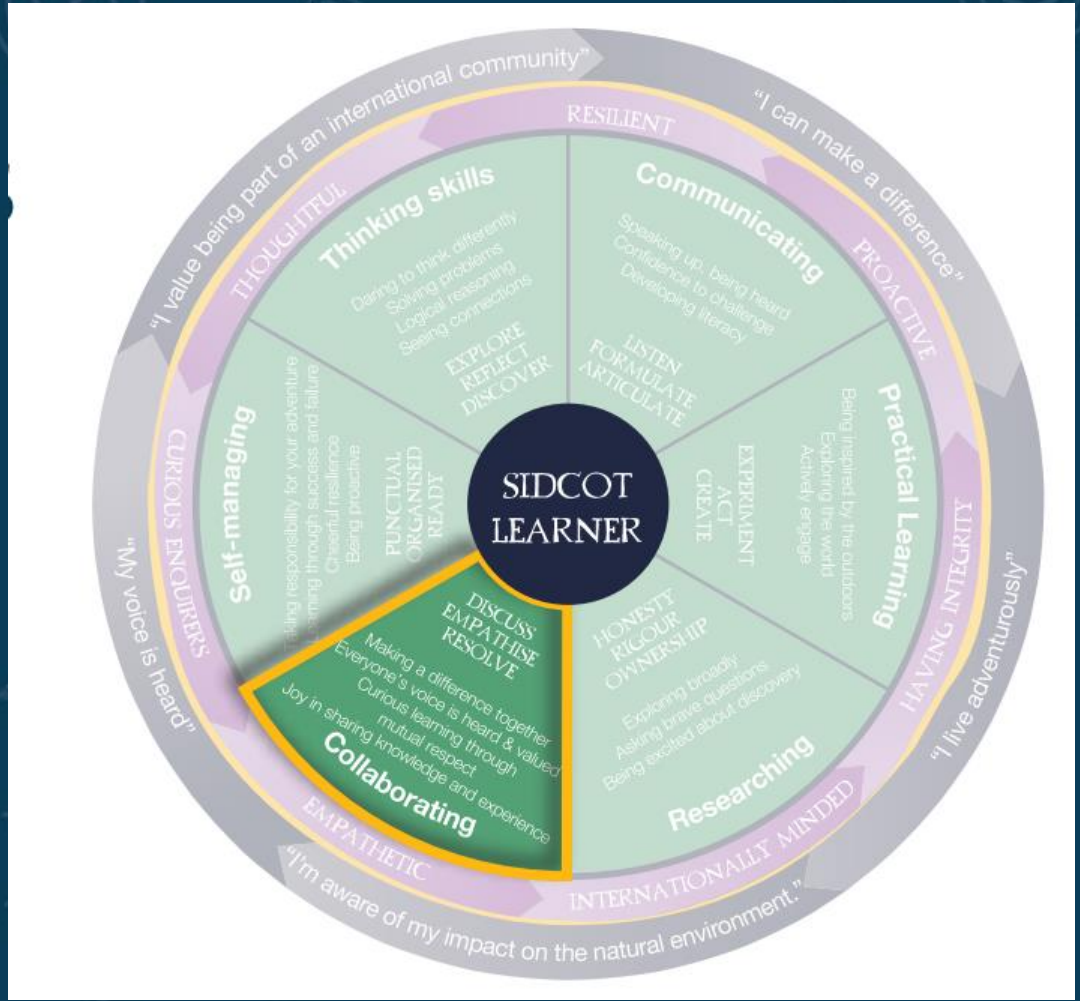

