



An Roinn Oideachais
Department of Education

Leaving Certificate Computer Science Support Framework

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INTRODUCTION

The introduction of Computer Science (CS) as a new Leaving Certificate subject and the announcement of the 40 schools to take part in Phase 1 of its introduction took place in January 2018 with the national rollout of the subject to commence in September 2020. Oversight of the introduction of the new subject is managed by the Leaving Certificate Computer Science (LCCS) Steering Group comprising representatives of the Department of Education including representatives from the Curriculum and Assessment Policy Unit (CAP), Teacher Education Section (TES), ICT Policy Unit and the Inspectorate, the National Council for Curriculum and Assessment (NCCA), the State Examinations Commission (SEC), the Professional Development Service for Teachers (PDST), business and industry.

This framework was put in place to support the national rollout of this subject to post-primary schools. It represents a collaboration between the Department of Education, the Computers in Education Society of Ireland (CESI), PDST, the Irish Universities Association (IUA), higher education institutions, Ibec, the technological higher education association (THEA) and SOLAS and operates as a subgroup of the Leaving Certificate Computer Science Steering Group to which it will report and from which it will, from time-to-time, take direction.

Science, Technology, Engineering and Mathematics (STEM) permeate every aspect of today's world, and the innovations that emerge from these fields underpin much economic development leading to the establishment of creative enterprises and rewarding careers. People working in STEM in Ireland are changing the face of the world we live in everyday, whether it is by making life-saving drugs and devices, researching new cures for cancer or creating new technologies that keep us healthier, safer and of course, entertain us¹.

The introduction of Computer Science as a Leaving Certificate subject is part of the Government's overall commitment to embed digital technology in teaching and learning. The society in which our children will grow up, will be one which has been fundamentally transformed by new technology. Our education system must prepare our children to thrive in such an environment by equipping them with skills in creativity, adaptability and problem solving. The introduction of this subject also complements other curricular changes such as introducing coding and computational thinking as part of

¹ Smart Futures – What is STEM? www.smartfutures.ie
STEM Education Policy Statement 2017 – 2026
Smart Futures – What is STEM?

the new maths curriculum for primary schools. Furthermore, the framework is informed by a number of key developments in curriculum and policy reform².

Curricular reform

Funding has been made available from within existing resources and carryover costs to support a range of curricular reform and related initiatives:

- Support for primary curricular reforms: primary Maths and Science (commenced in 2018);
- Junior Cycle reform;
- Support for Senior Cycle reforms: Politics and Society, Physical Education and Computer Science (commenced in 2018) and Economics, Agricultural Science (commenced in 2019);
- Further implementation phases of the *STEM Education Policy Statement*, *Languages Connect: Ireland's Strategy for Foreign Languages In Education 2017-2026* and *Gaeltacht Education Strategy*; and
- Creative Ireland initiatives.

A vision for the Leaving Certificate Computer Science Support Framework

To sustain a supportive STEM education eco-system, all stakeholders will need to work together to develop a connected learning network. The importance of this collaboration will ensure that Ireland is better prepared to enable our people to succeed and our economy to prosper³. This *LCCS Support Framework* will both harness and build upon a range of measures set out in the *STEM Education Policy Statement 2017 – 2026*, measures which aim to deliver quality STEM education in Ireland.

These measures include, but are not limited to:

- The development of guidelines to provide the basis for schools, both primary and post-primary to form quality, inclusive and relevant educational linkages with business and Industry, improving the STEM learning experience for all students.
- Activities to raise the awareness of STEM⁴ including the implementation of country-wide advertising campaigns.
- The formation of the Gender Balance in STEM Advisory Group, tasked with advising the STEM Implementation Advisory Group on the oversight, development and delivery of relevant gender balance actions within the *STEM Education Implementation Plan 2017-2019*.

² See Appendix 5

³ STEM Education Policy Statement 2017 – 2026

⁴ See Appendix 1

- The development of the *STEM CPD Design framework*⁵ intended to support the design and facilitation of STEM continuous professional development against the backdrop of varying policy and reform contexts
- The ongoing work of the support services in the design and delivery of new courses to support STEM education at primary and post-primary levels.

The success of the framework and its many interventions will be measured through improved professional learning experiences for teachers and outcomes for learners.

Context and Rationale

This framework is being introduced in line with the *STEM Education Policy Statement 2017 – 2026* within the specific context of the phased introduction of the new examinable Leaving Certificate subject computer science. Within this context, it is intended to support the delivery of the objectives and high-level actions set out in Pillars 3 and 4 of the Policy Statement – *Enhance teacher and early years’ practitioner capacity* and *Support STEM education practice*, thereby enriching current and future classroom practices.

⁵ The STEM CPD Framework is a document produced by the support services to guide the design and delivery of all future STEM-related CPD

Pillar 3. Support STEM Education practice

Objective	High-Level Action
Enhancing STEM teaching, learning and assessment practices in early years settings and schools	<ul style="list-style-type: none"> • Provide for ongoing STEM-related curriculum review, development and assessment. The review process will take due cognisance of the interdisciplinary nature of STEM. • Provide access to high-quality curricular materials for STEM-related subjects and courses and implement those pedagogical practices that will maximise student participation and enjoyment. • Provide opportunities for all learners to participate in STEM education through informal, co-curricular and extra-curricular programmes • Support early years and school leadership to enhance STEM education particularly in the areas of literacy, numeracy and digital literacy. • Support the evaluation of STEM education at early years and school level
Enhancing STEM teaching, learning and assessment practices using digital technologies	<ul style="list-style-type: none"> • Provide for digital technologies to support STEM education
Enhancing the link between STEM education and the Arts and Humanities	<ul style="list-style-type: none"> • Include provision for STEM education in The Arts in Education Research Repository (AiERR) • Provide for STEM education linkages in arts education partnerships
Enhancing partnership between schools and business and industry and the research community	<ul style="list-style-type: none"> • Provide supports for schools to establish links with business and industry, higher education institutions (HEIs) and the research community more broadly and ensure equity of access for all schools

Pillar 4. Use evidence to support STEM Education

Objective	High-Level Action
Using evidence to support STEM education	<ul style="list-style-type: none"> • Develop a model to support the STEM education research community in Ireland • Support national and international evidence-based research to inform STEM education provision, curriculum, pedagogy, professional learning and future policy development • Identify and provide annual STEM data indicators on participation, attainment, attitudes to STEM, graduate outcomes and STEM related skills needs • Develop innovative responses to skills gaps to meet national and regional STEM related skills needs • Explore the provision of bonus points in STEM-related higher level Leaving Certificate subjects (in cases where students apply for higher education courses in STEM-related areas) by the HEIs, in consultation with the Transitions Reform Steering Group.

