# MILNGAVIE PRIMARY SCHOOL AND EYC

## STEM STRATEGY PAPER

Date of Policy: November 2019

Member of Staff Responsible: G Graham

Review Date: TBC

Consultation: This policy was developed with staff and the Parent Council following local and national curriculum guidance.

To be read in conjunction with the Teaching and Learning Directive, Assessment Guidelines, Common Curriculum, ASN Policy, Equality Policy and Numeracy and Mathematics Strategy Paper.

## Quality Indicators

| QI 1.1 | Self-evaluation for self-improvement |
|--------|--------------------------------------|
| QI 1.2 | Leadership of learning |
| Leadership of learning | Leadership of change |
| QI 1.5 | Management of resources to promote equity |
| QI 2.2 | Curriculum |
| QI 2.3 | Learning, teaching and assessment |
| QI 2.5 | Family learning |
| QI 2.6 | Transitions |
| QI 2.7 | Partnerships |
| QI 3.1 | Improving wellbeing, equality and inclusion |
| QI 3.2 | Raising attainment and achievement |
| QI 3.3 | Increasing creativity and employability |

## Vision, Aims and Outcomes

Our vision is that all of our young people, practitioners and partners work collaboratively to support the development of STEM (science, technology, engineering and maths) based knowledge, skills and opportunities, increasing the skills for life, learning and work of our young people.

**Our vision is to create a school where everyone is encouraged and supported to develop their STEM skills throughout their lives, enabling them to be inquiring, creative, productive and innovative, in order to grow STEM literacy for themselves and the wider society in which they live, contributing to the social, cultural and economic fabric of the country.**

To deliver this vision, everyone needs to have an opportunity to develop the STEM skills and the capabilities they need for life and across all jobs and careers. There is also a need for more people to develop the more specialist STEM skills required to gain employment in the growing STEM sectors of the economy. We firmly believe to achieve this that the rudiments of science should be an integral feature of our curriculum across Milngavie Primary School and EYC.

## Strategic Aims & Outcomes

**Our strategy has four key aims:**
- To deliver *excellent* STEM learning experiences to enthuse, excite and inspire our learners;
- to close *equity* gaps in participation and attainment in STEM so that everyone has the opportunity to fulfil their potential;
- to *inspire* our learners to study STEM as they progress throughout their education, using the key skills associated with learning STEM subjects in a range of contexts; and
- to *connect* the STEM education we offer with expertise across the wider community – allowing our learners an insight into the range of varied employment opportunities available in the STEM fields, linking to the skills for learning, life and work (**D**eveloping **S**cotland's **Y**oung **W**orkforce). We will continue to build on the connections and expertise we have within our parent body, and the wider community, to enhance the experiences our learners receive.

## Our pedagogical and developmental aims

The aims of STEM teaching:

- To prepare children for a STEM focussed future;
- To inspire and engage children in STEM subjects;
- To inspire the future scientist and engineers Science
- To teach children to ask question and planning lines of investigative enquiry;
- To extend children's natural curiosity and wonder about the world;
- To help children make decisions concerning environmental, moral and social issues;
- To develop scientific strategies and skills;
- To work co-operatively and communicate scientific ideas to others;
Technology and engineering specific:
- To develop an understanding of technological processes, products, and their manufacture, and their contribution to our society;

• To develop imaginative thinking in children and to enable them to talk about what they like and dislike when designing and making;

• To enable children to talk about how things work, and to draw and model their ideas;

• To encourage children to select appropriate tools and techniques for making a product, whilst following safe procedures;

• To explore attitudes towards the made world and how we live and work within it;

• Children should learn to understand and apply the principles of nutrition and learn how to cook through Food Technology

Throughout all of this, we aim to bring concept to life by delivering them in real life contexts and situations, wherever possible. All of the aims ultimately help children to develop the capacity to solve problems, find solutions to challenges and to think laterally – fundamental skills for developing Scotland's young workforce

### Key Principles

To achieve our strategic objectives we will follow …… key principles. These are:

- enhancing our curriculum through engagement, empowerment and development
- supporting staff development
- co-operation and collaboration
- integrating diversity, equity and equality into all that we do e.g. tackle the gender imbalances and other inequities that exist across STEM education
- use intelligence and data to support our analysis of progress, to self-evaluate and to review policy, practice and our curriculum rationale
- Evaluate our leadership to ensure that we are addressing the most appropriate objectives and that these are having positive outcomes for learners

### Policy Drivers

There are a number of local and national policy drivers that support the development of a STEM strategy. These include Developing the Young Workforce (Recommendation 12: STEM should sit at the heart of the development), the Digital Learning and Teaching Strategy, and the current development of a National STEM strategy for Scotland.

### Curriculum Rationale

STEM is an integral part of our country's future economic and social development. Change is happening all around us and the pace of that change in the workplace, the economy and our everyday lives is relentless. It is driven largely by developments in STEM and, in particular, technology. To support this Milngavie Primary School must play its part in the development of a skilled and adaptable workforce that can take advantage of the growing number and evolving range of STEM jobs.

Developing our wider STEM knowledge and literacy is also important to us all as active citizens within the communities in which we live. A living example of this was a whole school community event that we led in October 2021, to promote the work the school had undertaken in relation to COP 26. Experiences like this help us to understand the increasingly connected world we live in. It helps us with the complex questions we face, from mitigating climate change to dealing with the impact of an ageing population and it gives us the tools and knowledge to make informed lifestyle choices on issues that may affect us as individuals.

Above all, STEM ignites our curiosity and helps us enjoy and understand the natural and physical world around us, enriching our lives.

Education, training and lifelong learning have a key role to play in responding to these economic and societal imperatives by building a strong base of STEM skills and knowledge for everyone and by enthusing and encouraging people to develop more specialised STEM skills and capabilities.