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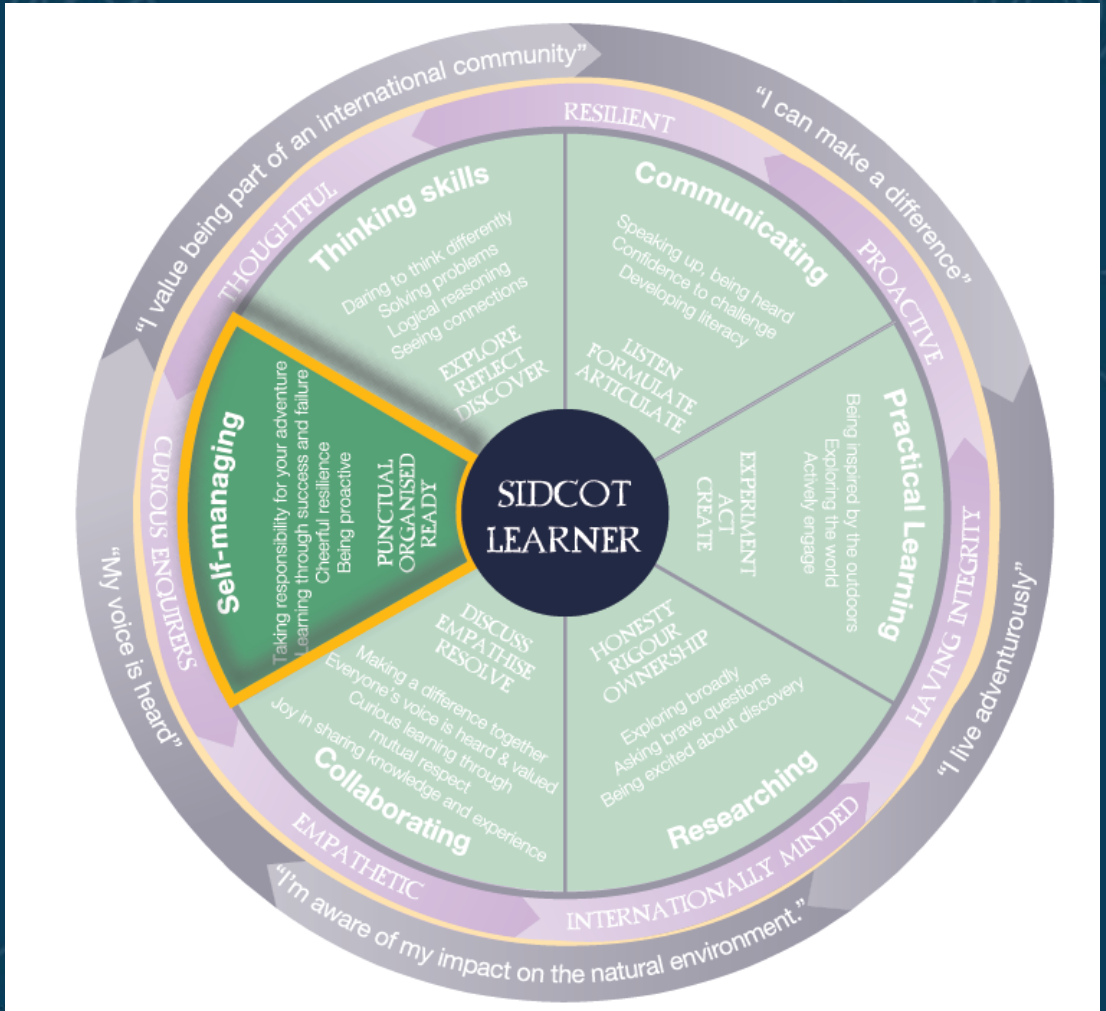