One key action under Pillar 3 has been the introduction of computer science as an examinable Leaving Certificate Subject. Phase 1 of the introduction took place in September 2018, involving 40 schools. Students in these schools presented for certification in computer science at Leaving Certificate level in 2020.

The specification for this subject contains three strands;

1. Practices and principles
2. Core concepts
3. CS in practice

During the two years of study the students of computer science will engage with:-

- Computational thinking
- Analysis of problems in computational terms
- Programming languages and how to read, write, test and modify computer programs
- Creative design
- Design computation artefacts such as web pages, digital animations, simulations, games, apps and robotic systems
- The ethical, historical, environmental and technological aspects of Computer Science

In supporting its introduction a comprehensive continuing professional development programme was put in place. The programme, delivered by the PDST was informed by a combination of research and a questionnaire completed by all Phase 1 teachers prior to the introduction of the subject. The outcomes of the questionnaire indicated that all of the teachers required considerable support in the areas of coding and computational thinking. This is a telling outcome, as one of the criteria for the selection of the Phase 1 schools was the availability of a teacher with some experience of/qualification in Computer Science.

To date, five two-day residential workshops have been delivered and these have been supplemented by two three-day skills-based workshops (specifically addressing the areas of Python and Web Skills Development (HTML/CSS, JavaScript and Databases)), Webinars and other online learning opportunities. An additional workshop was also provided in December 2018 on Advanced Python in response to teachers' expressed needs. In summary, the provision of skills-based workshops has involved:

- May 2018 – Python Fundamental Skills (3 days)
- Dec 2018 –Advanced Python Skills (1 day)
- May 2019 – Web Development: HTML/CSS/JavaScript/ Databases (3 days)

Due to Covid-19 restrictions, a one-day online Python Skills workshop was delivered to teachers of the national roll-out at the end of May 2020. The work of the teachers is also supported by a professional learning community (PLC) facilitated by the PDST team and designed to allow teachers to support each other as they progress through the implementation of the specification. In addition, a mentoring programme has been established between Phase 1 teachers (mentors) and those of the national roll-out (mentees).

Note: While the residential workshops do address coding and computational thinking, they primarily focus on pedagogies and interpretation of the specification. The provision of skills-based workshops was in response to the identified need to allow teachers to develop these skills in a setting where the balance was tilted more towards content than pedagogy.

The Interim Report on the teachers CPD programme to support the introduction of LCCS conducted by Lero (www.lero.ie/epe/schools) has found that:

There is a high level of positivity amongst the teachers and levels of teachers' motivation remains quite high as evidenced in the responses to the questionnaire. Indeed, given the scale of the challenge of providing professional development to out-of-field teachers to equip them to implement an upper secondary-level Computer Science subject, remarkable progress has been made to date. This is a result of both the high-quality professional development delivered by the PDST team and the motivation and dedication of the teachers. Note: The final report from Lero is expected to issue in autumn 2020.

Contribution of Partners to the Framework

The role of the Department of Education⁶

The Department of Education provides support and direction to the Framework through the Leaving Certificate Computer Science Steering Group. The Steering Group will also have oversight of the project and monitor project progress against relevant timeframes

The role of the Professional Development Service for Teachers (PDST)

Primary responsibility for the design and implementation of the continuing professional development programme to support the rollout of Leaving Certificate Computer Science (LCCS) will rest with the PDST. The CPD provision will, in line with previous practice in relation to Politics and Society and currently Physical Education, involve the design of an overall framework of support incorporating a variety and number of CPD events, outlining in broad terms the content of each event. In light of this Framework and the proposed partnership with CESI, an additional design template will be developed. Elective workshops will be provided to the new cohort of LCCS teachers who come forward under the Framework in 2020. A key feature of any new design is the need to ensure the seamless manner in which pedagogy and content knowledge are interwoven in the design and delivery of workshops. This will need to be replicated in any offerings arising from this Framework, achieved through an intensive design phase. Once approved, the content of each event and the pedagogical approaches to be adopted will be set out. The PDST will continue to provide ongoing support to those teachers involved in Phase 1 of the subject's introduction.

⁶ See Appendix 6

The role of the University Sector and Initial Teacher Education

Post-primary initial teacher education (ITE) is provided through programmes of a consecutive or a concurrent nature. The consecutive route comprises a suitable degree and a Teaching Council-accredited teacher education qualification. A suitable degree is defined as an award from a state-recognised higher education institution (HEI), which enables the holder to teach at least one curricular subject to the highest level within the post-primary schools' curriculum (for most subjects, this means to Senior Cycle higher level) and fulfils the subject requirements according to Teaching Council registration. There are a number of undergraduate concurrent Computer Science initial teacher education programmes available in Irish universities and application is via the CAO process.

The role of the Computers in Education Society of Ireland (CESI)

CESI as a voluntary body provides the opportunity for informal CPD mainly through its mailing list and Twitter page. Since the advent of Covid-19 the expanded platforms include a CESI Staffroom regular video along with a soon to be initiated live Q&A sessions on Zoom. CESI.CS was set up to specifically target those engaged in the teaching of computer science. An initiative to begin the development of communities of practice (CoP) coincided with the Phase 1 of LCCS and resulted among other things, in a manual on how to run CoP sessions.