**What is STEM at Milngavie Primary School and EYC?**

There is no single definition for STEM. STEM can be conceived as a set of inter-related disciplines and required skills. STEM related education and training seeks not only to develop expertise and capability in each individual, but also to develop the ability to work across disciplines and generate new knowledge, ideas and products through inter-disciplinary learning.

Our STEM strategy and Milngavie Primary and EYC defines STEM as follows:

**Science** enables us to develop our interest in, and understanding of, the living, material and physical world and develop the skills of collaboration, research, critical enquiry, experimentation, exploration and discovery.

**Engineering** is the method of applying scientific and mathematical knowledge to human activity and **Technology** is what is produced through the application of scientific knowledge to human activity. Together these cover a wide range of fields including business, **computing science**, chemicals, food, textiles, craft, design, engineering, graphics and applied technologies including those relating to construction, transport, the built environment, biomedical, microbiological and food technology.

All of STEM is underpinned by **Mathematics**, which includes numeracy, and equips us with the skills and approaches we need to interpret and analyse information, simplify and solve problems, assess risk and make informed decisions. Mathematics and Numeracy develop essential skills and capabilities for life, participation in society and in all jobs, careers and occupations. As well as providing the foundations for STEM, the study and application of mathematics is a vast and critical discipline in itself with far-reaching implications and value.

**Digital skills** also play a huge and growing role in society and the economy as well as enabling the other STEM disciplines. Like Mathematics, digital skills and digital literacy in particular are essential for participation in society and across the labour market. Digital skills embrace a spectrum of skills in the use and creation of digital material, from basic digital literacy, through data handling and quantitative reasoning, problem solving to support a *Broad general education (3-15 years)*. This is an on-going area of development for our school. We have made significant strides in recent years e.g. : using QR code; in house staff training from the ICT co-ordinator; extending the use of the interactive boards to enhance the curriculum, increased access to ipads and laptops across the school.

***Move to STE@M?***
As a school, we will enhance our music and art provision in session 2022-23. We hope to start the process of making more explicit links between STEM and the creative arts.

STEM education can be used as a highly motivating and relevant context for learning within the broad general education phase of Curriculum for Excellence. It can be used to support all four contexts for learning:
- Curriculum areas
- Ethos and life of the school
- Interdisciplinary learning
- Opportunities for personal achievement

STEM contexts can also support learning across all eight curriculum areas, and in particular within sciences, technologies and mathematics.

Areas which are the responsibility of all, especially numeracy, but also literacy and health and wellbeing, can also be supported through STEM contexts and approaches.

STEM education and training seeks not only to develop expertise and capability in each individual field but also to develop the ability and skills to work across disciplines through interdisciplinary learning.

Cross-cutting themes such as learning for sustainability, digital skills and creativity support STEM. Outdoor learning provides learners with opportunities to learn about the impact and contribution STEM makes to their lives, their communities and society.

In Milngavie Primary School and EYC we are developing a STEM curriculum that helps us acquire the following skills and capabilities:

- growing our understanding and appreciation of the natural and physical world and the broader universe around us;
- interpreting and analysing data and information;
- research and critical enquiry – to develop and test ideas;
- problem solving and risk assessment;
- experimentation, exploration and discovery of new knowledge, ideas and products;
- collaboration and working across fields and disciplines; and
- creativity and innovation – to develop new products and approaches.


**Why is STEM important for the learners of Milngavie Primary School and EYC and why do we see it as a curricular priority?**

- Relevant STEM contexts can enhance engagement and motivation of learners and support efforts to raise attainment.
- STEM skills help individuals function and thrive in a rapidly-changing world and enable them to make informed decisions about complex moral, ethical, scientific and technological issues.
- Advances in STEM have brought about dramatic improvements to our quality of life, our physical and natural environments and our nation's health and wellbeing.
- STEM skills are key to the Scottish economy and the future prosperity of its citizens. Many companies and industries are reporting difficulties in recruiting staff with STEM skills. This is affecting their ability to bring in new business and attract investment.
- There is currently a shortfall of STEM, particularly engineering and IT professionals.

- The 2014 CBI/Pearson Education and Skills Survey showed that 48% of employers prefer graduates with STEM skills. STEM skills, therefore, help people access jobs across many sectors, not just in STEM.
- The many rewarding and well-paid careers offered by STEM can support national efforts to tackle youth unemployment, poverty, social exclusion and the gender pay gap.
- New knowledge resulting from STEM research, discovery and invention has fuelled our collective global desire to co-operate in the wider interest – from nanotechnologies to the detection of gravitational waves.
- It is a priority for us all at Milngavie Primary School to ensure we use STEM as a vehicle to address gender imbalances, in wider society, as well as in the workforce. We refer to document s such as Gender Balance in STEM (Education Scotland, 2015), Improving Gender Balance and Equalities 3-18 (Education Scotland, 2020) and Women in STEM (Scottish Government)
- Investing in resources at the Early level is a way of ensuring we capture the imagination of all of our learners, irrespective of gender. An example of this is the investment in woodworking spanning the EYC and P1 stage.
- We feel that by introducing skills early, using dedicated Science delivery from P1-7, for example, we can work on how we transfer skills across the STEM subjects and beyond.

For the reasons above, we believe STEM should be at the heart of our curricular drive to *Develop the Young Workforce* (DYW). It also has a key role to play in tackling inequity through the *Scottish Attainment Challenge* (SAC) and raising attainment in literacy and numeracy in line with the ambitions of the *National Improvement Framework (NIF)*.