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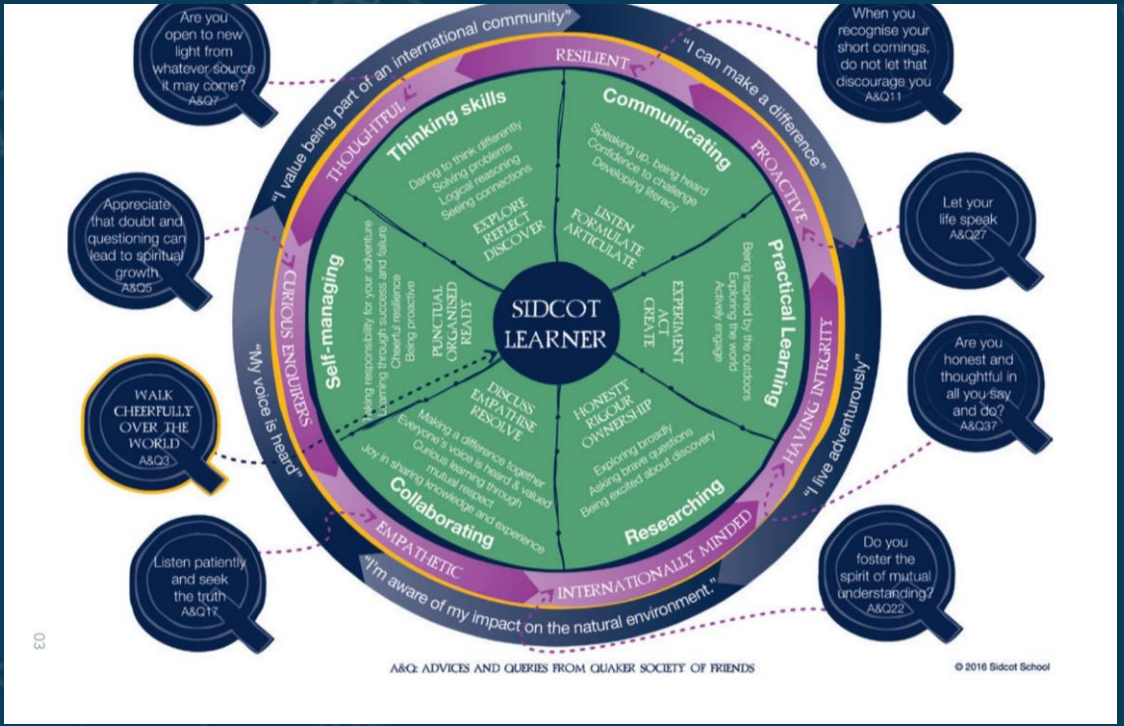
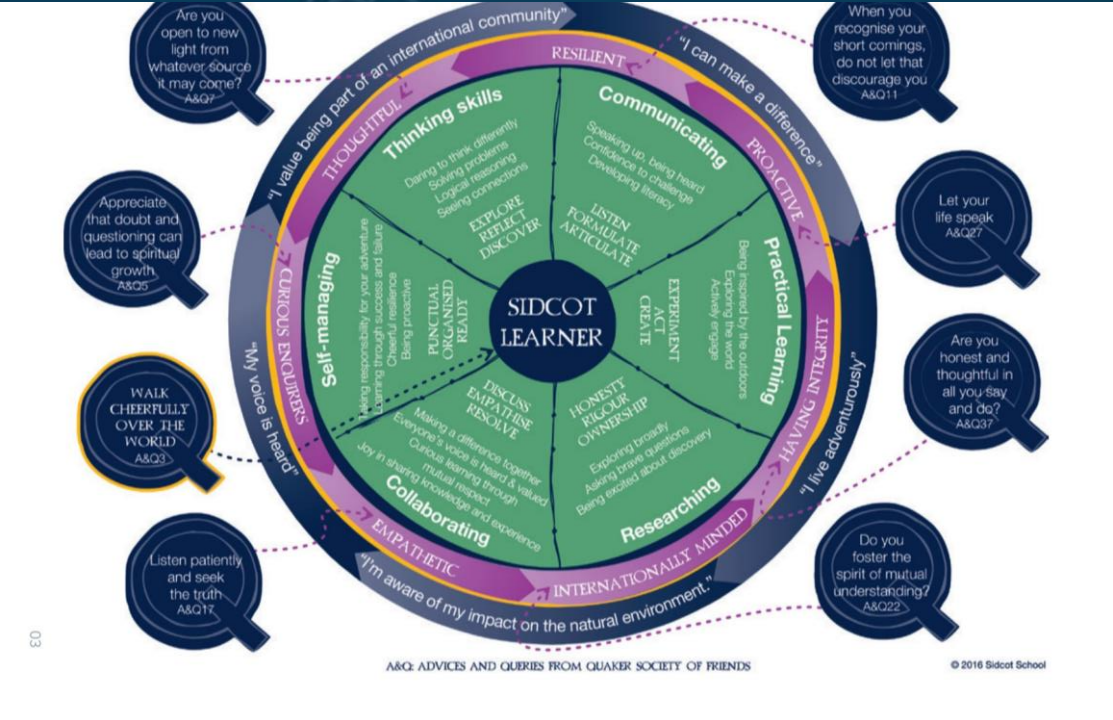


The Sidcot Learning Wheel

- At Sidcot and beyond, we see the requirement for:
- **collaborative** working,
- creative **problem-solving**,
- clear **communication** and careful **listening** skills.
- Underpinning these is a genuine **intellectual curiosity** and **resilience** borne out of learning from mistakes as well as delighting in things that have gone well.