CESI has welcomed the chance to work with the PDST right through Phase 1 and sees itself as offering opportunities complimentary to this body for the foreseeable future. It is envisaged that the mailing list will form the backbone of the informal support or buddy system. CESI has collaborated with PDST in the design and delivery of the skills-based workshop to support the introduction and rollout of LCCS. In addition, CESI will deliver workshops to support teachers at primary and post primary who are involved in teaching coding and computer science more generally. The content of these workshops will be discussed with the PDST to ensure alignment and avoid duplication. 2021 will see the development of a national network relating to communities of practice in conjunction with the Education Support Centre Network. These are in addition to the community of practice established by the PDST to support LCCS and will engage with teachers in primary and post primary with an interest, in an and engagement with, Computer Science and coding. CESI's annual conference will provide an opportunity for teachers to come together to share and learn. Teachers of Computer Science will be invited to showcase their students' work at this event. A medal will be awarded annually to the students who achieves the highest grade in LCCS.

The role of Business and Industry

Partnership with business and industry in sustaining the growth of Computer Science is central to the operation of this framework. Business and industry can contribute to enhancing opportunities for students to access high-quality information and experience in relation to careers in Computer Science. These will take the form of school visits by relevant personnel, input to careers' evenings, participation in co-curricular and extracurricular

events and the provision of internships to interested students. Engagement of business and industry representatives with teachers of computers science through buddy systems, teacher internships etc. will also be hugely important.

SUPPORTING THE DEVELOPMENT OF LCCS

The national rollout of LCCS to schools, beyond those participating in Phase 1 of its introduction, commenced in May 2020 attended by 89 teachers and received extremely positive evaluations. National Workshop 1 occurred online due to the Covid-19 restrictions. Further CPD with this teacher cohort will also occur online in autumn 2020. This poses operational challenges regarding the maintenance of the integrity of CPD design originally intended for a face-to-face environment including active teacher learning in a hands-on environment that emphasises the importance of pedagogical content knowledge (PCK). It has already been indicated and acknowledged in Lero's Interim Report evaluation of Phase 1 CPD that the development of PCK with respect to Computer Science is particularly complex. It is also anticipated that the teachers nominated to teach the subject by these schools will require a different range of supports compared to those offered to the teachers during the first phase of the subject's introduction. It is, therefore, obvious that significant interventions in the form of continuing teacher professional learning will have to be put in place if the subject is to flourish and student experience of LCCS is to be of a high quality. The national rollout of Computer Science will begin in September 2020 with 61 additional schools offering the subject on their timetables.

The nature of the subject and its importance in the government's STEM agenda demands that a radical approach be adopted in ensuring that the subject prospers in our post-primary schools. In light of this and of the concerns raised immediately above, additional interventions, and CPD logistical considerations with respect to Covid-19 restrictions will be required to bolster the work of the PDST in providing the requisite professional learning support.

In order to provide additional support for LCCS and in keeping with the spirit of collaboration mooted in Pillar 3 of the STEM Education Policy Statement, The framework sets out a series of actions including:

- Identifying and training a body of personnel (professional associates) from higher and further education institutions, business and industry to assist in the design and delivery of workshops and other professional learning events to support the national rollout. In relation the workshops, it is intended that:
 - They will, in some instances, run during the summer months
 - The materials used in the workshops will be that produced by the PDST with some agreed readjustment of the emphasis on the elements of coding and computational thinking over pedagogy. It is envisaged the PDST will address the pedagogies more closely in the workshops delivered by them during school time (as per the current models)

- The lecturers/industry personnel will receive training, particularly in relation to pedagogy, in advance of delivery of these workshops
- The PDST and CESI will collaborate in extending the existing community of practice supporting the work of the Phase 1 teachers. These communities will ultimately be self-sustaining but will, in the meantime, continue to be supported by the PDST. Ideally each regional community (it is envisaged that as the numbers grow, the communities will be regionalised) will have a clearly defined link to a third-level institution.
- A buddy system⁷ will be established whereby personnel (professional associates) in third level/industry will provide online/face-to-face support to teachers engaged in the national rollout. The buddies would be invited to participate in the communities of practice as part of their support work.
- Teachers and students of LCCS to be provided with internships⁸ in industry settings⁹.
- To ensure the long-term viability of the subject, accredited undergraduate and post-graduate programmes in Computer Science will need to be provided by the HEIs/ ITE providers. This, in turn, will need to be bolstered through ongoing professional learning for teachers of Computer Science.
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KEY ENABLERS TO THE SUCCESSFUL IMPLEMENTATION OF THIS FRAMEWORK

The success of this framework will be reflected in the embedding of Computer Science in the curriculum at post primary and its being regarded as a valued subject for career progression and life. This will require a significant expenditure of energy in promoting the subject, raising awareness and generating interest amongst parents, students and teachers including guidance teachers. To this end a number of key enablers have been identified, these include:

⁷ See Appendix 2

⁸ See Appendix 3

⁹ Marie Klawe... Research shows that if you can get a woman or other members of an underrepresented group an early experience doing research or an internship in that field, it increases retention in that field- Increasing the Participation of Females in Computing Careers (2019)

Research example -

1. Leaving Certificate Computer Science Steering Group

The adoption of this framework by the LCCS Steering Group and its incorporation into *the Project Plan for LCCS* leading to its accelerated implementation.

2. The Teaching Council

Publication of the subject criteria for LCCS is urgently required to facilitate clarity for the education system and in particular, teacher education programme accreditation in the HEIs.

As with other subjects, attendance by teachers of LCCS at PDST professional learning events will satisfy the criteria set out by Cosán – the national framework for teacher education. Teachers may wish to apply for courses leading to an additional third-level qualification, seeking recognition of prior learning for training undertaken where appropriate.

3. Sustained public relations campaign

One of the key actions of the framework is to develop and sustain a public relations campaign to enlighten parents, school leaders, teachers, guidance counsellors and students, of Computer Science as a “Subject for All”. This will involve the preparation of a road-map to raise awareness of the importance of Computer Science as a fundamental life skill including the many diverse career paths that can be charted. The campaign will also highlight the innovative collaboration with business and industry partners who were involved in developing this framework. Examples of this include displays of student work at the CESI Annual Conference, inclusion of student work in the Young Scientist and Technology exhibition (BTYSTE) competition and development of high-profile co-curricular events by the business and industry partners.

4. Teacher Supply

This framework situates the introduction of Computer Science as a Leaving Certificate subject in the context of overall Government policy. Due regard must be had for its position as a new subject while being conscious of

- a) competing demands;
- b) funding challenges;
- c) provision by HEIs
- d) the need for underpinning data in terms of subject uptake.

5. Collaboration with Business and Industry

A mechanism to encourage and facilitate collaboration with business and industry will be established.

6. Gender Balance in STEM¹⁰

The commitment to gender mainstreaming evident in the STEM Action Plan is key in informing the framework's aims and objectives. The underrepresentation of young women and girls evident in STEM generally was replicated in the first phase of the introduction of Computer Science. The Lero report indicates that while 38% of the teachers teaching Computer Science are female, only 22% of the overall population taking the subject were female. In mixed schools, this figure was lower with only 16% of the students being female.

A Gender Balance in STEM Advisory Group has been established as part of the STEM Action Plan and will:

- Assist the Department of Education in identifying key challenges to, and opportunities to promote, the uptake of STEM subjects at post-primary level
- Assess best practice methodologies to address key challenges and maximise these opportunities to promote the uptake of STEM subjects at post-primary level.
- Make recommendations for a co-ordinated response to these identified challenges and opportunities to include strategies such as pilot programmes
- Consider potential means of removing barriers to STEM subjects offered by post-primary schools and make recommendations to address these barriers.
- Auditing from a gender and diversity perspective is an essential element of gender mainstreaming and it is suggested that this is done from the start so that patterns can be observed and modified if required. This would mean auditing the representation of women and men in the teaching and learning materials for both CPD (online and f2f) and for LCCS students, auditing mentors to ensure that women and men are both mentors and mentees among other elements. It would help frame the message that computer science is for all.

¹⁰ See Appendix 4

Awareness of the ecological framework of factors influencing girls In STEM Figure 1¹¹ will be important for all involved in LCCS. It provides a coherent overview of many of the issues relevant to diversity and inclusion.

Under this framework greater cohesion will be given to any initiatives already in place, those under development and those that may be developed in the future by providing a single point of contact for the promotion of Coding at Junior Cycle and LCCS; their wider adoption generally and supporting greater participation by girls in the subjects and by female teachers in teaching the subjects. Cognisance will also be given to the impact of race, socio-economic status and geographical location as factors impacting on the uptake of Computer Science and STEM subjects generally. The approaches espoused in Appendix 4-Gender Balance in Computer Science will also inform the initiatives undertaken in this area.

7. Coding in Junior Cycle

Students in Junior Cycle are exposed to coding through Coding in Action: this collaborative initiative is designed to support schools and teachers in their introduction of the short course in Coding at Junior Cycle. Students and teachers engaged with innovative Coding-related resources, developed their expertise and shared their experiences. The initiative is supported by Intel Ireland and Lero – The Irish Software Research Centre. Teachers participated in a two-year programme of CPD, involving six core CPD events, had access to various elective CPD events, contributed to an online community of participating teachers and shared their experiences with the Junior Cycle for Teachers (JCT) short courses team, thereby informing the development of further supports for teachers. Phase 1 of the Coding in Action initiative involved 49 schools, 17 of which were DEIS. Phase 2 of the project will be rolled out to a further 62 schools of which 19 participate in DEIS.

8. Additional Resources for PDST

The availability of some additional resources for PDST to support its ongoing work and build on its evident successes, is critical to sustaining the positive experience of teachers, school leaders and learners with LCCS. This should include ongoing capacity building within the team of Computer Science advisors and associates.

9. The development of a medium and long-term plan

This is essential if the subject is to grow. Phase 1 teachers, for example will need ongoing support. The HEIs, business and industry will need to play a key role in complementing and extending the typical sustaining support supplied by the PDST. The work of the framework will involve developing and ratifying long and short term plans to meet the actions laid out in the framework structure below. A key feature of the operation of the Framework is that it will respond flexibly to emerging needs and actions can be added to the framework structure when it is appropriate to do so.

¹¹ See Appendix 4

10. Communication Strategy

Development of a communication strategy which enables dissemination to, and feedback from, the wider computer science community in Ireland is seen as essential in supporting the work of the framework. This will include input from the third-level sector on ongoing research in computer science education, updates relating to teacher professional learning , details of co-curricular activities to support computer science, inputs from business and industry etc.

FRAMEWORK STRUCTURE

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
1	Computer Science Summer School / Skills Related Programmes	<ul style="list-style-type: none"> • PDST to collaborate with CESI to make the arrangements for <ul style="list-style-type: none"> • the design of the programme • the design of an induction programme for those CESI members/professional associates who will deliver the Summer Schools / Skills Related Programmes 	<p>November 2019</p> <p>February 2020</p> <p>Easter 2020</p>	<p>CESI, PDST and TES (ITE/PD)</p> <p>CESI/PDS T Design Team including HEIs, and other agreed parties</p>	<ul style="list-style-type: none"> • Open to all teachers of LCCS - including those in the Phase 1 schools. • Engage with the HEIs to explore the possibility of the provision of credits towards post-graduate qualifications to those teachers that participate in the programme. 	Achieved & Ongoing

¹² Within the context of the framework, this indicates when work will begin on any given action. The duration will be a matter for the Action Plan which will emerge from the Framework.

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
		<ul style="list-style-type: none"> Meetings to be arranged with ESCI (Education Support Centres of Ireland) to arrange for marketing and hosting the Summer School 	November, 2019	CESI, PDST, ESCI and TES (ITE/PD)	<ul style="list-style-type: none"> Registration on the Teaching Council Register The design of the summer schools programme will have to take cognisance of the expected range of needs of the participating teachers. Consider the use of the Associate model to remunerate those who deliver the programme Needs to be provided for in 2020 budget allocation Reference at PDST Steering Group in November Need to consider alternative venue options in the event of capacity issues in Education Centres 	Achieved & Ongoing

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
		<ul style="list-style-type: none"> Create a panel of CESI members and teachers from the Phase 1 schools willing to deliver the Summer School Programme / Skills Related Programmes 	August, 2020	CESI, PDST, and TES	<ul style="list-style-type: none"> Consider as pro bono with overheads met through the TPN funding mechanism 	Achieved & Ongoing
2	Buddy System	<ul style="list-style-type: none"> A 'CS buddy system' will be established whereby personnel (professional associates) in third level, business and industry will provide online/face-to-face support to teachers engaged in the national rollout. The buddies will be allocated to the various cluster groups that constitute the Community of Practice¹³ established to support the introduction of Computer Science. 	November 2020	PDST, HEIs and IBEC	<ul style="list-style-type: none"> See further suggestions in relation to Buddy Systems in Appendix 2. 	Initiated

¹³ A community of practice involving the teachers of Computer Science and PDST personnel was established to enable and support collaboration between the teachers throughout the school year. Typically the teachers share expertise, pedagogies, classroom approaches and discuss matters pertinent to the teaching, learning and assessment of the subject.

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
3	Buddy Systems and Higher Education	<ul style="list-style-type: none"> This will form part of a transformative CPD model that may be appropriate for teacher engagement with Higher Education Institutes in Research. In this model a third-level researcher will become a teacher mentor for a summer term or for an academic year. The research focus, or the focus of the practitioner inquiry, could resonate with a topic that is prompted by a teacher interest or a concern emerging during the rollout of computer science 	March 2021	HEIs, CESI and PDST		
4	Sponsored PME	<ul style="list-style-type: none"> To explore with business and industry the possibility of funding Professional Masters of Education in Computer Science. 	November 2020	HEIs and IBEC		Initiated
5	Sustained Support – Initial Teacher Education and postgraduate programmes	<ul style="list-style-type: none"> Liaise with the Teaching Council with regard to <ul style="list-style-type: none"> A timeframe for publishing Computer Science subject criteria and Engagement with HEIs on programme accreditation 	September 2020	TES – both ITE/PD and Teaching Council/Teacher Supply areas, The	<ul style="list-style-type: none"> In terms of risk management, there is a real danger that there will be no extension of the existing provision before September, 2021 at the earliest 	Initiated

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
		<ul style="list-style-type: none"> Engagement with HEIs on accrediting out-of-field CS teachers Engagement with PAC and HEIs regarding CS numbers on PME courses 		Leaving Certificate Computer Science Steering Group		
6	Sustained Support – Funding Model	<ul style="list-style-type: none"> Ring-fence an allocation under the Teacher Fee Refund Scheme for LCCS applicants Explore mechanisms to leverage support from all of the partners for the upskilling of teachers 	<p>January 2021</p> <p>April, 2021</p>	<p>TES (ITE/PD)</p> <p>CESI, TES – both ITE/PD and Teaching Council/Teacher Supply areas and the Leaving Certificate Computer Science Steering Group</p>	<ul style="list-style-type: none"> To be further considered in the context of the review of the scheme which is currently underway This arrangement could support postgraduate programmes, internships and buddy systems and, in line with the STEM Education Implementation Plan, should not be limited to LCCS but extended to coding at upper primary and junior cycle. 	Initiated

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
7	Sustained Support – Communities of Practice (CoPs)	<ul style="list-style-type: none"> Continue the development of CoPs by building on work already in train in the system through Strengthening the partnership between CESI and PDST and Extending this partnership to HEIs and Business and Industry on a regional basis 	September, 2020	CESI, ESCI, HEIs, PDST, Business & Industry	<ul style="list-style-type: none"> Explore the possibility of hosting the CoPs in HEIs and Business and Industry as well as regular regional venues Desirable to reflect this as an activity which meets Cosán requirements 	Achieved & Ongoing
8	Transition Year	<ul style="list-style-type: none"> Development of Computer Science modules for transition year designed to bridge the gap between junior cycle coding and LCCS Engage TY students with competitions and extracurricular activities to promote Computer Science as a subject for all. Encourage TY placement opportunities in computer science, businesses and industry. Facilitate partnership with third-party providers to allow schools to access existing relevant resources and avail of school visits 	March 2021	PDST, JCT, CESI, HEIs, IBEC, Business and industry and schools	<ul style="list-style-type: none"> Collaboration with TY stakeholders. 	
9	Phase 1 Mentors	<ul style="list-style-type: none"> Sustain a mentoring system which enables a Phase 1 teacher to support and guide an identified colleague in a national rollout school. 	September 2020	PDST & CESI	<ul style="list-style-type: none"> Mentoring training required for mentor and mentee. This approach to mentoring will lead to the further 	Achieved & Ongoing

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
		<ul style="list-style-type: none"> Resources will be researched and developed to support Phase 1 teachers in this work. 			development of the Community of Practice.	
10	School Engagement with Enterprise	<ul style="list-style-type: none"> A subgroup comprising members of the Framework will be established to liaise with the Institute of Guidance Counsellors' (IGC) to promote engagement with enterprise. Particular focus will be given to the possible implementation of <i>The Indecon Report Review of Career Guidance</i>(2019)¹⁴ 	March 2021	All members of the support framework	<ul style="list-style-type: none"> These ideas resonate with the standard 'Teachers work together to devise learning opportunities for students across and beyond the curriculum within Domain 4 (Teachers' collective/collaborative practice) of the Teaching and Learning Dimension of Looking at Our Schools (2016). Please see Appendix 1 for Examples of initiatives in place to support computer science and coding in Irish Schools. 	
11	Careers and LCCS¹⁵	<ul style="list-style-type: none"> In the short-term, the subgroup will liaise with the IGC to 	January 2021	All members of the	<ul style="list-style-type: none"> Approaches to careers in computing need 	

¹⁴ Indecon Review of Career Guidance Final Report (2019), available online at:<https://www.education.ie/en/Publications/Education-Reports/indecon-review-of-career-guidance.pdf>

¹⁵ See Appendix 4

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
		<p>emphasise the importance of raising awareness of possible career paths among students at Junior Cycle level, Transition Year and Fifth Year</p> <ul style="list-style-type: none"> Collate existing events/competitions that are aligned with the thinking behind the support framework 	September 2020	<p>support framework</p> <p>All members of the support framework</p>	considerable thought and balance. In particularly ordinary level Computer Science needs clear worthwhile and visible career paths such as apprenticeships and Level 5, 6 NFQ programmes in further education.	Achieved & Ongoing
12	Inclusion in LCCS	<ul style="list-style-type: none"> Over the medium to long-term, and in line with the recommendations of the Indecon report, the subgroup in collaboration with the IGC will seek to introduce a specific module on Career Guidance as part of the training for teachers in DEIS schools to overcome the barriers faced by some learners in progression to employment. 	April 2021	Subgroup of the support Framework	<ul style="list-style-type: none"> This is aligned with the Vision for STEM contained in the stem Education Policy Statement 2017-2026 which envisages THAT: All Learner achievement in DEIS schools will increase, thus addressing the gap in achievement in STEM disciplines between students 	

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
					in DEIS schools and students in all schools.	
13	Promoting Diversity of Engagement with LCCS	<ul style="list-style-type: none"> Attendance by members of the subgroup at relevant annual conferences to promote the benefits of students taking Computer Science. The subgroup to liaise with curriculum bodies to consider the possibility of the inclusion of LCCS within the Vocational Subject Groupings (VSGs) in the LCVP. Develop a Partnership with CSforAll.org to host an annual <i>CSforALL</i> event in Ireland. 	<p>September 2020</p> <p>January 2021</p> <p>April 2021</p>	<p>All Members of the Support Framework</p> <p>TES, CAP and NCCA</p> <p>All members of the Support Framework</p>	<ul style="list-style-type: none"> The subject is perceived and framed (by schools) in its true sense as one for all students that empowers them to build skill sets including critical thinking, communication, self-regulation which serve to equip them for all walks of life Ensure that the primary goal of the LCVP is to prepare young people for adult life by ensuring that they are educated in the broadest sense, with an ability to cope and thrive in an environment of rapid change. 	Achieved and Ongoing

	Initiative/Support	Action	Indicative Timeline ¹²	Who	Remarks	Status
14	Internships	<ul style="list-style-type: none"> To seek Internships for teachers and students, in business, industry and higher and further education institutions. 	March 2021	IBEC, HEIs, TES and CAP	<ul style="list-style-type: none"> Organised centrally by somebody in the working group. Please see further suggestions in relation to Internships in Appendix 2. 	
15	Communications Strategy	<ul style="list-style-type: none"> Regular reports will issue from the framework to the wider CS community 	November 2020	Agreed by all	<ul style="list-style-type: none"> Typically half-yearly reports This will provide key data including gender balance, third level involvement, teacher professional learning etc. A reporting template to facilitate this action will be devised. 	Initiated

Appendix 1

Industry Supports Available

IBM Initiatives

Yvonne Conaty - P-TECH Liaison at IBM Ireland

P-TECH initiative with three Dublin schools:

Also launched Open P-TECH, a free digital education platform focused on workplace learning and digital skills, and available to everyone not just those involved in a formal P-TECH programme. This will very soon be offering teacher courses/badges that should be of interest, and there might also be an option to create specific courses for teachers and host them on Open P-TECH.

Currently (as per June 2020) piloting a Code & Response global competition for the next academic year (modelled on Call for Code competition for developers). This is being mapped onto the 3rd year Junior Cycle Coding Curriculum currently being taught in the three Dublin P-TECH schools. Some other US and UK schools in the pilot are working with older students, so their work might be adaptable to suit Leaving Certificate students.

AI Education Institutes for Teachers: an IBM initiative with Mindspark to support teachers in the area of AI. This is not just for STEM teachers but gives a solid foundation of AI for any teacher, and is an immersive, interactive learning suite of live and on-demand online experiences crafted by and for educators to guide them through AI's foundational concepts and K-12 classroom connections. See more here:

<https://www.mymindsparklearning.org/ibm-ai-education>.

IBM Academic Initiative, primarily aimed at third level, is accessible to teachers and students, and has some relevant material in the Additional Resources, e.g. "Machine Learning for Kids" which is popular among students:

Microsoft Ireland

Dr. Kevin Marshall | Head of Education

DreamSpace HomeSpace Series

Bring some STE(A)M lessons into your home. Let's Learn Together. DreamSpace HomeSpace is an initiative by Microsoft Ireland to help educators, parents and children participate remotely in some of our favourite DreamSpace activities. Our HomeSpace series begins with our favourite MakeCode

platforms- micro:bit, Arcade and Minecraft and some other areas such as python programming, Maker Challenges and Imagine Cup Junior workshops and projects. Just like in DreamSpace, we want to equip participants with some basic computer science knowledge in each session in a bid to spark their creativity about what they can make next. From April 20th we're going daily so check out our new schedule including weekly special guests too below. Every lesson will be available on demand for those who cannot join us live and for anyone revising afterwards. Each session will contain a 30-minute tutorial followed by a home challenge. There will be live Q&A so that we can help with any queries throughout and 15 minutes after the tutorial ends. Check out our schedule below and we look forward to welcoming you to virtual DreamSpace. Each lesson will be posted for on-demand viewing with-in 24 hours of live streaming on our Microsoft Ireland YouTube playlist here. Don't forget to come back here when you're doing your home challenges.

Oracle

Iris Lanny

Programme Manager UK, Ireland and Israel

Oracle Academy advances computing education around the world to increase knowledge, innovation, skills development, and diversity in technology fields. Oracle Academy understands and values educators as partners who are empowered to facilitate innovative student learning in and outside the classroom. We engage with thousands of educational institutions and educators in more than 120 countries, helping millions of students become college and career ready.

There were three questions asked in relation to:

Teacher education.

Promotion of Computer Science.

Engaging third level institutions to support LCCS.

Oracle Academy Institutional membership is free and offers institutions and their educators access to:

- World-class technology and software
- Expert curriculum
- Teaching and learning materials
- Professional development
- Oracle professional certification resources
- Member recognition and a wealth of classroom resources for their students.

Educators are able to share with students many of these benefits, including:

- Study resources
- Oracle certification learning materials
- Software licenses
- Oracle Application Express (APEX) workspaces
- Oracle Academy Cloud Program for hands-on practice learning and developing, and much more.

Google Ireland

Grace Haughian

Program Manager, CS Edu EMEA Team

Google offer a number of services including Google Classroom which has an uptake of 1,700 schools out of 4,000 in Ireland.

CS First - <https://csfirst.withgoogle.com/s/en/home> - teaching primary school children coding

They offer a summer programme to train teachers with their engineers (on pause at the moment as it was face to face, waiting to see if they will move to remote for this year)

Fidelity Investments

Karen Conway

Director, Technology Management

Fidelity Investments

Fidelity Investments is supporting an all-girls local secondary school, Mercy College, a school that was accepted on to the Computer Science pilot programme. Initially Fidelity upgraded the wifi, systems and hardware in the school to ensure all students had access to the technology. Fidelity Investments has created a framework that has the capability to be scaled for more than one school. Within the framework they look at four areas of CS

- Micro:bit
- Python
- SQL
- Web development

There is a training package for students and teachers that is downloadable. They have also created information packs for parents and guidance counsellors. Fidelity has hosted Connaught Guidance Teachers to show them the scope of jobs and careers as a result of studying CS, this is another project that could be lifted and shifted to other parts of Ireland. Teacher mentoring has been offered, particularly around SQL supports. They also

created a mailbox that is monitored by professionals in the business who will respond to teacher queries. Female mentors are offered to first year female university Computer Science students in an effort to encourage them to stay in their course and graduate.

Overstock

Lucia Macari

Director of Organisational Development

Overstock are involved in supporting teachers for the Leaving Cert Computer Science Programme. Attached was their first event this year which was to promote CS as a Leaving Certificate subject and show how technology companies in the region can support teachers and students. The main goal is to have one secondary school running the Leaving Certificate Computer Science Programme in Sligo.

24 NEWS SLIGO CHAMPION Tuesday, April 7, 2020

INSIDEBUSINESS

Contact: editor@sligochampion.ie

Overstock TY programme a big success



Overstock welcomed a group of Transition Year (TY) students to its European headquarters in Sligo prior to the recent lockdown due to the coronavirus outbreak.

Overstock, a US based online technology company focusing on a leading e-commerce website, has had a presence in Sligo since 2015.

The TY programme allows the students to get an insight into what a software development company is like and to gain some experience of fulfilling requirements and producing a piece of software.

Director of Organisational Development, Lucia Macari said:

"We're delighted to continue to see that offering students a look into the daily life of a technology professional allows them to more easily picture themselves in a similar role in their future."

Overstock's drive to encourage more people to consider a career in IT has been a focus of late.

Last month's cohort came from St Aurlan's, Tubbercurry, Summerhill College, Sligo and O'Connell Lyric, Kesh.

Together they developed a mobile app using one of the latest Google open sourced technologies, "Flutter" which allows for the rapid development of mobile applications in a more streamlined way.

They then gave a live demonstration to their work to the entire staff of the Overstock office.

Their teamwork and willingness to learn all went well commensurate and their final presentation was extremely professional.

Feedback from the TY students suggests that they enjoyed the experience and are all now re-considering their career choices.

Rachel O'Connor, O'Connell Lyric's IT teacher, commented: "I was impressed by the experience they gained and the way they presented their work."

This view was echoed by Cathal Sheehan from Summerhill who said:

"My views of working in the IT sector are very different than before."

I am now genuinely considering software development as a career.

Annie Gillespie of St Aurlan's summed her work up nicely:

"My favourite thing about the week was creating the app, but hearing staff members tell us how they got to where they are now and the different paths they took was very inspiring."

The Work Experience did change my view on Information Technology.

It was different to what I expected and I would definitely consider doing something in the IT industry in the future."

The TY programme in Overstock runs over a number of weeks each spring.

It is made possible by the voluntary efforts of many Overstock staff and with the support of Technology Ireland and IT Sligo."

FBD remains open for business during Covid-19 crisis. While in Sligo branch is currently closed, branch manager Pádraig Kennedy and his team are available to assist customers and take queries on 071 9144414 or via www.fbd.ie for further information and assistance.

"We understand the challenges faced by our customers, their farms and their businesses. We want to help you through these exceptional circumstances. Numerous experienced

Participate in the Overstock TY programme.

FBD ready to assist during Covid-19

AWS Initiatives

Melanie Nethercott
mnetherc@amazon.co.uk
Program Manager, AWS Educate

Tech Week

AWS is a strategic partner for Ireland Tech Week, a nation-wide festival of technology driven events aimed at students, parents, and the public. Classroom and community activities and competitions offer students an experiential engagement allowing them to explore their interest in technology. Tech Week could be a great platform for promoting the LCCS and spotlighting students who have selected to take it. In 2019 when AWS sponsored the event with the Irish Computer Society over 150,000 students, parents, and teachers were reached through Tech Week engagements.

AWS GetIT

AWS GetIT is an initiative designed to encourage girls aged 12-13 to consider a career in tech. Teams from different schools are invited to an app-building competition to solve real issues faced by their school or community. Along the way, participants learn practical digital and IT skills, experience working as a team, and gain self-confidence by presenting ideas to wider audiences— all while being exposed to IT as a potential career. AWS GetIT has launched in Ireland this year and AWS could work with DE to and promote participation in the GetIT program and competition among schools.

AWS Educate

AWS Educate is Amazon's global initiative to provide students and educators with comprehensive resources for building skills in the cloud. It is a no-cost curriculum providing access to content, training, pathways, and AWS services. AWS Educate offers young learners aged 16-18 access to self-paced content designed to introduce cloud computing skills which drive innovation in fields such as artificial intelligence, voice and facial recognition, gaming, medical advancements. Teachers can join AWS Educate to gain access to virtual classrooms, cloud content, professional development and more.

Day in the Life Of Series

The variety of jobs and careers in technology today is significant, and require different levels of technical breadth and depth, soft skills, and business knowledge. AWS can offer a webinar series where different employees talk about their job – what a typically day in their life looks like- and how their computer science background helped them. From solution architects to technical program managers, the series will show students there are many career paths open to them.

Teacher Education

While cloud computing is not in and of itself a stand-alone component of the LCCS, the Senior Cycle Computer Science curriculum references cloud computing in some of the applied learning tasks students must complete:

*“[students will] develop computer systems as they use programming, analysis and design skills combined with hardware knowledge to create network/Internet/cloud-based applications”*¹⁶

AWS could offer teachers involved in Phase 1 and the national rollout a half-day of training on Cloud Computing. We could deliver a ‘Cloud 101’ foundational session to teachers to introduce them to Cloud Computing and help them feel more secure in their subject knowledge. Topics covered could include:

- A brief history of cloud computing, its definition, and business drivers;
- Cloud computing concepts and terminology;
- Benefits of migrating to the cloud; and
- Specific solutions students might use to complete their applied learning tasks.

¹⁶ NCCA, Leaving Certificate Computer Science Draft Curriculum Specification, p.19,

Appendix 2

Towards a Framework for Internships and Buddy Systems

Below are some initial thoughts in relation to the topics of Internships and Buddy Systems as referenced in the *LCCS Support Framework* document:

From the outset we will consider the target group to be teachers. Initially, these would be LCCS teachers but over time the model could be extended to include teachers of other subjects, subject levels and even other educational sectors (and possibly students too).

Within the context of the support framework it is useful to clarify/distinguish between internships and buddy systems

- An internship is taken to mean first-hand industry experience from the technology sector.
 - ‘first-hand industry experience’ could comprise anything from a one-off site visit to work-experience gained over a period of time
 - ‘technology sector’ could be taken to mean any public or private organisation that has a function which is relevant to LCCS – most obviously software development but perhaps also R&D;
- A buddy system is interpreted more along the lines of mentoring and as such relies more on a deeper professional relationship between the mentor and the mentee. In this scenario the buddy is seen as a critical friend who is an experienced practitioner capable of asking provocative questions and offering helpful suggestions.

Recommendation

- Establish an organisation (e.g. National Centre for Excellence in Computing) responsible for the implementation of this initiative. Governance would be provided with support from the Department of Education (perhaps in partnership with, or at least including, Technology Ireland [1], IBEC, PDST/PDST LCCS Team, CESI-CS and HEIs as key stakeholders). Existing Department structures such as steering committees, sub-committees and ‘terms of reference’ documents could be used. However, one important and critical difference would be that this organisation would be staffed with a full-time position (e.g. national manager/development officer). The scope and staffing of this organisation could be extended in time. Initially, the main responsibility would be to develop a framework for internships and buddy systems, manage the implementation of this framework, and act as a general hub (backbone) between education and industry.

- The framework for internships would essentially be a three-year strategic plan which would be developed in consultation with a range of stakeholders and comprise a list of goals, actionable items and success indicators.
- A general Memorandum of Understanding (MOU) between host organisation and internees/buddies would need to be developed. This MOU would be supported by a detailed description of the internship/buddy process and while it could be tailored to meet the needs of each different context could be used as a basis for a contract between the relevant parties.
- It may be worth considering internships as a teacher-industry relationship and the buddy-system at teacher-HEI level. It is worth noting that the PDST LCCS team has already established a mentoring system in which the Phase 1 teachers are involved as mentors for the incumbent NR2020 teachers.

Actions to enable the CS Buddy System

- Contacts will be established in several of the multinationals to promote the campaign. Many of these companies have a specific person for this such as a Liaison officer or education officer. Teams within large software houses, who may be grateful for the opportunity to cover their corporate social responsibility could also be targeted.
- An online recruitment process will be put in place
- Buddies will be assigned on a regional basis rather than being assigned to individual schools or teachers in the short and medium term.
- Each cluster would have several buddies depending on the number recruited.
- Resources designed to support the work of buddies and manage the expectations of those being supported will be developed.
- All buddies will receive appropriate training, typically via an online platform. This will help to minimise the disruption to their everyday work.
- The work of the buddies may include sourcing guest speakers, organising business and industry visits, showcase events and competitions, providing careers advice etc.
- It is envisaged that each buddy will commit to four or five cluster visits per academic year and also provide some online support.

Appendix 3

One Teacher's Experience of Internship

I teach in a large girls' school. The students are from varied cultural and socio-economic backgrounds and as such are traditionally under-represented in STEM (particularly Technology and Engineering). For the past number of years we have tried to address this and get the girls to realise that Computer Science, Technology and Engineering are a good choice for them.

I came from industry originally, and so I had some knowledge of the type of career options that were out there for girls. I am interested and passionate about careers in computer science and engineering and speak often during all my classes about the opportunities and choices available to all students in these areas.

The school ICT co-ordinator is a woman, so the students are used to seeing women "fix computers".

We have promoted coding as a subject for the past few years and through my involvement with CESI and attendance at the conferences, I met like-minded people who advised and inspired me to keep going- a natural buddy system.

We offered Junior Cycle coding as a short course and now have two coding classes in each year group. The teachers attended CPD given by JCT, