



An Roinn Oideachais
Department of Education

STEM Education Implementation Plan – Phase 1 Enhancing Progress Report



Context

The recommendations as set out in this document were informed by the STEM and the Arts Advisory Group (the Advisory Group) set up by the Department of Education's STEM Education Implementation Advisory Group (IAG) to guide national actions that enhance linkages between STEM education and the Arts across the education continuum. In the view of the STEM Education Implementation Advisory Group, STEM education is enriched and extended by an alignment between STEM and the arts.

Introduction

The STEM Education Policy Statement 2017–2026 (Policy Statement) was published by the Department of Education (DoE) in November 2017. It is informed by extensive research and consultation and reflects the views of education stakeholders, including young people. The STEM Education Policy Statement focusses on the many strengths in STEM education, while providing a roadmap to address the areas for development. It sets out ambitious goals and actions required to achieve and improve the STEM education experience for all learners from early years to post-primary level.

The vision of the Policy Statement is that: *“Ireland will be internationally recognised as providing the highest quality STEM education experience for learners that nurtures curiosity, inquiry, problem-solving, creativity, ethical behavior, confidence, and persistence, along with the excitement of collaborative innovation”*¹. Central to this vision is the ambition to deliver systematic improvement across the continuum of education, which will contribute to Ireland's future economic development.

Implementation Plan

The STEM Education Implementation Plan 2017-2019 (Implementation Plan), published alongside the Policy Statement, built on a range of reforms and initiatives already underway in STEM, in areas such as curriculum and assessment reform, teacher professional development, embedding digital learning and advances in initial teacher education. It focused on establishing what is necessary to provide a quality STEM education experience for all learners.

The STEM Education Implementation Advisory Group (IAG) was established in order to drive the implementation of the Policy Statement and to progress the Implementation Plan and its key objectives. This group includes representatives from early years, primary, post-primary, further education and third level, as well as representatives from business/industry, the arts, the fields of science and engineering along with representatives from the Department of Education.

The areas of policy development and action in relation to STEM education, as identified in the Policy Statement, span four pillars as follows:

- Nurture Learner engagement and participation;
- Enhance early years practitioner and teacher capacity;

¹ <https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/#stem-education-policy-statement-2017-2026>

- Support STEM Education Practice; and
- Use Evidence to support STEM education.

In order to provide a particular focus to a number of key areas identified for progression a number of subgroups were established under the guidance of the IAG. These groups are as follows:

- The STEM Education Business and Industry subgroup, established to advance the actions in relation to collaboration with business/Industry;
- The STEM and the Arts Advisory group, established to advise on the development, delivery and oversight of relevant actions that enhance the link between STEM education and the Arts and;
- The STEM Gender Balance Advisory Group, established to advise on the oversight, development and delivery of relevant gender balance actions.

Progress in the implementation of the 2017 STEM Education Policy Statement and the 2017-2019 Implementation Plan

Phase 1 of implementation of the Policy Statement was planned for 2017-2019. The focus of implementation included:

- STEM curricular reform and access to excellent resources in order to ensure that students leave school with the required STEM skills;
- Support for principals and teachers to incorporate STEM into their whole-school planning activities;
- Support for schools and teachers to work together on innovative and collaborative initiatives in STEM as part of a programme to improve the STEM learning environment and to implement successful initiatives;
- Scoping out the partnership with STEM business and industry and the education sector;
- Supporting effective and engaging STEM teaching in all schools through a quality assured programme of professional learning for teachers and school leaders;
- The Department's Inspectorate continuing to evolve models of inspection to support, build capacity and monitor the quality of STEM education from early-years to post-primary level;
- The publication of analyses of inspection outcomes in STEM in 2019 and at regular intervals thereafter;
- The development of actions to promote and support increased participation in co-curricular and out of school STEM learning opportunities;
- The establishment of stretch targets for STEM education based on analysis of the baseline and the ambitions of the strategy;
- Ensuring teachers and early years educators use a cross-disciplinary approach in and across the four STEM disciplines;
- Increasing opportunities for students to access quality information about STEM careers in partnership with the SFI Smart Futures programme, active involvement of HEIs, business and industry and guidance/STEM subject teachers and;
- Attracting more specialist STEM graduates into the teaching profession.

In early 2020 and again in early 2021, closures of early years settings and schools were mandated as part of public health efforts to contain the spread of Covid-19. These closures, the emphasis on settling the learners back into education settings and addressing needs arising from varied remote learning experiences has impacted on the embedding of STEM education. As a result Phase 1 implementation was extended to 2022, when it was possible to consult with the system.

Notwithstanding the disruption due to the Covid-19 pandemic substantial progress has been made in many areas of the Policy Statement to date.

Pillar 1: Nurture Learner engagement and participation

Pillar 1 states that Nurturing young people's STEM curiosity starts from early childhood and continues throughout their learning journey. We must ensure that learners have a positive engagement with STEM education, while also increasing the uptake of STEM related subjects for learners of all backgrounds, ability and gender. High-quality advice on the importance and relevance of STEM skills and information on the range and diversity of STEM related career opportunities is required for schools, learners and parents.