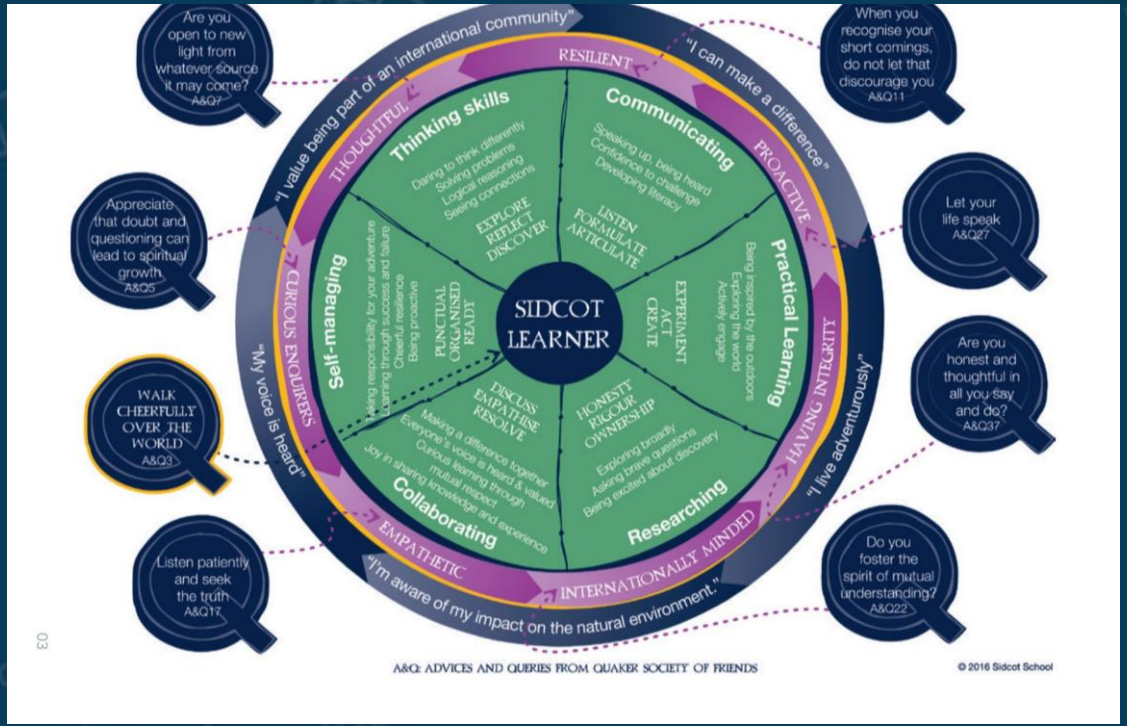


The Sidcot Learning Wheel

- We combine:

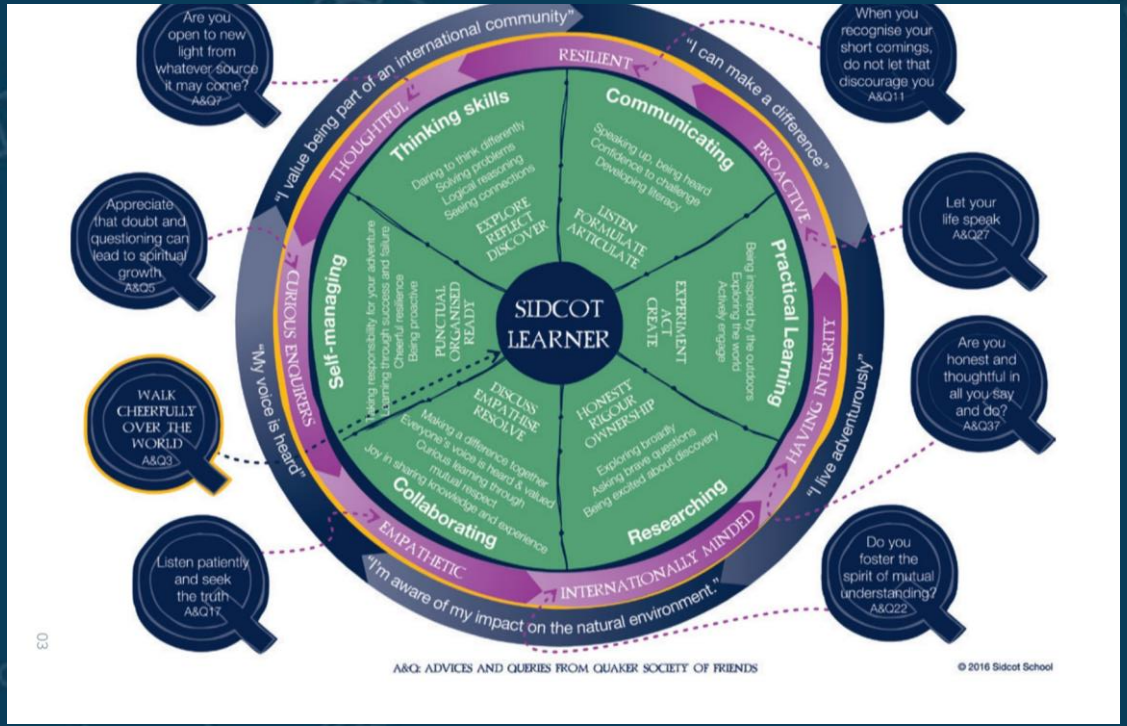
- thinking,
- communication &
- research skills with
- practical learning,
- self-management &
- collaboration.

