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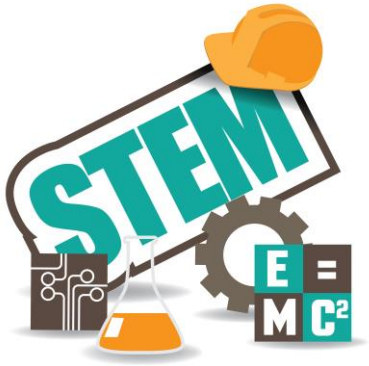


# STEM self-evaluation and improvement framework

For early learning and childcare, ASN, primary and secondary schools

Version for STEM coordinators and senior leaders

December 2017

# Introduction

This self-evaluation and improvement framework can be used to stimulate dialogue and action towards a whole setting approach to sciences, technologies, engineering and mathematics (STEM). It can serve as a helpful guide or route map for early learning and childcare (ELC) establishments, primary, additional support needs (ASN) and secondary schools looking to evaluate and improve their approach to STEM using the quality indicators within *How good is our school? (Fourth edition)* (HGIOS4?) and *How good is our early learning and childcare? (HGIOELC?).* The framework is also aligned with national priorities and policies including the STEM Education and Training Strategy for Scotland, Developing the Young Workforce and the Scottish Attainment Challenge.

**What is STEM?**
Sciences, technology, engineering and mathematics (STEM) education supports high-quality learning within each of its constituent curriculum areas and enables learners to apply their learning in stimulating interdisciplinary contexts. STEM education helps learners to develop a wide range of valuable skills such as creativity, problem solving, analysing, communication, project management, team working, critical thinking, evaluation and systems thinking skills. Learners can be highly motivated and engaged by STEM learning experiences, especially when they involve practical enquiry or problem-based approaches linked to real-life applications and to the world of work.

All of STEM is underpinned by mathematics, which includes numeracy. Digital skills play an increasingly important role in the economy and society and are an important part of STEM education. Within the broad general education, all learning within the sciences, technologies and mathematics curriculum areas would be included within STEM. In the senior phase, a wide range of STEM-related qualifications and awards are available including National Qualifications, Skills for Work Courses and Foundation Apprenticeships. See the *Defining STEM* document for more information: http://bit.ly/STEMSEIframework.

It is important to note that other curriculum areas and qualifications have important contributions to make to the development of STEM skills such as the use of sound and lighting equipment in drama or conversing on STEM topics within modern languages. Many also see the arts and creativity as having a vital role to play in STEM education – this is often referred to as a STEAM (STEM + Arts) approach.

**Why is STEM important?**
- 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.
- The UK has a shortfall of 400,000 STEM graduates every year, 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 imagination and sense of wonder – from the marvel of nanotechnologies to the detection of gravitational waves.

For the reasons above, STEM is seen to be at the heart of the programme 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)*.

**How can we become a STEM Nation?**

If we are to make progress with STEM education then we need to address a number of challenges:

- Many young people enjoy their experiences of STEM at school but research suggests that they rule themselves out of further study or STEM careers because of misguided notions that STEM careers are only for the 'brainiest' few.
- Young people can have a very narrow view of STEM careers (scientist in white coat, maths teachers etc) and don't understand that STEM opens up many careers options – both within and outwith STEM sectors.
- Peers, parents, carers, practitioners, the media and society can sometimes inadvertently perpetuate negative views of STEM as 'geeky' or 'difficult'.
- Practitioners and parents/ carers are key influencers over children and young people's career choices and need to be supported to provide positive encouragement and effective STEM career information.
- Building 'science and STEM capital' in families is vital. This is the knowledge, understanding, interest and contacts within STEM that allows families to support young people in their STEM journey. Without this, learners are less likely to progress onto STEM careers.
- Young people and adults sometimes have a fear or anxiety in relation to mathematics which can be overcome through effective interventions and support.
- We have a gender imbalance across STEM with girls being under-represented in physics, computing science and technologies and boys being under-represented in biology. This has persisted for more than 30 years. Tackling this requires sustained effort and new approaches.
- Many STEM career interventions focus on learners in the senior phase of secondary school when research shows that young people are often making decisions about future pathways and interests in primary school – hence the focus in this framework on progressive STEM learning from 3-18 years.
- Practitioners in early learning and childcare, ASN and primary sectors can often lack confidence in teaching STEM due to a lack of specialism in this area and also due to difficulties in accessing support from industry and providers.
- We need to promote a 'STEM for all' approach to highlight the various rich and rewarding learner pathways such as Foundation Apprenticeships and college and work-based learning so STEM isn't seen as being solely for those wishing to pursue advanced study through a school to university route.
- There are equity issues in some subjects, particularly physics and chemistry, which result in an under-representation of young people from deprived areas.
- STEM competitions, projects and awards can provide important opportunities for personal achievement for learners but it is important to focus also on the key learning community strategies that can bring lasting and transformative change to practice and pedagogy that benefits <u>all</u> learners.

See the Appendix for hyperlinks to key policy and research documents.

This framework provides useful prompts to support progressive and sustained action over several years to help establishments address many of the challenges listed above. It can also provide a useful basis for partnership working with parents/ carers, colleges and industry and to support joint planning, dialogue and improvement activities which lead to transformational change.

**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 across Scottish education. Their aim is to support practitioners and school leaders at all levels as they evaluate current practice and plan next steps for improvement.