Progress to date includes:

Data Gathering

Data papers, on the uptake at post-primary level of STEM subjects in general and by gender, have been compiled by the DoE. The data is based on the number of students sitting exams for STEM subjects at Junior Cycle and Leaving Certificate, and compares the uptake of STEM subject's year on year. It also details the number of applications to CAO for STEM related courses. The data shows that while there is an increase in uptake of STEM subjects for examination this increase is small. The gender disparity in those taking STEM subjects for examination is also clear in these reports. It has not been possible to update these papers over the past couple of years given the cancellation of the Leaving Certificate and Junior Cycle exams.

[STEM indicators](#) are included as part of the annual Education Indicators for Ireland report published by the Department of Education. The indicators cover all levels of education from early years, primary and post-primary school, further and higher education and through to lifelong learning. The STEM indicators show that there are strong differences in the percentages of girls and boys participation in STEM subjects, particularly when biology is excluded.

The Inspectorate of the Department of Education published a report in September 2020, entitled '[STEM Education 2020: Reporting on Practice in Early Learning and Care, Primary and Post-Primary Contexts](#)'. This report presents the findings of an Inspectorate evaluation of the implementation of the first phase of the STEM Education Policy Statement 2017-2026 in a sample of primary and post-primary schools and early learning and care settings during the period January 2019 to December 2019. The report provides a benchmark for the education system and policy makers more broadly in relation to how STEM education policy is being implemented at school and early learning and care setting level and to inform actions that may need to be taken to ensure that national STEM education objectives can be achieved.

² <https://www.gov.ie/en/publication/055810-education-statistics/>

Gender Balance in STEM recommendations

*A Review of Literature to Identify a Set of Effective Interventions for Addressing Gender Balance in STEM in Early Years, Primary and Post-Primary Education*³ Settings was undertaken to support the development of the actions. The Gender Balance in STEM recommendations⁴ were published in March 2022. These recommendations aim to enable systemic change in addressing the barriers to female participation in STEM education and to create an inclusive educational experiences for all learners.

Gaeltacht e-Hub project

The Gaeltacht e-Hub project is an innovative project which seeks to use online blended-learning delivery to extend the subject range available through the medium of Irish to students enrolled in post-primary schools in the Gaeltacht School Recognition Scheme. The initial focus of the project has been to facilitate students in Gaeltacht post primary schools to undertake the Leaving Certificate (LC) Physics Higher-Level course. The project is delivered by e-Teachers in lead e-Hub schools to students in receiver schools, who are supervised and supported by e-mentors. The e-Hub project has been extended until 2024 with a fourth Physics cohort, starting in September 2022.

In early 2021, the Education and Training Inspectorate (ETI) Northern Ireland completed an independent evaluation of the impact of the digital e-Hub pilot project. Overall, the findings of the ETI evaluation report were very positive. It was found that the e-Hub project was well resourced, well managed and effective. The ETI recommendations noted the potential for scaling up the project. Following consultation, it was decided to offer Chemistry as the second subject under the e-Hub project. This commenced In September 2022.

Science Foundation Ireland

Science Foundation Ireland (SFI) is undertaking a number of activities, which include:

- A pilot study of STEM Engagement between organisations, and schools and third-level educational institutions carried out by Science Foundation Ireland in conjunction with the Department of Education. Recommendations of the study include the need to expand the reach of industries represented and to include a survey of educational sector;
- The commissioning a review of existing STEM careers awareness provisions, which will inform the future direction of Smart Futures and/or other SFI careers programming;
- The updating of SFI Smart Futures website completed and running with increased interaction since its development www.smartfutures.ie;
- SFI continuing to promote STEM in schools and across the country through the Discover Primary Science and Maths, now Curious Minds, Smart Futures, Science Week and SFI research centers. The phase II pilot of the SFI Badge of Excellence for Curious Minds was launched in Q1 2021. It aims to raise awareness of and excitement about STEM among pupils, teachers and parents/guardians;

³ <https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/#gender-balance-in-stem>

⁴ <https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/#gender-balance-in-stem>

- Renewed partnership between SFI and Careers Portal and continued support of key career events and programme including Higher Options, BT Young Scientist and Technology Exhibition and SciFest and;
- New partnership agreed between Science Foundation Ireland and the Department of Education to support education and public engagement projects in science, technology, engineering and maths (STEM) across the country. Under the partnership the Department of Education will contribute up to €500,000 towards successful projects in the SFI Discover Programme. Under the 2021 SFI Discover call five projects were co-funded under the call. The Department of Education and SFI have continued the partnership in 2022 with a further ten projects funded with increased allocation from the Department of Education of €800,000.

Support of informal STEM education

The Department of Education continues to support key STEM events such as:

- Gold partner of the BT Young Scientist and Technology Exhibition (BTYSTE), a competition for post-primary students that aims to stimulate a passion for STEM within young people, with the provision of funding and support from the Department.
- Provision of funding and support to SciFest by the Department. Scifest promotes Science, Technology, Engineering and Mathematics (STEM) education through the provision of a forum for students at local/regional/national level to present and display their scientific investigations;
- Partnership with RDS ESB Science Blast with the provision of funding and support from the Department. Science Blast is a non-competitive educational programme for primary schools that involves a whole class investigating the science behind a simple question and showcasing their work at one of three National events and;
- Continued support of IWish, an initiative to inspire, encourage and motivate young female students in post-primary schools to pursue careers in STEM

Awareness:

- The development and publication by the Department of a flyer for schools and parents on the Department's approach to STEM education, how to promote STEM and where to look for more information on STEM Education;
- SFI in conjunction with the DoE has run two country-wide cinema advert and social media STEM career awareness campaigns i.e. 'This Is STEMs' and #IGetPaidToDoThis⁵. The cinema advert and social media campaign was designed in line with best practice, to address awareness of STEM careers to young people. Both campaigns were co-funded by the DoE and SFI and were launched in advance of the CAO deadline in early February 2018 and 2019 respectively and;
- The raising awareness of STEM education with learners, teachers and parents through the Department of Education stand at BTYSTE 2019 and 2023 (this was not possible for the intervening years due to the need for BTYSTE to go virtual due to Covid). Information was also provided by the Department for the BTYSTE's virtual Teacher Zone.