## Drivers

As a school we will use the following drivers to influence change and improve outcomes for our learners:

- **To make use of a specialist teacher of science to provide our learners with the best possible outcomes in this field of study**
- **To have two staff as lead specialists in numeracy and mathematics to drive forward curriculum developments**
- **Develop a progressive, regularly reviewed curriculum plan to ensure that learners have an opportunity to develop a range of skills in computing and information technology**
- **To find external funding mechanisms to allow our school to invest in new technologies**
- **To engage with a range of parents, grandparents, partners and local and national STEM specialists to provide learners with a range of opportunities to develop their skills, competencies and interests in STEM subjects e.g. assisting with planting and growing using our EYC garden and the polytunnel**
- **To work with the STEM ambassadors project e.g. support with the development of Coding**
- **To work with Young Engineers Scotland, Institution of Civil Engineers and other agencies to ensure our children are exposed to the specific skills associated with engineering**

- **To work with parents who work in STEM industries to share their expertise with our practitioners through In-service and other training opportunities**
- **To work with the Glasgow Science Centre to deliver in school and on-site experiences to develop children's enthusiasm for STEM subjects**
- **To encourage wider use of the resources available through the Skills Development Scotland toolkit – My World of Work https://www.myworldofwork.co.uk/**
- **To develop partnership links with STEM subject leads from our associated Secondary, Douglas Academy, and to build this into our transition programme**
- **That we will showcase our curricular developments and pupil's successes via social media, workshops and other open events**
- **We will work closely with the link representative from the Parent Council to support the development of partner links to enhance curricular opportunities for our learners**
- **We will encourage the wider Parent Forum to attend STEM Advisory meetings to make suggestions as to how we can further enhance our curriculum**
- **We will ensure inclusion and diversity are central to our programme of delivery e.g. ensuring gender is in no way a barrier to accessing the STEM curriculum or ensuring that our pupils know that there are many routes into the STEM and related professions, including apprenticeships.**
- **We will link our 'Common Curriculum' to the STEM curriculum to further extend learners' exposure to a range of experiences. The skills we develop through this programme are also important in STEM careers e.g. creativity, problem solving, co-operative working, resilience, communication, responsibility, organisation and leadership**

## CURRICULUM DELIVERY

Organisation of STEM

### Teaching and Learning

Science teaching focuses on enabling children to think as scientists. We place emphasis on examining primary sources and in each stage children have the opportunity to learn through a variety of scientific enquiry methods and investigations. We encourage children to answer scientific questions and offer them the opportunity to use a variety of data. In addition we enable children to use ICT in science lessons where this serves to enhance the learning. We focus on helping children to understand that scientific events can be interpreted in different ways and that they should always ask searching questions about the information they have been given.

 Fair testing is an important aspect of scientific investigation; however, it is not the only means of investigation. Children are taught to appreciate this through access to a variety of methods of investigation. Methods of investigation used at our school include:

• Observing over time

• Pattern seeking

- Identifying, classifying, grouping and comparing

- Fair testing

- Researching using secondary sources.

## Design and technology

The school uses a variety of teaching and learning styles in design and technology lessons. The principal aim is to develop children's knowledge, skills and understanding in design and technology. Teachers ensure that the children apply their knowledge and understanding when developing ideas, planning and making products and then evaluating them. We do this through a mixture of whole-class teaching and individual/group activities. Within lessons, we give children the opportunity both to work on their own and to collaborate with others, listening to other children's ideas and treating these with respect. Children critically evaluate existing products, their own work and that of others. They have the opportunity to use a wide range of materials and resources, including ICT. During the Early Years, young children will be given the opportunity to explore a wide variety of materials e.g. play dough, clay, wire, wood and plastic. They will investigate uses of different materials and will be introduced to the correct language and use of a range of tools and equipment. They will be given the opportunity to use their imagination to create in 2d and 3d as well as opportunity to cook, bake and learn about healthy eating. Resources will be made available on a daily basis through the indoor and outdoor learning environment as well as teacher led and teacher input opportunities to develop these designing skills. Our long-term and medium-term plans map out the themes covered each term for each year group. These plans define what we will teach and ensure an appropriate balance and distribution of work across each term.

Risk Assessment and reference to the ASE 'Be Safe' document are considered when undertaking technology using tools etc. A copy of the ASE document can be found on the Technology Trolley.

## ICT/Computing

We use ICT in STEM subjects where appropriate; through the use of the laptops, Activepanels, camera recorders, electronic microscopes, digital simulations and music equipment. Children use ICT in science to enhance their skills in data handling, presenting work and researching information using the internet and relevant software. Children have the opportunity to use ipads to record and use photographic images. Children use data loggers within lessons to enhance the accuracy of the data they record. During technology projects children use computer aided design. Children also use computing to allow them to program, monitor and control their products.

Our ICT Co-ordinator supports staff across the school, delivers training, and signposts staff to relevant resources to assist in their personal development.

**<u>Cross Curricular</u>**

*Numeracy across the curriculum: STEM* in our school contributes to the teaching of mathematics in a variety of ways. Opportunities for STEM to support mathematical understanding are regularly exploited. These include, but are not limited to:

-The study space, scale and distance;

-The use of graphs to explore, analyse and illustrate a variety of data;

-The use of surveys and write conclusions based on their results;

- Choosing and using appropriate ways of calculating measurements and distances;

-Checking results of calculations for reasonableness;

-Learn how to use an appropriate degree of accuracy for different contexts;

-Use of equipment to measure;

-They apply their knowledge of fractions and percentages to describe qualities and calculate proportions.

- Interpret and analyse a range of data to reach conclusions and recommendations

*Literacy across the curriculum: STEM* subjects make a significant contribution to the teaching of literacy in our school because it actively promotes the skills of reading, writing, talking and listening. Some of the texts we use during literacy are scientific in nature, for example writing explanations about the water cycle or creating information pages about the digestive system. Children develop oracy through scientific questioning, presenting their findings to the rest of the class and through speaking and drama activities relating to specific topics. They develop their writing ability by writing up investigations, composing reports and through presenting collected data within using a range of mediums.

In RME children will be encouraged develop open mindedness to the suggestions of others and to make judgements on evidence not prejudice. Students realise that moral dilemmas are often involved in scientific developments. When considering the environment, the use of further natural resources and its effect on future generations is an important moral consideration. We will use real like events to explore the big religious and moral questions of the current day and how these may overlap with STEM. This will also overlap with some of the philosophical enquiry we bring into the curriculum.

In PSE we will provide opportunities for pupils to develop team working skills and to take responsibility. Pupils must take responsibility for their own and other people's safety when undertaking practical work. Global advances in STEM subjects has a major effect on the quality of our lives. Pupils are encouraged to consider the benefits and drawbacks of scientific and technological developments and the social responsibility involved.

At Milngavie Primary we will explore Cultural education in STEM subjects and develop an understanding that scientific discoveries are as much of a part of our culture as great music and films. Credit is given to scientific discoveries of other cultures. Science is also seen as a contemporary activity and developments are made all over the world. It is therefore an activity undertaken by a wide range of men and women in many different cultures both now and in the past. The interdependence of the world in environmental issues is central to science.

**Resources & Risk**

STEM subject resources are audited by the Science Class Teacher. We will enhance the availability of resources starting in session 2020-21.

Risk assessments: All aspects of STEM are taught in a stimulating yet safe environment. Children are taught to recognise that there are hazards in living things, materials and physical process, and assess risks and take action to reduce risks to themselves and others. When using various pieces of equipment children are given the necessary supervision and resources to ensure they are working in a safe environment. All activities are risk assessed if required.

An example of this working very effectively was the 'Building Bridges' project that was a collaborative venture between the school and a parent.

In Early Years children learn to risk assess the things they do in and around the Early Years Centre. Risky play without adults intervening unnecessarily is commonplace. School staff are beginning to take the same approach.

<u>**Developing Wider Achievement**</u>

At Milngavie primary we will ensure that our core values are promoted, demonstrated and applied consistently throughout school. Within the teaching of STEM subjects, opportunities to address these values include but are not limited to the following:

- The activities of the school's eco council
- School assemblies about respect for the environment
- Group work during technology and engineering sessions
- Supporting charities through donations and fundraising
- Promoting a respectful approach to our local and wider environment
- Caring for other living things
- Links with other schools
- Whole class activities that involve caring for other living things
- Teamwork e.g. during inter-house activities, events such as Sundog or science competitions
- Events to mark national and international events (World Space Week, British Science Week)
- Engaging with the local community during STEM events
- Trips to places of significance to STEM in the local and wider community
- Lessons that involve debate, team work and collaborative learning

We will look for opportunities to integrate more STEM opportunities into our Common Curriculum.

We will look at different models to track and monitor wider achievements.

We will liaise with our local Secondary and the Developing Scotland's Young Workforce Team to look at the possibility of using Pupil profiles to capture the pupil's learning pathway.

*At the time of writing the school is looking at approaches to more effectively engage pupils in dialogue about their wider achievements as well as recording and tracking this more formally so that we can use the data to better identify where more challenge and support is required as well as signposting children to specialists who can develop their specific skills and aptitudes.*

<u>Meeting the needs of All of our Learners and Challenging Learning</u>

As well as our established approaches to targeted and Universal support we work hard to remove barriers to learning.
Using a differentiated curriculum, appropriate questioning and ensuring we have a robust yet engaging classroom ethos we create the conditions for learning that maximised everyone's potential.

We work hard to challenge our more able learners using the following pedagogical approaches: -
**Zone of Proximal development**
-Asking student to do something just outside of what they can already do
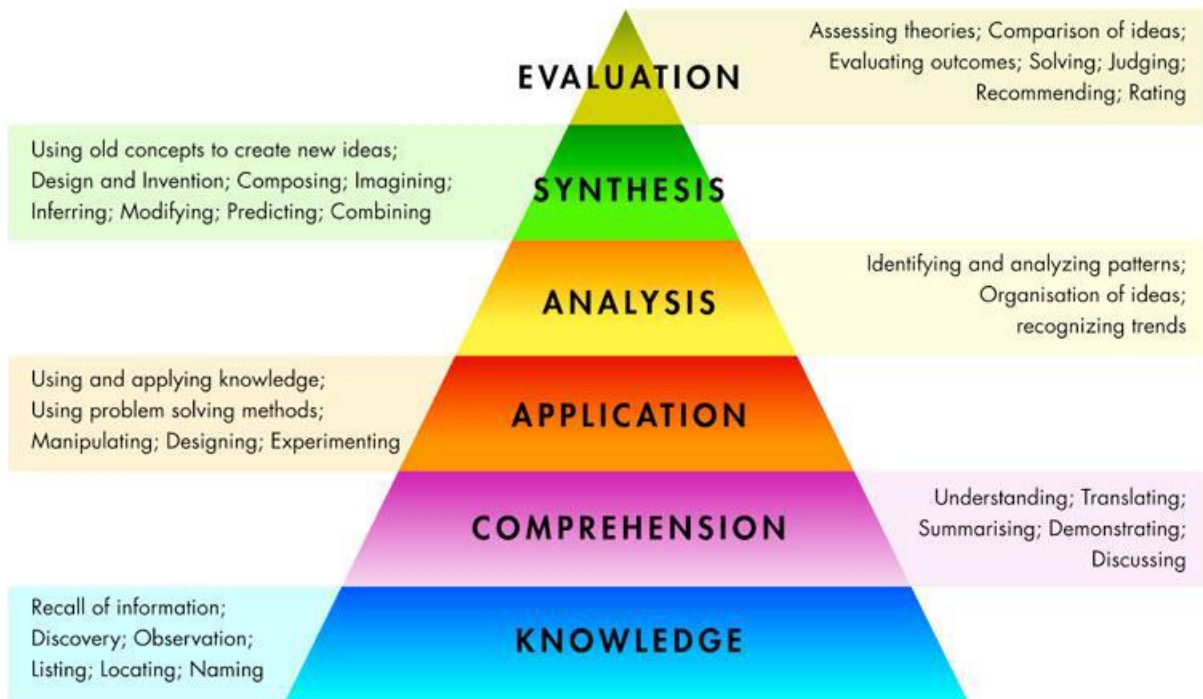**Socratic Questioning**
- draw out assumptions, misconceptions and errors in students own thinking
**Four Levels of learning** - finding questions that shift the learner into the realms of analysis and concepts

Our staff have received training on using Blooms Taxonomy to develop pupil's Higher Order Thinking Skills. See below.

*For more information, please see our Able Pupil Strategy Paper. We are currently creating a Strategy paper on Maths and Numeracy and have devised a series of curriculum planners for ICT to complement the STEM suite of activities.*

# BLOOMS TAXONOMY

**EVALUATION** — Assessing theories; Comparison of ideas; Evaluating outcomes; Solving; Judging; Recommending; Rating

**SYNTHESIS** — Using old concepts to create new ideas; Design and Invention; Composing; Imagining; Inferring; Modifying; Predicting; Combining

**ANALYSIS** — Identifying and analyzing patterns; Organisation of ideas; recognizing trends

**APPLICATION** — Using and applying knowledge; Using problem solving methods; Manipulating; Designing; Experimenting

**COMPREHENSION** — Understanding; Translating; Summarising; Demonstrating; Discussing

**KNOWLEDGE** — Recall of information; Discovery; Observation; Listing; Locating; Naming

## Equal opportunities

At Milngavie Primary School and EYC we teach science to all children, whatever their ability. STEM forms part of the school's curriculum policy to provide a broad and balanced education to all children. We provide learning opportunities matched to the needs of the children with learning difficulties and disabilities e.g. visual and auditory impairment, and we take into account the targets set for individual children in their Support Plans. Training for Makaton started in session 2021-22. At the time of writing 2 staff have level 2 with a further 3 about to undertake the training. A grant for Early Years staff has been awarded so that we can extend this across the Early level.

Assisted Technology is also used to support children. A range of Apps and tools are used to meet specific requirements.

As above, we also challenge our higher achieving children by setting enquiry based problems and through targeted questions. We recognise the fact that there are children of widely different abilities in all classes and we provide suitable learning opportunities for all children matching the challenge of the task to the ability of the child. We achieve this by:

Setting common tasks which are open ended that can have a variety of responses;

- Setting tasks of increasing difficulty
- Providing resources of different complexity according to the ability of the child;

- Using teaching assistants to support the work of individual children or groups of children.

As a school we are aware of the 9 protected characteristics and as a consequence have undertaken work, as a staff, on ensuring LGBT issues are understood and are no impediment to accessing any curricular area. Going forward we will use LGBT history month to disseminate the positive contributions people from the LGBT community have had on STEM, and as a consequence, on society.

As a school we take every opportunity to tackle gender inequality. From play to learn through to considering positive career destination, this is central to our school's ethos and culture. When arranging visits off site or when arranging visitors to work with the school, we endeavour to ensure that there is good representation from both genders, especially in areas traditionally viewed as having a gender slant. An example would be our work with Atos, promoting the roles for women in the field of IT, cyber security etc.

We create a positive learning environment for our learners whose barrier to learning is a disability. We work hard to ensure that we have the right equipment to help anyone with a disability access learning and devise individualised curriculum where this is required.

We work with a number of agencies and 3rd sector partners to meet the needs of our pupils who are Young Carers or LAC/C. We use funding for our Care Experienced Children to help them access the Curriculum.

This is all reflected in our School and EYC Curriculum Rationales.

## Partnership Working

We have outlined in this paper that we have made a lot of progress in this regard.

We see this as crucial if we are to further enhance learners' exposure to a broad, balanced and dynamic curriculum. To do this we will continue to:

I. Increase collaboration between our school with colleges, universities and employers
II. Further develop our partnership working that has been developed in partnership with our parent body
III. Look for opportunities to further work with business to access resources
IV. Continue to look for support through the STEM Ambassador programme
V. Seek opportunities to work with organisations e.g. Young Engineers and the Science Centre

Examples of current STEM partnership work

Digital
- Scratch Coding
- Financial
Engineering

- Primary Engineer:

Science
- STEM at the Glasgow Science Centre

Employability
- My World of Work


<u>After school Learning and other links include:</u>

<mark>Coding club, Programming, Engineering, Young inventors, Creative Engineering, Gardening Club, just some examples of the STEM related extended learning that we offer.</mark>

**Engagement of Parents and the Wider Community**

In recent months we have established significant buy in from parents who have an interest in science or who work in STEM professions. This began with an open event for parents and from this we have formulated a plan of experiences throughout the session to provide our learners with a range of fun, challenging and creative opportunities to extend their exposure to scientific enquiry. An examples of this can be found in Appendix A & B.

Pre Covid we held our first science Fayre. We aim to reintroduce this, with the support of our parents who work in the STEM industries.

As part of our strategic planning we will refer to the Engaging Parents and Families suite of resources produced by Education Scotland.

**Assessment, Planning, Tracking and Monitoring**

How will we assess our learner's work in STEM subjects?

Professional judgements will be made as staff observe the children during lessons. Once the children complete a piece of work, this will be reviewed and commented on as appropriate and children will engage in peer and self-assessing. Once we complete a unit of work, we will use evidence from a range of sources to make judgement of each individual child's understanding. As of August 2019 we will record our professional judgements on the Seemis Progress and Achievement platform. This allows us to drill down against other factors including FME, SIMD, LAC/C, Young Carers, Child Protection and other aspects of Safeguarding. These assessment records are used to plan future work, to provide the basis for assessing the progress of the child, and to pass information on to the next teacher at the end of the year. Samples of the children's work are kept each year showing evidence of good practice. Science assessment records are maintained by the Class Teacher in Science.

Staff have been provided with a range of Assessment proformas to track and monitor pupils progress using a R,A,G model, consistent with that of the Seemis Progress and Achievement platform.

Baselines are used to gather evidence in Literacy and Numeracy. We will investigate what is available for doing something similar for the science aspect of STEM.

From starting at the age of three, children's progress is gathered using the Learning Journals. This allows us to track and monitor children's progress and is a basis for the discussions teachers have at the transition between the EYC and P1, ensuring that the skills of early level On moving to P1 these are used more as a tool to share learner's experiences with their family.

Planning formats are in place for each Level and Curricular area and are linked to the Experiences and Outcomes of the Curriculum for Excellence. We will continue to monitor all processes to ensure that they are not overly bureaucratic.

New proformas are being developed to focus on key areas of learning and teaching. This includes areas such as AIfL and Differentiation and others will be devised to review all aspects of the curriculum, including STEM.

**Evaluating our progress**

**Self-Evaluation** *(Please refer to our new Self Evaluation Guidelines and Procedures)*

We use How Good is Our School 4 to evaluate our performance against the Quality Indicators and the Level 5 statements. (See below)

We also refer to the STEM Self Evaluation and Improvement framework to help is drill down to some of the core elements of STEM. See Appendix C.

We have also started to use How Good is OUR School to engage pupils in the self-evaluation progress. Latterly, this was led by the Headteacher in partnership with representatives from across the school. This was integrated into our 'Common Curriculum', being one of the numerous pupil engagement groups (House Huddles).

**Using this framework**

*How good is our school?* (Fourth edition) (HGIOS4?) and *How good is our early learning and childcare?* (HGIOELC?) encourage a culture of self-improvement

STEM self-evaluation and improvement framework is intended to act as a complementary resource to *HGIOS4?* and *HGIOELC?*



**LOOKING INWARDS:** knowing ourselves inside out through effective self-evaluation

**LOOKING OUTWARDS:** learning from what happens elsewhere to challenge our own thinking

**LOOKING FORWARDS:** exploring what the future might hold for today's learners and planning how to get there

Although Self-Assessment is on-going we do have a Monitoring Calendar that provides a broad overview to our activities each session. At the end of Sessions '17/'18 and '18/'19 we met with parents to evaluate our joint progress and to plan next steps in our curricular delivery.

**School Improvement Planning**

As part of Our School Improvement Plan for Session 2019-20 we will revisit the development of skills in problem Solving and mental computation. This was led by the Maths Working Party.

In Session 2020-21 we will revise our approaches to active learning in Numeracy. The Numeracy Co-ordinators will research pedagogies and methodologies that would best support delivery.

 Staff will be given time to engage with the process and review the strategy papers that are produced.

We will use the self-evaluation and monitoring processes outlined above to determine our next steps.

We are aware that we need to revisit AifL strategies so that we have a more consistency of approach in ensuring learners are engaged in their learning and more adept at setting their own targets and next steps. In 2021-22 a Consistency group was established. In session 2022-23 they will review Dylan Williams materials.

**Strategy Conclusion**

We will continue to take every opportunity to reach outside the classroom to enhance and enrich the school curriculum by making links with the world of work, so that children can relate school S.T.E.M. subjects to real world experiences. Through taking part in lessons, workshops, demonstrations and activities linked to businesses and industry, children at Milngavie Primary School and EYC can gain insights into the various job roles open to them and get excited about the new directions their learning can take them in. We will continue to encourage S.T.E.M. ambassadors from many professional careers to come and work alongside the children to encourage them to work in teams, to take on work roles or produce an end project. We will continually encourage the use of the outdoors as a purposeful learning platform.

By inspiring and motivating our children, our aim is to ensure that all children see the value and opportunities these subjects offer, personally and professionally. Through our creative enquiry based curriculum we teach the S.T.E.M. , whilst mindful of the need to include the Arts as appropriate (STE@M), knowledge and skills that they will need, to take an active role in our increasingly scientific, and technological society.
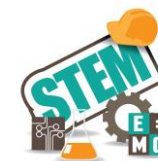
Appendix A (Example)

SEPTEMBER

| Date | Event | Contacts | Comments | Curricular link | Class |
|------|-------|----------|----------|-----------------|-------|
|      | Scottish Food and Drink fortnight |  |  |  |  |
|      | World First Aid Day |  |  |  |  |
|      | Maths Week Scotland |  |  |  |  |
|      | International week of the deaf |  |  |  |  |
|      | International day of Peace |  |  |  |  |
|      | Harvest Festival |  |  |  |  |
|      | British Food Fortnight |  |  |  |  |
|      | World Heart Day |  |  |  |  |
|      | Recycle Scotland |  |  |  |  |
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Appendix B – (example)

| Curric Area/ CLASS | Biological Systems : Body Systems and cells; Inheritence | Forces, electricity and waves: Forces; Electricity; Vibrations and waves | Materials: Properties and uses of substances; Earth's materials; chemical changes | Planet Earth: Biodiversity and interdependence; Energy sources and sustainability; processes of the planet; Space | Topical Science | People, Past events and Societies | People, Place and Environment | People in Society, Economy and Business | **EXPLORE, BUILD & REFINE** | | | | | | **ADDED VALUE** | | | | | |
| | | | | | | | | | Technological developments in society | ICT to enhance learning | Business | Computing science | Food and textiles | Craft, design, engineering and graphics | John Muir Award | Sustrans/ibike | CULTIVATION | Enterprise | Community Partnerships | |
| ELCC | | | | | | | | | | | | | | | | | | | | |
| 1a | Senses | Forces/Electricity/Sound | Materials | Living Things/Plants/Energy/Water/Sun, moon and stars | SCN 0-20a | Scottish Stories and Authors | Our school / Seasons/ Minibeasts | Our Community | | | | | | | | | | | Friendship Circles | |
| b | | | | | | Scottish Stories and Authors | | | | | | | | | | | | | Friendship Circles | |

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| Starting out | | Features of highly-effective practice |
|---|---|---|
| **QI 1.1 Self-evaluation for self-improvement.** We look inwards with staff, learners and partners to self-evaluate our STEM approaches. We are identifying initial strengths and areas for improvement. We have started to gather evidence about the quality of learning and teaching in STEM and progress of learners. We are engaging with the *Career Education Standard* to reflect on current practice. We are beginning to look outwards to learn from others. We use our self-evaluation to look forward and plan our next steps. | 1 2 3 4 5 6<br>Our next steps: | A range of effective approaches are being used to involve staff, learners and partners in our STEM self-evaluation. Learners are put at the centre of this process and have a strong voice. We have a shared understanding of expectations in STEM and of our strengths and our improvement needs. Robust evidence is being gathered to track progress in STEM for all learners. Engagement with a wide range of advice and research helps us reflect on current practice. We actively look outwards to seek good practice in STEM. Our self-evaluation is leading to continuous improvement. |
| **QI 1.2 Leadership of learning.** Collegiate and collaborative working to support STEM improvement takes place. Identified staff lead STEM developments. We are reaching out to staff, learners, parents, STEM partners and employers to learn with and from each other. Staff strengths and development needs in STEM have been identified and collegiate working and professional learning opportunities are being planned. Learners are starting to take responsibility for their STEM learning. | 1 2 3 4 5 6<br>Our next steps: | A culture of professional learning and collegiate working exists across our learning community. There is strong leadership of learning by staff. Constructive relationships, internally and with STEM partners, help us to learn with and from each other. Engagement with STEM and DYW research and policy is improving learning. Staff share resources, subject expertise and pedagogies across sectors to build their mutual capacity. STEM is linked to digital skills and learning for sustainability. Learners take on leadership roles in STEM, including as Youth STEM Ambassadors. |
| **QI 1.3 Leadership of change.** Through consultation we are developing our understanding of why STEM is important for our learners, their families and our community. Senior leaders have set out the strategic direction for STEM. Leadership in STEM is not overly-dependent on one person. Staff have confidence in the process of change and have contributed to the plan for improvement. We are reflecting on our practice to ensure changes lead to improvement, social justice and equity for learners. | 1 2 3 4 5 6<br>Our next steps: | Our shared vision for STEM reflects the uniqueness of our setting and takes account of labour market information. Strategic leaders effectively guide and manage the direction and pace of change and staff demonstrate collective responsibility for STEM. STEM supports DYW, Scottish Attainment Challenge and National Improvement Framework priorities. Time for professional dialogue, collegiate learning and self-evaluation is protected. We monitor and evaluate impact of changes on outcomes for all learners. |
| **QI 1.5 Management of resources to promote equity.** We audit available STEM resources, including digital technologies, to see what can be used to enhance learning. This includes a focus on learning resources which tackle stereotypes and promote equity and equality through positive STEM role models. We are exploring ways to use our indoor and outdoor spaces creatively to support STEM. | 1 2 3 4 5 6<br>Our next steps: | Best use of available resources, including digital technologies, enables us to create motivating, hands-on STEM learning experiences. Indoor and outdoor learning environments fully support STEM learning. Resources challenge learners at all levels and support independent learning. Stakeholders are enabling us to source additional resources. Resources are allocated to those pursuing different STEM pathways in a way that ensures equality and equity. |
| **QI 2.2 Curriculum.** We engage with STEM challenges, themed weeks and events to build our confidence and understanding of STEM and to help us develop our curriculum. We develop the rationale and design of our STEM curriculum collegiately. We are learning to weave sciences, technologies, engineering, mathematics and digital skills together. We are trying new pedagogies to develop STEM skills for learning, life and work through play and active learning. | 1 2 3 4 5 6<br>Our next steps: | We have a strong rationale and shared vision for STEM. STEM is effectively embedded across the four contexts of learning. Collegiate working across STEM staff, colleges and employers, ensures coherent curriculum planning, progression and learner pathways. Our STEM curriculum is creative and motivating and aligned to learners' aspirations and labour market needs. Curriculum developments are planned with stakeholders including our local college and employers. Children develop play and practice skills in STEM. |

| Starting out | | Features of highly-effective practice |
|---|---|---|
| **QI 2.3 Learning, teaching and assessment.** Our STEM pedagogy is developing and we are exploring how different environments and approaches can be used to motivate and engage learners. Staff share successes and practice to enhance learning and teaching and ensure a more consistent approach. We are starting to engage with the *Benchmarks for Assessment* and are reviewing the way we gather and moderate evidence to monitor and track learners' progress in STEM. | 1 2 3 4 5 6 <br> Our next steps: | STEM pedagogy promotes inquiry-based, experiential and challenging learning that reflects the needs and interests of learners. Creativity, curiosity, investigation, invention, discovery and problem solving are enhanced through STEM. A range of evidence is gathered to assess progress and to provide high-quality feedback to learners. The *Benchmarks for Assessment* are being used to support moderation of STEM across all ages and stages. We monitor and track learners' progress across STEM using robust evidence. |
| **QI 2.5 Family learning.** Families are being consulted to better understand their needs and aspirations in relation to STEM. We are reaching out to parents to involve them in our STEM planning, events and activities. Colleagues from our learning community, including early learning and childcare, are sharing approaches to parental and family engagement. | 1 2 3 4 5 6 <br> Our next steps: | Family and parental engagement is integral to our STEM activities, events and communications. This is helping to build STEM capital. The diversity of the STEM workforce and the value of different STEM pathways are promoted to families, especially to those facing barriers to STEM employment (SIMD/ deprivation, ethnicity, disability, gender and care-experienced learners). |
| **QI 2.6 Transitions.** Consultation and collaboration with learning community colleagues and partners is helping to improve transitions, information-sharing and pathways in STEM. Visits to other settings in our learning community, including our college and early learning and childcare settings, help build our understanding of learners' journeys in STEM and how progression in learning across transitions can be improved. | 1 2 3 4 5 6 <br> Our next steps: | Learners make progress through well-planned transitions and are supported to make informed choices about STEM careers and pathways including apprenticeships. Tailored programmes help those needing additional support. There is progression in STEM learning and skills development across all curriculum areas at all stages of learning. Tracking, monitoring & profiling helps learners identify their strengths, skills and next steps in learning. |
| **QI 2.7 Partnerships.** We are exploring opportunities to engage in partnership working with parents/carers, our regional college, STEM Ambassadors and employers to enhance STEM learning and teaching and promote STEM careers. An understanding of the different contexts in which we work and the purpose of partnership working is developing. | 1 2 3 4 5 6 <br> Our next steps: | Sustainable relationships have been built with a wide range of STEM partners and employers. Partnerships are based on our shared values, vision and aims and the *Work Placement Standard* and *Guidance on School/Employer Partnerships*. We have a clear strategy for growing new and existing partnerships and jointly plan and evaluate work to enhance our STEM offer. |
| **QI 3.1 Ensuring wellbeing, equality and inclusion.** STEM is beginning to enhance wellbeing and outcomes for learners. Opportunities to promote equality, diversity, inclusion and equity through STEM are being explored. Our understanding of gender equality and stereotyping in STEM is developing. STEM learning materials, books and displays are being reviewed to ensure they promote diversity and tackle stereotypes. | 1 2 3 4 5 6 <br> Our next steps: | All learners feel safe, healthy, achieving, nurtured, active, respected, responsible and included in STEM activities. STEM builds positive relationships across our learning community. STEM activities focus strongly on equality, diversity, inclusion and equity. We monitor and track progress of learners (SIMD, ethnicity, disability, gender and care-experienced learners). Sustained action addresses unconscious bias and promotes gender balance. |
| **QI 3.2 Raising attainment & achievement/***Securing children's progress.* Learners are being provided with opportunities for personal achievement in STEM through STEM clubs, challenges, competitions and other experiences. Approaches to raising attainment and achievement, including in literacy and numeracy, through STEM are being trialled. | 1 2 3 4 5 6 <br> Our next steps: | We are raising attainment in literacy, numeracy and STEM areas, particularly for the most disadvantaged learners. We develop STEM skills and celebrate and accredit achievements. STEM-related *Benchmarks for Assessment* support moderation and inform professional judgement. Robust tracking and monitoring informs interventions. STEM is increasing positive destinations. |
| **QI 3.3 Creativity and employability.** STEM careers fairs and *My World of Work* website are raising the profile of STEM skills and careers. Creativity, entrepreneurship and innovation are being introduced to STEM learning. The expertise of young people themselves is helping to build our digital skills. We are engaging with the *Careers Education Standard*. | 1 2 3 4 5 6 <br> Our next steps: | Creativity, entrepreneurship, innovation & digital skills are embedded in STEM learning. Employers and partners help us develop STEM skills linked to the world of work. Employability skills help learners make informed choices about learning pathways. The *Career Education Standard*, *Work Placement Standard* and *Guidance on School/Employer Partnerships* are fully implemented. Learners are highly informed about STEM careers. |

# Key links/documents

- Benchmarks – The Curriculum for Excellence Benchmarks set out clear statements about what learners need to know and be able to do to achieve a level across all curriculum areas.

- Experiences and outcomes (often called Es+Os) are a set of clear and concise statements about children's learning and progression in each curriculum area. They are used to help plan learning and to assess progress.

- Principles and practice - The principles and practice documents are essential reading for practitioners as they begin, and then develop, their work with the statements of experiences and outcomes.

- Building the Curriculum - The 'Building the Curriculum' document series provides advice, guidance and policy for different aspects of Curriculum for Excellence including: the curriculum areas assessment; and developing skills for learning, life and work.

- CfE Briefings - A series of briefings designed to provide practitioners with information and advice to support their implementation of Curriculum for Excellence.

- Curriculum for Excellence: A Statement for Practitioners from HM Chief Inspector of Education (Aug 2016) - This Statement is part of the streamlined guidance and support produced as a result of the 2015 OECD report.

- Minutes from the Curriculum for Excellence Management Board meetings.

- Curriculum for Excellence Implementation Board Plans.

- https://education.gov.scot/improvement/learning-resources/improving-gender-balance-3-18

- https://education.gov.scot/improvement/research/gender-balance-in-stem-2015/

- https://www.gov.scot/policies/science-and-research/women-stem/