This STEM self-evaluation and improvement framework is intended to act as a complementary resource to *HGIOS4?* and *HGIOELC?* It has been designed to support professional dialogue, evaluation and improvement in relation to STEM. Education Scotland has worked in partnership with over fifty ELC settings and schools over a three-year period to develop this STEM framework. There is no obligation to use this framework – it is offered as a helpful guide to settings that are looking to move forward on their STEM journey. Two versions of this STEM framework have been produced. This detailed version has been developed for STEM coordinators and senior leaders within settings. A two-page summary version for practitioners has also been produced and is available from Education Scotland's National Improvement Hub.


- The adjacent diagram illustrates how an "inwards, outwards, forwards" approach remains at the heart of effective self-evaluation. Through this approach you will look inwards to analyse your work, look outwards to find out more about what is working well for others locally and nationally and look forwards to gauge what continuous improvement in STEM might look like in the longer term.

- The progression statements from 'Starting the journey' to 'Features of highly-effective practice' have been organised for consideration under the three main categories from HGIOS4? and HGIOELC? namely: leadership and management, learning provision and successes and achievements.

- Each category contains a selection of quality indicators (QIs) which are particularly relevant for STEM. You may find it more manageable to focus your efforts on one or two QIs at a time. It may take you a few years to make progress towards highly-effective practice but it will be worth it! Start small and watch it grow!

- Quality indicators and sub-headings noted in italics are from *How good is our early learning and childcare?*

- Challenge questions have been provided to support professional dialogue. A pro-forma has also been included at the end to allow establishments to record their self-evaluation and actions.

- Some of the text in the framework will be more relevant to particular sectors. Establishments should use their professional judgement in deciding which aspects are most relevant to them.

| Leadership and management | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Self-evaluation for self-improvement** [QI 1.1]<br><br>Collaborative approaches to self-evaluation | We are looking inwards to self-evaluate our approaches to STEM. This is being done in partnership with staff, learners and stakeholders. Strengths and areas for improvement are being identified. | Our approaches to evaluating STEM provision are being extended. We are involving a wider range of partners and stakeholders, including employers, in self-evaluation activities. A shared understanding of our community's strengths and improvement needs is being developed. | A range of effective approaches are being used to ensure all staff, learners and partners, such as employers and our regional college, are actively involved in our STEM self-evaluation activities. Learners are put at the centre of this process and have a strong voice in all developments. We have a shared understanding of our strengths in STEM and our improvement needs. We can show how consultation with stakeholders informs change and improvement. |
| Analysis and evaluation of intelligence and data/ *Evidence-based improvement* | Evidence about the quality of learning and teaching in STEM and the progress of learners is being gathered and reviewed. Staff engage with key advice and guidance, including the *Career Education Standard*, to reflect on current practice. | Engagement in quality improvement and moderation activities in STEM is helping us develop an understanding of expectations and standards. Approaches to monitoring and tracking learners' progress and skills in STEM are improving. We are looking outwards and engaging with research and guidance to reflect on our practice. | We engage regularly in effective quality improvement and moderation activities in relation to STEM and have agreed standards and expectations. Accurate intelligence is helping us track progress for all learners in STEM including in attainment, achievement and skills development. A wide range of advice and research enables us to reflect on current practice and evaluate the impact of new initiatives. We actively look outwards beyond the school to seek good practice in STEM and can demonstrate improvement as a result. |
| Impact on learners' successes and achievements/ *Ensuring impact of success on children and families* | Our STEM self-evaluation is shared with staff and learners. The outcome of our STEM self-evaluation is helping us to look forward and plan our next steps. | We can show evidence of improvement based on our STEM self-evaluation. This includes impact on various aspects such as, learning and teaching, attainment, achievement and wellbeing of learners. Stakeholders, including learners, are engaging with evidence, to look forward and plan improvements. | Our self-evaluation focusses on key aspects of learners' successes and achievement in STEM. Clear evidence of improvement can be demonstrated based on actions taken as a result of self-evaluation. This includes impact on learning and teaching, attainment, achievement and wellbeing of learners. All stakeholders, including learners, have shared ownership of this evidence and use it to look forward to plan continuous improvement. |
| **Challenge questions:** To what extent are we looking inwards, outwards and forwards to address our improvement needs? How do we ensure improvement for the learner is central to our STEM self-evaluation activity? How well do we involve all stakeholders in self-evaluating our STEM approaches and planning for improvement? How well is evidence from self-evaluation being used to inform change and improvement? To what extent do we have a shared understanding of our strengths and improvement needs in relation to STEM. | | | |

| Leadership and management | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Leadership of learning** [QI 1.2]<br><br>Professional engagement and collegiate working | Opportunities for collegiate working and professional engagement are being provided to support improvements in STEM. Staff have been identified to lead and coordinate STEM activities. We are reaching out to colleagues, learners, parents, partners and employers to build our understanding of STEM and STEM careers. | Regular opportunities for professional engagement and collegiate working in STEM are being provided. An increasing number of staff are demonstrating leadership in learning in STEM and helping to motivate, inspire and support others. A collaborative network of support is being built involving staff, learners, parents, employers and STEM providers. | An ethos and culture of professional engagement and collegiate working across our learning community is evident. Staff share resources, subject expertise and pedagogies to build their mutual capacity. This leads to continuous improvement in learning and teaching in STEM and to improved outcomes for learners. There is strong and shared leadership of learning by staff in STEM. We build constructive relationships with learning community colleagues, parents, STEM Ambassadors, employers, colleges, DYW Regional Groups and STEM providers to take forward improvement priorities and to learn with and from each other. |
| Impact of career-long professional learning | Staff strengths and development needs in STEM have been identified. Collaborative working and professional learning is being accessed by staff and is beginning to enhance learning and teaching. We are engaging with the *Career Education Standard*. | An increasing number of staff are engaging in STEM professional learning and collaborative and collegiate working to build our practice. This is developing our pedagogy and enhancing experiences for learners. We are extending our knowledge of STEM curriculum areas and how they relate to the world of work and other priorities in education. | There is a culture of professional learning and collaborative professional enquiry in STEM. Engagement with STEM research, literature and policy is helping us to lead and develop learning. Staff understand how STEM can help to raise attainment and achievement, tackle inequity and develop the young workforce. We are linking STEM to cross-cutting themes such as digital skills and learning for sustainability. Engagement with employers, our regional college and other STEM providers continues to deepen our knowledge of STEM curriculum areas, careers and applications. |
| Children and young people leading learning | Learners are being given opportunities to take responsibility for their STEM learning, successes and achievements. | Learners have a range of opportunities to take decisions about their STEM learning and to lead others' learning. They are increasingly engaged in discussions about next steps in their learning in STEM. | Young people are taking responsibility for their own and others' learning. Learners have a strong voice and take on leadership roles as STEM mentors, captains and Youth STEM Ambassadors within our setting and across our learning community. Former learners are encouraged to return to support others in their STEM journeys. |
| **Challenge questions:** To what extent are our practitioners accessing CLPL that builds their confidence in STEM? To what extent are we utilising existing expertise to build STEM capacity across our establishment? How well do we promote a culture of professional enquiry? To what extent are we encouraging learners to lead their own learning across a range of STEM contexts? How are we linking STEM to other strategic priorities such as DYW, the National Improvement Framework, the Scottish Attainment Challenge and Learning for Sustainability? | | | |

| Leadership and management | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Leadership of change** [QI 1.3]<br><br>Developing a shared vision, values and aims | Consultation with stakeholders is building our understanding of why STEM is important for our learners, their families and our community. Our STEM vision, values and aims are being developed. | Our vision, values and aims for STEM have been established through collaboration, debate and dialogue. A growing number of stakeholders have ownership of this vision which is shaped by the context of our community and awareness of policy and practice. | Our shared vision, values and aims for STEM continue to evolve through ongoing debate, dialogue and reflection with stakeholders including community, college and business partners. Our aspirational vision reflects the social, economic and cultural context of our community. All staff and partners are committed to ensuring we achieve the highest standards and success for all learners. |
| Strategic planning for continuous improvement | Senior leaders are establishing the strategic direction for STEM. Staff are confident about the process of change and are contributing to the plan for improvement through dialogue, collegiate learning and self-evaluation. | STEM is on our improvement plan. Staff, learners and stakeholders are beginning to take on shared leadership roles and collaborate effectively. STEM is being connected to other priorities including NIF, SAC and DYW. Time is being made for professional dialogue, collegiate learning and self-evaluation to support improvement. | Staff demonstrate collective responsibility to initiate well-informed change in STEM. STEM is being aligned with other strategic priorities such as the National Improvement Framework, Scottish Attainment Challenge and DYW. Strategic leaders effectively guide and manage the direction and pace of change. Time is being protected for professional dialogue, collegiate learning and self-evaluation to support continuous improvement. |
| Implementing improvement and change | Staff have been identified to lead implementation, improvement and change in STEM. This leadership is not overly-dependent on one person. Staff understand the need for change and how STEM can help promote equity, equality and social justice. | A core team of staff provide effective coordination and leadership for STEM. Leadership for STEM at all levels is emerging and staff are increasingly taking responsibility for implementing change. A clear rationale for STEM has been agreed. Strategies are being developed to monitor and evaluate the impact of changes on outcomes for learners, with a focus on equity and equality. | A strong core team and shared leadership at all levels, including staff, learners, parents and employers, is helping to make our vision for STEM a reality. Staff at all levels take responsibility for implementing change and for promoting equality and social justice across STEM-related work. Creativity, innovation and practitioner enquiry is leading to positive change and greater equity for all learners. Effective strategies are in place to monitor and evaluate impact of changes on outcomes for all learners. |

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| **Management of resources to promote equity** [QI 1.5]<br><br>Management of resources and environment for learning | Available resources, including digital technologies, are being audited to see what can be used to enhance STEM 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. | An increasing range of resources, including digital technologies, are being used to support STEM learning. This includes creative use of indoor and outdoor spaces to support learning, teaching and inclusion. Online resources, such as *My World of Work*, are used to connect learning to the world of work. Resource allocation is being reviewed to ensure the needs of all learners are being met equitably, including those pursuing different learner pathways in STEM. | We make best use of available resources, including digital technologies, to create motivating, hands-on STEM learning experiences and investigations. Indoor and outdoor learning environments fully support learning, teaching and inclusion in STEM. Learners make independent and responsible use of resources and have access to resources which challenge them at all levels. Online resources, such as *My World of Work* and *Marketplace* are being used effectively to promote awareness of STEM careers and opportunities. Employers, colleges, STEM providers and other stakeholders are helping us to access additional resources to enhance learning. We diligently implement health and safety legislation in relation to STEM equipment and activities. STEM resources are being allocated efficiently and transparently, and with a focus on equality and equity. Those pursuing different STEM pathways are supported equitably. |
| **Challenge questions:** How effectively do we use our resources to meet the learning needs of all and ensure equity? How well are our buildings, outdoor spaces and community resources being used to create stimulating STEM spaces? How well are we monitoring the impact of resources to inform future resourcing? How effectively are we working with STEM partners to give learners access to a much wider range of resources and learning environments? | | | |

| Learning provision | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Curriculum** [QI 2.2]<br><br>Rationale and design | The rationale and design of our STEM curriculum is being developed collegiately. Opportunities to make links across science, technologies, engineering and mathematics, and digital skills, are being explored. Engagement with national events and themed weeks builds motivation, awareness and confidence in STEM. | A clear vision and rationale for our STEM curriculum, informed by our values, has been agreed. Our STEM curriculum is increasingly being delivered through the four contexts of learning. Staff recognise the importance of STEM to promote equity, equality and positive destinations for all learners. Improved collegiate working across STEM areas is evident. | STEM is fully embedded across the four contexts of learning and meets the entitlement of learners as set out in the *Career Education Standard*. An increasing range of creative, motivating and relevant opportunities and learning contexts are being used. Learning for sustainability, creativity and enterprise are being promoted through STEM contexts. Effective collegiate working across STEM areas enables coherent curriculum planning. |
| Development of the curriculum | Own knowledge of STEM and DYW is growing and helping us develop our STEM curriculum. We are reaching out to parents and learning community colleagues to involve them in this process. | Learners, learning community colleagues, parents, college staff and employers are involved in reviewing and developing our STEM curriculum. We take account of labour market information, DYW and learning for sustainability (LfS). | Our STEM curriculum continues to evolve and is aligned to labour market needs, the National STEM Strategy, DYW and LfS. Learners, learning community colleagues, parents, college staff and employers jointly plan curriculum developments to support positive outcomes for all learners. |
| Learning pathways/ *Pedagogy and play* | Learning pathways in STEM are being reviewed to ensure they meet the needs of all learners. This includes a review of prior learning, progression in learning, and skills development. We are trying new pedagogies to develop STEM skills through play and active learning. | Flexible learning pathways in STEM are being developed to meet the needs of all learners. These are aligned to the principles of curriculum design and build on prior learning. STEM is being linked to literacy, numeracy, health and wellbeing and digital skills. Play and practice skills relating to STEM are more embedded. | Flexible learning pathways in STEM are helping to raise attainment and meets the needs and aspirations of all learners. We work with regional colleges and employers to plan and deliver a coherent range of STEM learner pathways. Learners are provided with rich and relevant opportunities to develop play and practice skills in STEM, both indoors and outdoors. |
| Skills for learning, life and work | We are engaging with the *Career Education Standard* and are reflecting on how we are meeting the entitlements of learners through STEM. Through the curriculum, we are raising the profile of STEM skills and careers. | Employability and career management skills, as outlined in the *Career Education Standard*, are beginning to be embedded in the curriculum. Work with partners and employers is enhancing learners' skills and awareness of STEM careers. | The entitlements of learners, as outlined in the *Career Education Standard,* are embedded in our curriculum. Partners help shape progressive, challenging and motivating STEM experiences in line with the *Work Placement Standard* and *School Employer Partnership Guidance*. All learners are highly informed about STEM skills and careers. |
| **Challenge questions:** How well are we using STEM to support interdisciplinary learning? To what extent can our learners relate their STEM learning and skills to the world of work? How well do our approaches to profiling help young people recognise the STEM skills they are developing? How well are our learning pathways in STEM meeting the needs and aspirations of all learners, as well as employers and industry? | | | |

| Learning provision | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Learning, teaching and assessment** [QI 2.3]<br>Learning and engagement | Interactive learning experiences in STEM, including with digital technologies, are being developed to engage and motivate learners. Staff are sharing successes and practice to enhance learning and teaching across our setting. | The majority of learners are engaged in motivating and challenging inquiry-based and experiential STEM learning experiences. Learners are becoming increasing resilient, confident and independent in their learning. Learners exercise choice in their learning. | STEM pedagogy promotes active, inquiry-based, experiential learning that is challenging and well-matched to the needs and interests of learners. All learners understand the purpose and relevance of their STEM learning, such as to children's rights. Learners lead learning in STEM and are resilient and confident in exercising choice. Learners are highly motivated. |
| Quality of teaching/ *interactions* | Our STEM pedagogy is developing and we are exploring how different learning environments and approaches can be used to engage learners. Observation of learners' engagement is informing interventions and future learning. | Staff across our setting increasingly demonstrate effective pedagogy and practice in STEM, in line with our vision and values. We use learning environments and creative teaching approaches to promote curiosity, independence and higher-order thinking. | Our STEM pedagogy is underpinned by our school vision and values. A wide range of STEM learning environments and creative teaching approaches are used to develop higher-order skills and independent learning. Learning is enriched by digital technologies. Curiosity, investigation, invention, discovery and problem solving are strong features of our STEM learning. |
| Effective use of assessment | We are looking at the evidence we gather for STEM-related learning and what this tells us about learners' knowledge, understanding, skills, capabilities and attributes. Staff are starting to engage with the *Benchmarks for Assessment* for STEM areas. | Our approaches to assessment in STEM are improving. Staff are using evidence to provide regular feedback to learners and to parents. The *Benchmarks for Assessment* are being used by staff to moderate and develop our understanding of standards. | Assessment is integral to our planning of learning and teaching in STEM. We use a variety of assessment approaches to gather reliable and valid evidence of progress; to provide high-quality and regular feedback to learners and to report to parents. Our learning community has shared expectations of standards in STEM and staff use *Benchmarks for Assessment* to support moderation of STEM across all ages and stages. |
| Planning, tracking and monitoring | Our approaches to planning, tracking and monitoring in STEM are being reviewed to help us meet the needs and secure progress for all learners. Learners are being involved in planning learning. | Approaches to planning, tracking and monitoring in STEM are improving. Staff are gaining confidence in analysing data and evidence of learners' progress, attainment and skills development in STEM subjects. This includes a focus on those facing additional challenges. | We effectively monitor and track learners' progress, attainment and skills in STEM. Robust and reliable data and evidence is being used to plan interventions. This improves STEM outcomes, particularly for those facing additional challenges, for example, those from our most deprived communities, those who are looked after, young carers and those with additional support needs. |

**Challenge questions:** How well do staff provide regular high-quality feedback to learners so they understand their progress in STEM learning and what they need to do to improve? How well do we record, analyse and use assessment information in STEM subjects to identify development needs for individual learners and specific groups? How well do we use our community and outdoor spaces to provide high-quality outdoor learning in STEM? How well do staff access and apply relevant findings from research to improve learning and teaching?

| Learning provision | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Family learning** [QI 2.5]<br><br>Engaging families in learning | Families are consulted about their needs and aspirations in relation to STEM and to better understand how they might be involved in STEM planning and activities. We are engaging with colleagues across our learning community, including early learning and childcare settings, to learn about different ways to engage with parents. | Parents/carers are being more widely consulted to ensure that we are meeting their needs and aspirations in relation to STEM. A range of parents are actively involved in planning STEM programmes and supporting STEM activities. Staff work with parents/carers to reduce potential barriers to engagement. STEM has greater profile in our communications to parents and families and in events within our setting. | Parents/carers are involved in the design and delivery of our STEM programmes. We consult parents and careers regularly to ensure that we are meeting the needs and ambitions of families within the learning community. Our parental and family engagement programmes build STEM capital. Families have a diverse range of opportunities to engage in their child's learning, such as cluster-wide STEM fairs, participation in lessons and STEM clubs etc. We use creative, hands-on approaches to STEM homework to engage parents and families. Social media and digital technologies are used effectively to engage parents in their child's learning. Opportunities such as citizen science events, industry visits, science centres and festivals are promoted to our families. A wide range of parents come into school to talk about how they use STEM in their jobs and to support wider STEM activities. |
| Quality of family learning programmes | Engagement with partners, including community learning and development (CLD) partners, helps us map STEM family learning programmes that are currently being delivered. This helps us to build on existing programmes that are having an impact. We are exploring ways to better engage families in learning about STEM and STEM-related careers. | Relevant, fun and engaging STEM family learning programmes are being developed through effective partnerships with relevant agencies, including CLD partners. More parents/carers are becoming involved in their children's STEM learning as well as gaining skills of their own. Families are gaining an understanding of STEM skills, careers and pathways. | Partnership working with CLD and other agencies builds strong, positive relationships with our families and supports lifelong learning in STEM. Parents/carers are actively involved in STEM learning and engage in their children's learning at home and in community settings. We have a sustained focus on promoting gender balance in STEM and engaging with families facing barriers to STEM including those from deprived areas and different ethnic backgrounds, those at risk of disengaging, those with disabled children and those who have experienced care. STEM careers are promoted effectively to families and we celebrate the diversity of the STEM workforce. Different STEM pathways, including Foundation and Modern Apprenticeships, are being promoted enthusiastically to parents. |
| **Challenge questions:** How effectively are we building STEM capital in families? To what extent are we successfully engaging hard to reach families? To what extent are we making use of parental skills and expertise in STEM? How effectively are we using STEM opportunities to engage families in exciting, innovative, relevant and motivating learning experiences? How effectively are we using STEM learning to improve the life chances and health and wellbeing of families? | | | |

| Learning provision | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Transitions** [QI 2.6]<br><br>Arrangements to support learners and their families | The effectiveness of STEM transitions are being reviewed to ensure young people are being prepared for their next phase of STEM learning. Learners, parents/carers and relevant agencies are consulted and involved. | Improved transition arrangements are building confidence and resilience of learners in STEM. The information and support we provide to learners/parents is being improved to help them make informed choices about the next phase of STEM learning. We are taking account of group and individual needs including those needing additional support. | Young people demonstrate resilience and confidence in their STEM learning during transitions and continue to make progress, including those requiring additional support. Learners and parents/carers are supported to make informed choices about learning pathways and to prepare for future destinations in STEM. We promote parity of esteem between traditional and other pathways such as Foundation and Modern Apprenticeships. |
| Collaborative planning and delivery | Collaboration with partners enables us to plan for more effective transitions and pathways in STEM. We are reviewing the way we share information about learners' progress and needs in STEM. | Transition arrangements and the way we share information about learner's progress in STEM are improving. We are increasingly taking account of group and individual needs and making provisions for those requiring additional support. STEM–themed transition days and activities are being used to engage and motivate learners. | Comprehensive, well planned transition arrangements are in place for STEM. Effective tailored programmes for those needing additional support are in place. Strong relationships have been formed across our learning community, and with our regional college and Skills Development Scotland. Coherent STEM transitions and pathways have been developed with our partners. We jointly plan and evaluate our STEM curriculum and share information about learners' progress and needs. |
| Continuity and progression in learning | Staff are visiting other establishments in our learning community to better understand the STEM journey for learners. We are reviewing the continuity and progression in STEM-related learning and observing changes in engagement, motivation, attainment and achievement in STEM subjects through transitions. | Our tracking, monitoring and profiling of STEM progress, attainment and skills development are becoming more effective. This is increasingly helping learners' to identify their strengths and next steps in learning. Collaboration with learning community colleagues and with our regional college is helping to improve continuity and progression in learning in STEM, including across transitions. | There is continuity and progression in STEM learning across all curriculum areas at all stages of learning. Tracking and monitoring, profiling and personal learning planning is helping children and young people identify their strengths, skills and next steps in STEM learning. Information is being shared effectively across transitions within the learning community, and with further/higher education establishments where appropriate. Partnership working helps learners transition into sustained, positive, post-school destinations, particularly in STEM. |
| **Challenge questions:** To what extent are we planning opportunities for staff across sectors to come together to develop a shared understanding or progress across levels and into the senior phase? To what extent are we using information from profiling to ensure continuity in learning and progression in skills development? How effectively are we ensuring learners achieve positive destinations in STEM when they leave school? How well are we engaging with colleagues in our learning community, and in our regional college, to plan coherent learning experiences and pathways in STEM? | | | |

| Learning provision | Starting the journey | Building on achievements | Features of highly-effective practice |
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| **Partnerships** [QI 2.7]<br><br>The development and promotion of partnerships | We are engaging with partners, such as parents, STEM Ambassadors and local employers, to develop our STEM activities and promote STEM careers. We are developing an understanding of the different contexts in which we work and the purpose of our partnership working. | Effective partnerships with parents, employers, our regional college and STEM stakeholders continue to grow. We are starting to align activities to the *Work Placement Standard* and *Guidance on School/Employer Partnerships*. Our partnerships are enabling us to undertake a wider range of STEM activities. Communication between partners is becoming more regular, structured and efficient. | Positive, sustainable relationships have been built with a wide range of STEM partners including parents/ carers, employers, STEM Ambassadors, community learning and development and Third Sector partners, our regional college and higher education institutions, where relevant. Partnerships are based on our shared values, vision and aims. Sustainable partnerships with employers are aligned to the *Work Placement Standard* and *Guidance on School/Employer Partnerships*. We have a clear strategy for growing existing and new partnerships. |
| Collaborative learning and improvement | Partners are involved in evaluating our partnership activities. We are discussing ways in which our partnership working can be extended or improved. | We are starting to work collaboratively with partners to plan, deliver, monitor and evaluate joint activities. Our partnership working supports professional learning and is helping to build leadership capacity and understanding of STEM workplaces, training and career opportunities. | We collaborate effectively, and in a structured way, with partners to plan, deliver, monitor and evaluate joint work. Expertise is shared through mutual training and college/industry visits so that we learn with and from each other. Our partnership working is building the capacity of staff and strengthening leadership within our setting and for our partners. |
| Impact on learners/ *children and families* | Our STEM partnership working is starting to improve learning provision. Positive impacts are emerging for learners and families in our community. We are exploring ways to enhance STEM pathways and parental engagement. | STEM partnership working is resulting in positive outcomes for an increasing number of learners and their families. We work with parents to promote positive perceptions of STEM and engage them in STEM learning. Motivational STEM learning experiences are starting to have a positive impact on attainment. A range of learning pathways in STEM are being planned. | Partnerships are delivering positive outcomes for our learners and families and promoting equity in STEM. We are raising attainment and closing the gap, including in literacy and numeracy, through STEM. STEM capital is being developed by engaging parents in their child's STEM learning. Effective partnerships are providing an extended range of learning pathways in STEM. Learners develop skills to enable them to secure sustainable, positive destinations in STEM. |
| **Challenge questions:** How well are we working with partners including Third Sector organisations to provide tailored programmes for those requiring additional support due to gender, ethnicity, disability and those who have experienced care? To what extent to we engage in joint professional learning with partners? How well do we understand the employment needs and opportunities in our local community? How is this reflected in our learning pathways? | | | |

| Successes and achievements | Starting the journey | Building on achievements | Features of highly-effective practice |
|---|---|---|---|
| **Improving wellbeing, equality and inclusion** [QI 3.1]<br><br>Wellbeing | Our approach to STEM is beginning to enhance wellbeing and improve outcomes for learners. We are exploring ways to use STEM to build supportive relationships in our setting and to celebrate the dignity and worth of every individual. | Our approaches to STEM are promoting wellbeing and improving outcomes for an increasing number of learners. Our learners are benefitting from a wider range of high-quality STEM learning experiences. STEM is enhancing our staff relationships and our sense of community. Staff with STEM-related responsibilities are working together. We are involving learners in decisions and discussions about their STEM learning and pathways. | Our approach to STEM promotes wellbeing and improves outcomes for all learners and their families. All learners feel safe, healthy, achieving, nurtured, active, respected, responsible and included in STEM activities. All staff and STEM partners feel valued and supported. Learners benefit from high-quality STEM experiences and high expectations. STEM is helping to build very positive and supportive relationships across our learning community. Staff with STEM-related responsibilities collaborate effectively. We consider the needs, risks and rights of young people as individuals and actively include them in discussions and decisions about their STEM learning and pathways. |
| Inclusion and equality | We are exploring ways to address equality, diversity, inclusion and equity through STEM. Engagement with research is helping us to build our understanding of gender equality and stereotyping in STEM. Learning materials, books and displays are being reviewed to ensure they promote diversity and do not perpetuate stereotypes. | We are trialling approaches to improve gender balance, equality, equity, diversity and inclusion through STEM. This aims to increase the engagement, attainment and achievement of learners from our most deprived areas; from DYW identified groups (gender, ethnicity, disability and care-experienced young people) and groups with protected characteristics. The diversity of the STEM workforce is celebrated and promoted. Prejudice-based choices about future careers and learning pathways are being challenged, including those relating to gender. | Our STEM curriculum has a strong focus on equality, diversity, inclusion and equity. Evidence is gathered to monitor and track the impact of STEM on engagement, achievement and attainment of learners from our most deprived areas and from DYW identified groups (gender, ethnicity, disability and care-experienced young people). Effective strategies are in place to enable all learners to achieve in STEM. This includes tailored learning and transition programmes for those requiring additional support. Staff engage with research and pro-actively address unconscious bias and promote gender balance in STEM, supported by an effective whole-setting approach to gender equality. STEM visitors to our establishment reflect the diversity of the workforce and promotion of career options, work placements and apprenticeship programmes actively targets DYW identified groups. |

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| **Raising attainment and achievement/**<br><br>***Securing children's progress***<br>[QI 3.2] | Learners are being provided with opportunities for personal achievement through STEM clubs, challenges, competitions and other experiences. Approaches are being trialled to raise attainment and achievement, including in literacy and numeracy, through STEM. The way we track and monitor progress in STEM is being reviewed. | We are starting to see a positive impact on attainment and achievement in literacy, numeracy and STEM areas as a result of our STEM learning. Staff are using STEM-related *Benchmarks for Assessment* to support moderation and inform their professional judgement about learners' progress. Our tracking system is increasingly effective and is helping us to plan interventions to ensure progress and effective skills development, particularly for our most disadvantaged learners. An increasing number of learners are being given opportunities for personal achievement in STEM. | STEM experiences are highly motivating and are helping to raise attainment in literacy, numeracy and STEM learning, particularly for the most disadvantaged learners. A wide range of experiences helps learners develop their STEM skills and capabilities. There is a culture of achievement and STEM successes are celebrated and accredited. Staff use STEM-related *Benchmarks for Assessment* confidently to support moderation and inform their professional judgement about learners' progress. Robust tracking and monitoring exists to capture learners' progress, achievements, attainment and skills development and helps to inform effective interventions. STEM is impacting positively on aspirations and leading to an increase in sustained positive destinations. Learners are being given a wide range of opportunities for personal achievement in STEM. |
| **Challenge questions:** To what extent do we promote equality, equity, diversity and inclusion and have a 'STEM for All' approach? How well are we embedding children's rights, global citizenship and outdoor learning in STEM learning to promote wellbeing and make STEM relevant to learners' lives? How well can we demonstrate improved attainment, achievement, skills development and outcomes for groups and individuals facing barriers to learning, including poverty? To what extent are learners making good progress from prior levels of attainment? How well is assessment evidence used to inform practitioners' judgements? | | | |

| Learning provision | Starting the journey | Building on achievements | Features of highly-effective practice |
|---|---|---|---|
| **Increasing creativity and employability** [QI 3.3]<br><br>Creativity | Through partnership working, we are developing our understanding and ambitions for creativity skills, entrepreneurship and innovation within STEM. Our learners are growing in confidence in their use of creativity as they develop skills for learning, life and work. | Creativity, entrepreneurship and innovation are a feature of our STEM learning. Learning and teaching in relation to creativity and STEM is being enhanced through partnerships with education colleagues and employers. Learners are demonstrating a wider range of creativity and STEM skills and understand the importance of these skills to learning, life and work. | Creativity, entrepreneurship and innovation are embedded across STEM learning. We work with education, employers and partners to enhance learning and demonstrate the relevance of creativity and STEM skills to careers. Learners are motivated, confident and have high levels of self-esteem in STEM-related learning. STEM is promoting curiosity, discovery, imagination and invention in learners and helping them to ask questions, solve problems, make connections across disciplines, explore ideas and seek and justify solutions. |
| Digital innovation and literacy | We are building the capacity of our staff to support the use of digital technologies within STEM. The expertise of young people is being used to build the digital skills of staff and peers. | Staff and learners are growing in confidence and access a wider range of digital technologies. Learners appreciate how computation underpins innovation in STEM and are starting to engage with computational thinking to develop digital solutions, resources and products. | Digital technologies are being used effectively to enhance STEM learning and teaching and to develop learners' digital skills. Learners use computational thinking effectively and confidently when creating innovative digital solutions, resources and products. All learners are well-informed about digital skills and careers. |
| Increasing employability skills | Staff are relating learning and skills development in STEM to future careers. Staff are engaging with the *Career Education Standard*. We are promoting STEM careers through the *My World of Work* website, by organising careers fairs and STEM talks in our setting. | We are better preparing learners for the world of work, including STEM careers, by taking account of labour market needs and the entitlements and expectations in the *Career Education Standard*. Young people are becoming more resilient and adaptable and make more realistic and informed choices as a result of the career management and employability skills they are developing. | Learners are ambitious and prepared for the world of work through progressive learning that connects them more directly to employment. Learners are highly informed about STEM careers and pathways and make realistic and informed choices about their learning pathways, including in STEM. Skills development is aligned to aspirations of learners and needs of employers. The *Career Education Standard*, *Work Placement Standard* and *Guidance on School/Employer Partnerships* are fully implemented. |

**Challenge questions:** How well are we applying creativity as a higher-order thinking skill in STEM? How robust and proactive are we in challenging prejudice-based choices about future careers and learning pathways, including with gender? How well are we developing digital skills through our STEM approaches? To what extent are we protecting time for staff to engage with the *Career Education Standard*, *Work Placement Standard* and *School/Employer Partnership Guidance*?

# STEM – Our self-evaluation, evidence and actions for improvement Date:

| Leadership and management | | |
|---|---|---|
| How well are we doing? | How do we know? What evidence do we have? | What are we going to do now? Actions required? |
| **Learning provision** | | |
| How well are we doing? | How do we know? What evidence do we have? | What are we going to do now? Actions required? |
| **Successes and achievements** | | |
| How well are we doing? | How do we know? What evidence do we have? | What are we going to do now? Actions required? |

# Appendix

## Links to useful resources

The table below contains hyperlinks to useful STEM research, policy and resources.

STEM Education and Training Strategy for Scotland: http://www.gov.scot/Publications/2017/10/1386/downloads
STEM self-evaluation and improvement framework: http://bit.ly/STEMSEIframework

How good is our school? (Fourth edition): http://bit.ly/2mcVlz9

How good is our early learning and childcare?: http://bit.ly/2Arm51f

**Education Scotland**

Monthly STEM e-bulletin sign up: http://bit.ly/2hpDK5m

STEM Central blog: http://bit.ly/EdScotSTEMblog

STEM Central classroom resources: http://bit.ly/STEMcentral

Learning for sustainability: http://bit.ly/LfSframeworks

STEM Yammer group: http://bit.ly/YammerSTEM

Twitter: @EdScotSciences #ScotSTEM

Benchmarks for Assessment: http://bit.ly/CfEbenchmarks

**Developing Our Young Workforce (DYW)**

Monthly DYW e-bulletin sign up: http://bit.ly/2hpDK5m

My World of Work: https://www.myworldofwork.co.uk/

Twitter: @ESskills #youngworkforce

Marketplace: https://www.myworldofwork.co.uk/marketplace

DYW on the National Improvement Hub including *Career Education Standard*, learning resources and case studies: http://bit.ly/DYWsummary

**STEM research**

Aspires: http://bit.ly/STEMAspires

STEM Book of Insights: http://bit.ly/STEMBOI

**Gender**

Improving Gender Balance: http://bit.ly/NIHIGB

Institute of Physics Research: http://bit.ly/IoPGender

**Digital**

Digital Learning and Teaching Strategy for Scotland: http://bit.ly/DigiLTScot

Digital Schools Award: http://www.digitalschoolsawards.co.uk/

## STEM partners

There are a wide range of organisation and partners that can provide support for STEM activities in early learning and childcare settings and schools. These include:

- Parents who have STEM careers or who use STEM skills within their workplace
- Local authority STEM-related support officers and regional STEM Advisors (being recruited from 2018-19)
- RAiSE and Digital Skills Development Officers or Mathematics and Numeracy Hub Champions in your authority
- Employers including local and national employers
- Regional colleges, universities and higher education institutes
- Developing Young Workforce Regional Groups – established to develop links between schools and employers
- STEM hubs – to be established in 2018/19 onwards to support links between schools, employers, colleges, universities and DYW Regional Groups
- Science centres and festivals
- Community learning and development organisations
- STEM providers and third sector organisations.

Please contact your local authority STEM or DYW lead officer or DYW Regional Group (http://bit.ly/DYWRegG) for further support and information.

## Support

SSERC: http://www.sserc.org.uk/

STEM Ambassadors: http://bit.ly/STEMHubsScot

Science Festivals: http://bit.ly/ScotSciFest

SCDI Young Engineers and Science Clubs: http://www.yecscotland.co.uk/

Engineering Development Trust: http://www.etrust.org.uk/contact-us

Digital Extra: http://www.digitalxtrafund.scot/

## Glossary

**STEM** – Sciences, technologies, engineering and mathematics
**DYW** – Developing the young workforce
**HGIOS4?** – How good is our school? (Fourth edition)
**HGIOELC?** – How good is our early learning and childcare?
**QI** – Quality Indicator

**CLD** – Community learning and development
**ELC** – Early learning and childcare
**NIF** – National Improvement Framework
**SAC** – Scottish Attainment Challenge
**LfS** – Learning for sustainability