- However, we align these with the traits of:
- empathy,
- curiosity, thoughtfulness, resilience, proactivity,
- integrity and international mindedness.



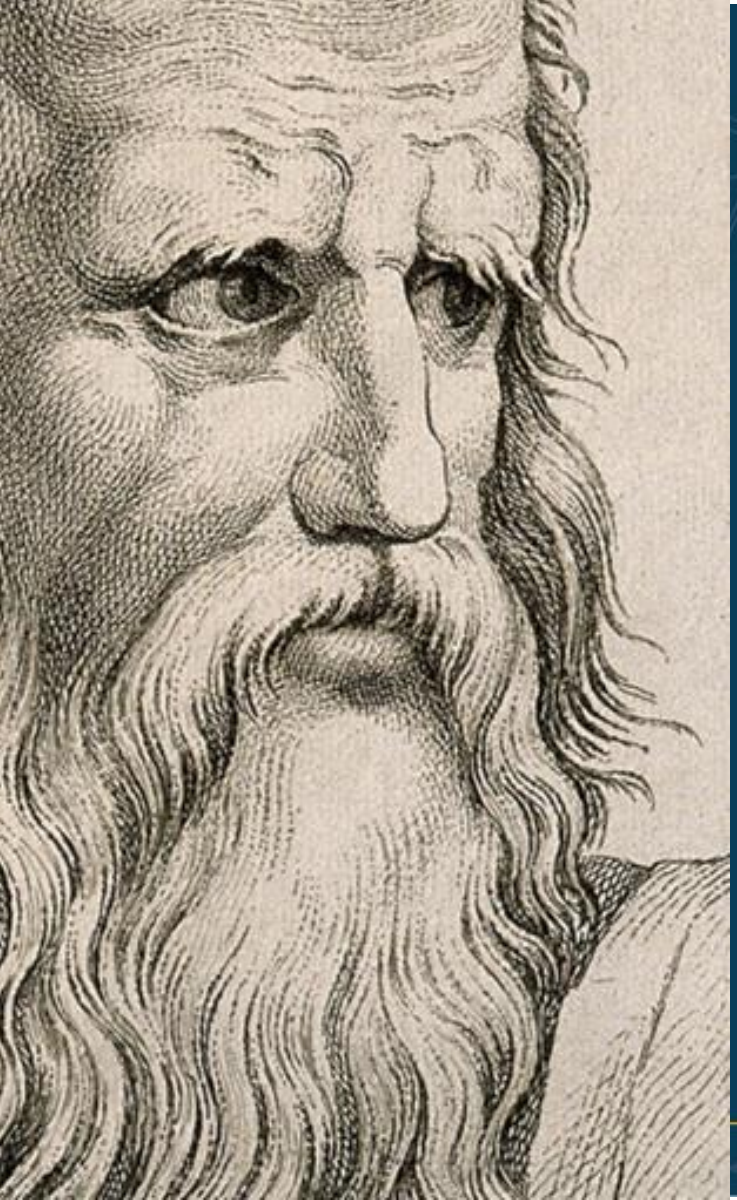
The Sidcot Learning Wheel

- Our curriculum model is a wheel with the learner at the centre,
- the metaphor representing a young person taking ownership of their learning,
- with the support of their teacher as part of a learning community.



The Sidcot Learning Wheel

- We feel that this combination of:
- values,
- skills &
- personality traits,
- are the bedrock of an education that will encourage problem-solving and drive creativity within our students and,
- deliver a genuine love of learning that will last them long after they leave school, ready to face the multi-faceted and ever-changing world that awaits them.



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Thank you.

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