⁵ <https://www.youtube.com/watch?v=AlTzYnRPoRM>

⁶ [Smart Futures | Home New | Explore STEM careers & Education.](#)

Pillar 2: Enhance teacher and early years' practitioner capacity

Pillar 2 states that improved teacher capacity is a key enabler in delivering STEM education of the highest quality for our learners. Enhanced preparation, development and support, through high-quality training, Initial Teacher Education, induction and ongoing professional learning is required. We must ensure that we have sufficient capacity within the teaching and early years' profession to respond to current and future developments.

Progress to date:

School placement and student mentoring

The report of the School Placement Working Group was published in 2021. Work on the implementation of recommendations in the report is being progressed by a project team from the Teaching Council and the Department of Education, with the focus on the creation of a centralised placement system and looking at the professional learning needs of Teoraithe, Service the teachers who support and guide the student teacher while on placement.

Continuing Professional Development (CPD) and provision of resources

A Continuing Professional Development (CPD) Framework supporting cross-sectoral design and delivery of STEM CPD has been developed. It harnesses and builds upon a range of CPD innovations already underway in Irish education, in both formal and informal settings.

CPD supports (including online resources and webinars) are continually being developed by the Professional Development Service for Teachers (PDST) and Junior Cycle for Teachers (JCT) (both to become Oide) that connect STEM learning ideas and possibilities across STEM areas at primary and post-primary levels.

Professional Development Service for Teachers (PDST)

Provision of quality assured programmes of professional development with all of PDST's professional development design going through a multi-faceted design process which is informed by the overarching STEM CPD framework. Each design goes through a rigorous internal design process in addition to an external process with relevant stakeholders for designs supporting curricular reform.

CPD provision includes;

- Engagement with the Digital Portfolio Initiative through in-school support and webinars, focused on supporting and enhancing formative assessment in the classroom using digital portfolios;
- Provision of support for clusters of primary and post-primary schools along with third level and/or business partners in the Schools Excellence Fund DEIS/STEM/ Digital;
- Facilitated schools engagement in a Massive Open Online Course (MOOC). The MOOC looked at implementing coding and computational thinking in the classroom using different approaches: AI, robotics, programming, tinkering and making;

- The PDST have commenced a cross-STEM project in partnership with SFI and Teagasc, which will support students in exploring STEM as a way of thinking and set of transferable skills. As part of this process, teachers and students will collaborate with working scientists from industry and research, to develop scientific thinking and methods;
- PDST in association with Limerick Education Centre have launched in term one of 2022/2023 academic year a buddy and school register for the Buddy System which is an agreed action from the Leaving Certificate Computer Science Framework;
- Development of 'Mol Mata', an online Maths Resource through the medium of Irish through cross-border project which included the PDST, with An Chomhairle um Oideachas Gaeltachta agus Gaelscolaíochta (COGG) and (CCEA);
- A Memorandum of Understanding between PDST and Science Foundation Ireland (SFI) which provides an agreed framework for continued cooperation and communication between the two organisation's in the interests of CPD for primary and post primary teachers;
- PDST in collaboration with the School of Education, University College Dublin, expanded 'Equality, Diversity, & Inclusion in STEM: Changing Mindsets and Impacting Sustainable Futures in STEM' (formerly Girls in STEM). This research-based collaboration responds to a key principle identified in the 'STEM Education Policy Statement 2019 - 2026' that 'STEM Education should be for all backgrounds, ability and gender';
- PDST supported thirty schools to engage in the Equality, Diversity & Inclusion (EDI) in STEM initiative for 2021-2022. Teachers were supported in implementing practical interventions to engage pupils in activities designed to nurture positive attitudes to STEM and appreciate the contributions made by people working in STEM to society;
- PDST collaborated with Dr. Niamh Shaw and The Ark Children's Cultural Centre to produce a pack 'Caring for our Earth'. The material connects the primary school Science curriculum and key skills development in particular Designing and Making Skills, with the creative components promoting integration between Science and the arts curricula especially Drama;
- DCU AI Project: This primary project PDST/DCU involves the co-creation of resources focusing on the uses of AI in the primary classroom, including informative webinars and constructed lessons that teachers can engage with;
- AI4T Project (Artificial Intelligence for Teachers): This post-primary project looks at the usefulness of using artificial intelligence for educational purposes. This Erasmus Plus project involves 5 countries (Ireland, Slovenia, France, Italy and Luxembourg). A MOOC to develop teachers' understanding around AI is being developed and piloted during 2021/2022 with a view to more widespread usage upon its revision following the pilot period and;
- DCU WEAVE Project: This primary project in collaboration with DCU aims at integrating computational thinking in a cross-curriculum, culturally-responsive way. Throughout the Weave Project, teachers and students work together to develop resources and activities that will lead to the development of a computational thinking framework for Irish primary schools.

Junior Cycle for Teachers (JCT)

Provision of quality assured programmes of professional development with design informed by reference to the STEM implementation plan 2017 -2019 related documentation, particularly the STEM CPD Framework. JCT CPD support for all Science, Maths and Technologies (which include Engineering, Graphics, Applied Technology and Wood Technology) teachers moved online in 20 -2021 due to the COVID-19 pandemic.

The JCT Technologies team collaborates with other subject teams to help develop coherent effective STEM learning experiences across the curriculum and in elective initiatives such as STE(A)M in Junior Cycle

CPD provision includes:

- The development of an online elective CPD in partnership with SFI/ESERO, Ireland which supports teachers in implementing STEM thinking in their approaches to teaching Earth & Space;
- The design of a suite of resources to support connecting real world data to classroom practice through the use of Common Online Data Analysis Platform (CODAP);
- The development of a series of Podcasts with input from international researchers and practicing teachers on supporting investigation in the science classroom;
- The design and facilitation of an online interactive workshop which explores how teachers can develop the skills of researching in STEM with their students;
- The development of the resource -Digital manipulatives for teaching and learning mathematics- which explores digital tools that support students in visualising mathematical relationships and properties;
- The hosting of webinars including:
 - Exploring digital technology use in the classroom and;
 - Mathematical modelling and problem solving Creativity in mathematics.
- Formative assessment and formative feedback with cross-curricular relevance;
- The development of a large range of digital resources which outline possible digital learning strategies and digital resources that could be utilised in the classroom;
- The provision of Laser Cutting CPD to teachers in partnership with the Atlantic Technological University;
- The delivering of online cloud-based CAD CPD, delivered in partnership with Educational Support Centre's Ireland (ESCI);
- Collaborating with inform and 3DWIT to deliver a series of blended learning electives to teachers. The electives explore how teachers may engage with the modern technology of 3D printing to benefit their students;
- The delivering of electives in collaboration with ATU Connemara, focusing on effective use of laser cutters in the classroom;
- Enhancing creativity and problem-solving using micro: bit in the suite of Technologies subjects and;
- The provision of STE (A) M in Junior Cycle. This is an initiative which provides CPD for teachers of all STEM subjects and offers both subject specific and cross curricular learning opportunities to support teachers to connect classroom learning with real world problems. There are two parts to this initiative. JCT works in partnership with CPD providers from STEM research and industry to develop

curriculum relevant workshops. JCT also works with schools to support teachers in connecting learning across STEM subjects and to improve STEM outcomes for students. CPD provided specifically aligned to the Curriculum Specifications for Science, Geography, Mathematics and Home Economics.

Other CPD provision and resources:

- A National *Solta Auster* Initiative (NSAI) CPD section has been added to the *Auster Solta* Practice Guide providing a series of freely-available short, self-directed bite-sized CPD opportunities. STEM-related CPD developed to date includes, 'Supporting young children's STEM learning', 'Supporting opportunities for creativity' and 'Supporting early maths as a basis for STEM';
- The Resource Development Group of the (NSAI) has been progressing content for CPD in STEM and the Arts for early years' educators. This CPD presents an introduction to recognising and supporting young children's STEM and the Arts experiences in early learning and care settings. It is envisaged that this CPD will be piloted in 2023;
- A wide variety of STEM and the Arts related resources have been developed for the online *Aistear Sóolta* Practice Guide. These include tip sheets for early years' educators and parents;
- SFI's Curious Minds/ESERO programme offers free whole school CPD courses in STEM Education teaching the Curious Minds/ESERO Framework of inquiry through the topics biodiversity, heat and insulation, and space. SFI also offer this free STEM education CPD for teachers on an individual basis at Education Centre's across Ireland and;
- The NCCA continues to explore broadening the use of the Visual Thinking Strategies (VTS) methodology in the education system, from not only supporting teachers of Art, but by introducing it in the subjects of Science, History, Geography and Modern Foreign Languages in post-primary and primary schools.

Leaving Certificate Computer Science

The Leaving Certificate Computer Science (LCCS) Support Framework was put in place to support the national rollout of the new subject Computer Science to post-primary schools. The unique collaboration in the Framework comprises the Department of Education, the Computers in Education Society of Ireland (CESI), Professional Development Service for Teachers, Irish University Association (IUA), Higher Education Institute (HEI), Irish Business and Employers Confederation (IBEC), the Technological Higher Education Association (THEA) and SOLAS and operates as a subgroup of the Leaving Certificate Computer Science Steering Group.

The final report '[Exploring teachers' professional development to support the roll-out of Computer Science in Irish second-level schools](#)', was published in August 2020 by Lero – the Irish Software Research Centre.

Schools Excellence Fund-Digital and STEM

The three-year School Excellence Fund (Digital and STEM) Programme which, was supported by a €1m investment fund, consisted of thirty Digital and ten STEM clusters. The clusters were established comprising circa 230 schools, with links to external agencies including business/industry and higher education. An assigned advisor from the PDST was provided to each of the clusters with the initiative running for three years. In view of the impact of the pandemic and school closures, the duration of the programme was extended to 2022 to allow completion of the projects. External evaluators have been appointed to evaluate the programme.

Pillar 3 – Support STEM Education Practice

Pillar 3 states that we must embrace the changes required in our approach to STEM teaching, learning and assessment if we are to improve learning experiences and outcomes. We must enable learners to become active and reflective participants by providing a range of learning and formative assessment in addition to providing out-of-school STEM learning opportunities. Effective leadership, at both early years and school level, is required to build a STEM culture and enhance the capacity of STEM education. Partnership with business, industry and the research community are also important.

Progress to date:

Curriculum development:

- Consultation on the new Primary Mathematics Curriculum (PMC)⁷ from Junior Infants to Second Class ran from October 2017 to March 2018. Completion of the PMC was delayed following a decision taken to publish the Curriculum as a single specification from Junior Infants to Sixth Class⁸ and to allow more time for teachers to adjust to new pedagogies. Consultation on the full PMC ran from April 2022 to end June 2022. The final draft of the PMC has been forwarded to the Minister from the NCCA with introduction in schools expected in the 2023/2024 school year;
- Consultation on a new Primary Curriculum framework ran from February 2020 to March 2022 (timelines impacted due to covid-19). The NCCA submitted the finalised framework to the Minister for approval in late 2022. Publication is expected by end Q1 2023. This framework will then guide the NCCA's work in developing a specification for each of the five curriculum area;
- The NCCA are in the process of updating Aistear: *the early childhood curriculum framework*. The update is being carried out over two phases with Phase 1 beginning in May 2021. It focused on consultation with stakeholders, including children, parents and practitioners;
- Consideration of approaches to integrating coding and computational thinking as part of the review and redevelopment of the primary curriculum⁹ is informed by the Primary Coding Initiative;¹⁰
- The new specification for Leaving Certificate Applied Mathematics was implemented in schools in September 2021;
- Phase 1 Leaving Certificate Computer Science which commenced in September 2018 with 40 schools has been rolled out nationally to all post primary schools as an optional leaving certificate subject¹¹ since September 2020;
- Implementation in schools of Junior Cycle Wood Technology, Engineering, Applied Technology, Graphics commenced in September 2019;

⁷ <https://ncca.ie/en/primary/primary-developments/primarymathsconsultation/>

⁸ The introduction of the Primary Mathematics Curriculum has been delayed for one year, from 2022 to 2023, due to the Covid-19 pandemic

⁹ <https://ncca.ie/media/4456/ncca-primary-curriculum-framework-2020.pdf>

¹⁰ <https://ncca.ie/en/primary/primary-developments/coding-in-primary-schools/>

¹¹ Due to Covid-19, a decision has been taken to allow schools determine whether they have the capacity to introduce LCCS in 2020 or whether they would prefer to wait and introduce LCCS in 2021.

- Leaving Certificate Science – The review of Leaving Certificate Biology, Chemistry and Physics began in September 2019. Draft curriculum specifications were approved for consultation by NCCA Council in Q4, 2021 but consultation was delayed due to impact of Covid in schools. The new curricula for these subjects will be available in September 2024;
- A new leaving certificate Art specification implemented in all post-primary schools from September 2021;¹²
- Implementation of new Junior Cycle Mathematics curriculum commenced in schools in September 2018 and;
- The new specification for Agricultural Science began implementation in post-primary schools in September 2019 and was examined for the first time in June 2021.

Provision of resources

The National Council for Curriculum and Assessment (NCCA) continue to provide curricular materials for teachers in consultation with the DoE and its support services and other stakeholders such as:

- Support material for the new Primary Mathematics Curriculum;
- Support materials for Junior Cycle Mathematics, Science, Engineering, Wood Technology, Applied Technology and Engineering Graphics which include assessment guidelines and annotated samples of student work;
- Guidance and in practice group monitoring for Leaving Certificate Agricultural Science;
- Guidance and online resources for Leaving Certificate Applied Mathematics;
- Guidance and materials to support teaching and learning for Leaving Certificate Computer Science and;
- Provision of digital resources for the revised specification Agricultural Science Scoilnet¹³ (run by the Department of Education's Support Service – PDST-Technology in Education), is the central repository for STEM resources. It hosts a dedicated section covering STEM with links to Irish and International resources across Science, Mathematics and Engineering including separate sections for primary and post-primary level.

There are currently 4,679 primary and 4,177 post-primary STEM-related resources shared through Scoilnet and tagged to curriculum specifics. There are also sections on recommended resources to include teacher websites, teacher professional development etc. This includes teaching and learning resources that have been shared through collaborations with other organisations.

Scoilnet collaborations include:

- Working with Accenture and Dublin City University to create a dedicated section to highlight and focus on the contribution to STEM of eight female pioneers. The 'Women on Walls' initiative provides information on the innovative work of each scientist and is accompanied by classroom learning activities relating to their work as well as suggestions for career progression in the area;

¹² The introduction of the new Leaving Certificate Art specification was due to take place in September 2020 but was deferred to 2021 due to Covid-19.

¹³ <https://www.scoilnet.ie/>

- A number of STEM-focused organisations have collaborated with Scoilnet and have actively shared their teaching and learning resources since the STEM hubs were built on Scoilnet;
- A dedicated satellite website (www.compsci.ie) to support the roll out of the Leaving Certificate Computer Science was developed. Compsci has a total of 602 senior-level resources and 29 resources are tagged to the Junior Cycle Short Course on Coding and;
- The PDST Technology in Education team have developed five webinars on the implementation of the Digital Learning Framework which can be used by schools to evaluate their progress in implementation STEM education in schools.

Opportunities to participate in informal education programmes:

- SFI Curious Minds which aims to inspire and engage young people in science and technology Awards require schools to take part in two or more informal or extracurricular STEM activities. As part of the Curious Minds CPD offering, in 2021-22 SFI offered €100 vouchers to visit SFI Discover Centre's for schools completing the whole-school course;
- ESERO Ireland promotes and co-ordinates 4 European Space Agency Classroom projects supporting multidisciplinary and hands-on learning;
- SFI conducted a review of the informal STEM learning opportunities offered by the network of 59 SFI Discover Centre's with a view to increasing promotion and participation;
- Through subject CPD teachers are encouraged to include STEM activities on the Junior Cycle Profile of Achievement (JCPA). By 2018/19, with the establishment of the Technologies team, all STEM subjects were provided with subject CPD through the cluster model. Teachers are provided with opportunities to consider which activities could be included under 'Other Areas of Learning' in subject CPD. Some of the informal, co-curricular and extra-curricular STEM activities suggested for inclusion: Student participation in Maths, Science or Technology clubs, involvement in SciFest or BTYSTE, student involvement in Maths Week, Science Week, Engineers Week and Tech Week;
- In whole school CPD - teachers and school leaders have been provided with opportunities to consider what 'Other Areas of Learning' activities, including STEM activities, might be appropriate for inclusion on the JCPA;
- Establishment of the STE(A)M in Junior Cycle initiative by the JCT Science team in 2017 and its expansion to include all STEM subject teams in 2018 provides opportunities for teachers to engage with professional learning experiences in STEM. These experiences encourage engagement in STEM activities and celebrating and promoting these activities through previously established PR channels of the participating teachers and their schools and through social media. Further development of the STE(A)M initiative to include the STE(A)M in Action in Schools Project which supports the development of an interdisciplinary STE(A)M action to be carried out within participating schools. As part of the initiative in 2022, participating schools were invited to a STE(A)M showcase event organised by JCT. All schools involved in the project are presented with a certificate of participation. Student participation in the STE(A)M in Action in schools project is also suitable for inclusion on the JCPA under 'Other Areas of Learning' and;

- The JCT Graphics team collaborated with the Royal Institute of the Architects of Ireland (RIAI) and showcased student entries in the 'Good Design in Everyday Life' Exhibition.

Development of STEM awards programme

SFI Curious Minds Awards, revised criteria to include more evidence of student participation in informal and extracurricular STEM activities and events in schools. Schools continue on an annual basis to receive their awards. In Q2 2019 a third level of Award, the SFI Badge of Excellence, was piloted. It was launched following evaluation in Q1 2021. It aims to raise awareness of and excitement about STEM among pupils, teachers and parents/guardians

Support school leadership to enhance STEM education

The Department's inspectorate illustrate, through the School Self Evaluation (SSE) process how it can be used by primary and post-primary schools to engage with national priorities such as Digital Learning and STEM. At primary, areas of focus for SSE can include skill development, play and inquiry based learning, thematic learning, coding and computational thinking, collaborative learning or STEM design projects. Similarly, at post-primary level, the Inspectorate support schools to identify areas of focus in STEM Education which would have relevance across all curricular areas and to support their own achievements in STEM.

Support the evaluation of STEM education – Department of Education Inspectorate:

- The target set in 2017 for the appointment of five additional inspectors with STEM expertise in early years, primary and post-primary sectors has been fully achieved. Since that time the inspectorate appointed six inspectors with expertise in various aspects of STEM, from Science and Chemistry, to Technology, Molecular Sciences and Mathematics;
- Engagement of young pre-school learners with high-quality STEAM learning experiences is promoted and evaluated through the Quality Framework for Early Years Education Inspections. The Framework includes a number of quality criteria that relate directly to STEAM learning, for example, the provision of "opportunities to engage with activities that build early dispositions towards science, technology, engineering, the arts and mathematics (STEAM)". The use and understanding of mathematical language, the provision of mathematical resources, the use of ICT, the provision of environments that promote curiosity and imagination, and the promotion of hands-on exploration and experimentation of natural materials and other diverse objects through play are also highlighted in the Quality Framework;
- In direct response to the commitment in First Five, the Whole of Government Strategy for Babies, Young Children and their Families to '...pilot the extension of education-focused inspection to children under three' (Goal D Action 2B), the Department of Education Inspectorate opened a consultation with the sector in November 2021 and has also piloted a model to extend Early Years Education Inspection (EYEI) to include early learning provision for children aged under three years. This extended inspection model will include the promotion and evaluation of STEAM learning experiences of all young children from birth to six years attending early learning and care settings. The results of the consultation and pilot are in the

process of being analysed and the results, and a draft revised external Guide to EYEI will be presented to the sector as part of the process;

- A review of 200 Early Years Education Inspection Reports was conducted in 2019 to research and highlight examples of STEM education in practice in early years' settings. This work was a collaboration between Early Years Education Policy Unit (EYEPU) of the Department of Education, the early years Inspectorate and in conjunction with DCU degree programme placement. The review has informed further actions in relation to the progression of STEM and the Arts learning in ELC settings;
- Department of Education Inspectorate - In 2019, over 28% of subject inspections in post-primary were carried out in the STEM subject areas. During Q1 2020, over 40% of all subject inspections at post-primary level were in a STEM subject and over 34% of all Curriculum Evaluations at primary level occurred in STEM subjects. In the remainder of 2020 and 2021, subject inspections and curriculum evaluations were not carried out due to COVID-19 restrictions;
- In the cases where inspectors provided SSE advisory visits in schools that had identified STEM as an area of focus, inspectors advise on the use of the SSE process to support evaluation and improvement planning in STEM;
- In 2020, the Inspectorate developed a webinar series called 'Insights'. Each series contains webinars for early years' educators, parents and teachers in primary school. These short webinars are designed to share the findings, ideas and examples of effective practice that have been gathered during inspection visits to thousands of diverse early learning and care settings across Ireland since 2016. A webinar series focusing on Numeracy, titled: *Numeracy and Mathematical Development in the Early Years*, is available at [gov.ie - Insights – Numeracy and Mathematical Development in Early Years \(www.gov.ie\)](https://www.gov.ie/en/publications-and-resources/details/?document-id=63494). This considers the relationship between numeracy and maths and;
- The DoE Inspectorate published the following reports:
 - STEM Education 2020: Reporting on Practice in Early Learning and Care, Primary and Post-Primary Contexts and;
 - Digital Learning 2020: Reporting on practice in Early Learning and Care, Primary and Post-Primary Contexts.

National and International testing

Ireland continues to benchmark learner achievement in STEM through participation in National and International studies. In 2021 the National Assessments of Mathematics and English reading (NAMER) were completed (delayed due to Covid) with results due to be published in early 2023. Ireland participated in Trends in International Mathematics and Science Study (TIMSS) 2019¹⁴ with results published in the first half of 2023. Ireland participated in Programme for International Student Assessment (PISA) 2018¹⁵ with results published in December 2019. Ireland did again participate in PISA 2022 with the study conducted in schools at the end of 2022.

¹⁴ https://www.erc.ie/wp-content/uploads/2020/12/03-ERC-TIMSS-2019-Report_A4_Online.pdf

¹⁵ <https://www.erc.ie/2019/12/03/pisa-2018-national-report-for-ireland-published/>

Digital Strategy for Schools

A Digital Strategy Action Plan was published annually from 2017 to 2020. Notable achievements over the lifespan of the Digital Strategy for Schools 2015-2020 include:

- The development and rollout of the Digital Learning Framework (DLF) for primary and post-primary schools, the planning guidelines and supporting resources along with the leadership of the PDST (TiE). Engagement of the ERC to conduct a three-year longitudinal study of the implementation of the DLF;
- The inclusion of the development of Digital Skills as a core element of Initial Teacher Education (ITE) programmes;
- Schools Excellence Fund –Digital and STEM Cluster Schools has enabled creative and innovative ways of embedding digital technologies in learning, teaching and assessment;
- ICT infrastructure grants totalling €210m were issued to all recognised eligible primary, special and post-primary schools, to support the implementation of the Digital Strategy over the five-year period beginning in the school year 2016/2017;
- Continuation of provision of STEM/STEM and the Arts resources through Scoilnet and;
- An upgrade programme for post-primary schools to provide baseline connectivity of 200 Mbp/s or greater.

The successor strategy, the Digital Strategy for Schools to 2027, was published in April 2022 and has at its core the aim of empowering schools to further embed digital technologies across their teaching, learning and assessment. It sets out how the development of digital skills are supported in schools and builds on the key achievements under the previous strategy.

The strategy is underpinned by an overall investment of €200m, €50m of which has already issued directly to schools. A further €13m is invested on an annual basis in the Schools Broadband Programme and a further €50m was issued in grant funding in November 2021 as part of Ireland's National Recovery and Resilience Plan to address the digital divide. Through continued investment all schools, regardless of location, will be provided with appropriate broadband connectivity.

Enhancing the link between STEM education and the Arts

The STEM and the Arts Advisory group was established to guide national actions that enhance linkages between STEM education and the Arts across the education continuum. A Review of Literature to Identify a Set of Effective Interventions for Addressing STEAM in Early Years, Primary and Post-Primary Education Settings¹⁶ was undertaken in order ensure any recommendations made by the advisory group were founded in, and informed by, the available data and evidence. The Review drew on national and international studies that considered STEAM interventions and it sets out key barriers and enablers for effective STEAM education within the formal, non-formal and informal education sectors. The Advisory group has developed a set of recommendations to support multiple interventions addressing different segments of the STEM ecosystem to effect the change required.

¹⁶ <https://www.gov.ie/en/policy-information/4d40d5-stem-education-policy/>

Enhancing partnership between schools and business/industry and the research community:

- Guidelines for developing STEM School – Business/Industry Partnerships were launched on 14th November 2019. The guidelines have been developed, in conjunction with education and business/industry partners and provide the basis for both primary and post-primary schools and business/industry to form quality, inclusive and relevant educational links, to improve the STEM/Digital learning experience and secure enhanced outcomes for all learners. A toolkit accompanies these guidelines and includes case studies/ examples of good practice;
- SFI is commissioning a review of existing STEM careers awareness provisions, which will inform the future direction of Smart Futures and/or other SFI careers programming. This will include business/industry led STEM careers awareness provisions and;
- Co funded SFI/DoE project 'Engaging Families in STEM Programme' under the SFI Discover programme which aims to create opportunities for family engagement in STEM with a series of hands-on family STEM workshops aimed at engaging children and their parents in STEM learning together and includes an introduction to positive STEM role models with a particular emphasis on positive female role models.

Pillar 4 – Use Evidence to Support STEM Education

Pillar 4 states that building and sustaining a vibrant STEM education eco-system for all learners will require ongoing innovation in STEM education. The adoption of an evidence-led approach to STEM education will assist the Department in implementing and informing future policy decisions. It will also involve monitoring the impact of programmes and initiatives, both formal and non-formal, to improve STEM outcomes across our education system.

Progress to date includes:

Use of evidence to support STEM education

STEM education research commissioned by the Department of Education

- *Review of Literature to Identify a Set of Effective Interventions for Addressing STEAM in Early Years, Primary and Post-Primary Education Settings*
- *Review of Literature to Identify a Set of Effective Interventions for Addressing Gender Balance in STEM in Early Years, Primary and Post-Primary Education Settings*

Skills gaps:

- The Skills for Growth data collection system allows for data on skills needs to be gathered directly from employers in relation to their skills needs in a cohesive format which informs the national skills database, overseen by the Skills and Labour Market Research Unit (SLMRU) in SOLAS. Data collected from this initiative at regional level is supporting trends already identified nationally by the SLMRU and they include areas of identified skill needs such as ICT, Engineering and Science;
- The Regional Skills Fora (RSF) have identified the upskilling of the existing workforce, at all levels, as a key priority emerging for industry both nationally and regionally. In 2018 the EXPLORE Programme was developed with the objective to increase transversal and digital skills for people aged over 35 years in employment. Following evaluation in 2019 it recommended that the Explore programme moved into mainstream FET provision and is led by the Education Training Boards (ETB);
- Technology Skills 2022, the ICT action plan for 2019 – 2022 was published in Q1 2019. Implementation of the action plan is ongoing, and key actions have included the promotion of ICT apprenticeships as an alternate pathway for individuals and an increase in the number of places available in undergraduate ICT courses;
- Existing programmes to support and encourage STEM in Higher Education include Springboard+ and Human Capital Initiative (HCI):
 - Springboard+ provides free and subsidised upskilling and reskilling higher education opportunities at NFQ level 6 to level 9 in areas of identified skills need. There is a strong STEM focus. In the academic year 2022 59% of Springboard+ course were in STEM-related areas;
 - Human Capital Initiative Pillar 1 provides for Graduate Conversion Courses. Almost 65% of HCI Pillar 1 course places in academic year 2022 are in STEM-related areas, with 59% of Springboard+ course

places in this area. Over 90% of the courses offered in Springboard+ and Human Capital Initiative Pillar 1 are delivered in a blended format which can make them more accessible. Human Capital Initiative Pillar 2 provided for additional, incentivised undergraduate places in areas of identified skills needs, predominantly STEM and ICT;

- The Technological University Dublin led Convene project which is increasing the capacity of higher education to anticipate, understand, and deliver emerging skills needed by enterprise, and provide lifelong learning and upskilling opportunities for all, actively supports Women in STEM. The project has introduced two new initiatives to support and develop enterprise leaders: an Executive Ph.D. for Enterprise-Based Leaders and an MBA in Life Sciences Leadership and;
- Technological University Dublin led Graduate School of Business and School of Chemical and Pharmaceutical Sciences have collaborated with the 30% Club to offer two scholarships for successful women applicants to boost gender representation in the Life Sciences sector. The TU Dublin led GROWTH hub project has also validated and launched a PG Cert in Entrepreneurship and Innovation for Women, and held Women entrepreneur seminars.

Annual STEM data indicator on STEM

Data papers, on the uptake at post-primary level of STEM subjects in general and by gender, have been compiled by the DoE. The data is based on the number of students sitting exams for STEM subjects at Junior Cycle and Leaving Certificate, and compares the uptake of STEM subject's year on year. It also details that the number of applications to CAO for STEM related courses. The data shows that while there is an increase in the uptake of STEM subjects for examination, this increase is small. The gender disparity in those taking STEM subjects for examination is also clear in these reports.

[STEM indicators](#) are included as part of the annual Education Indicators for Ireland report¹⁷ published by the DoE. The indicators cover all levels of education from early years, primary and post-primary school, further and higher education and through to lifelong learning. The STEM indicators show that there are strong differences in the percentages of girls and boys participation in STEM subjects particularly when biology is excluded.

Conclusion

Notwithstanding the disruptions due to Covid-19 progress has been made in the implementation of the Policy Statement to date however, there is much more to do. An Implementation Advisory Group (IAG), established in 2017, continues to drive the implementation of the Policy Statement. Under its guidance, the 2022-2026 Implementation Plan has been developed which builds on progress made since 2017 and includes key actions required to ensure the of a quality STEM education experience for all learners.

¹⁷ <https://www.gov.ie/en/publication/055810-education-statistics/>

The STEM Education Implementation Plan 2022-2026 is available on [gov.ie-STEM Education Policy](#), together with reports in relation to the consultation process for the development of the new implementation plan.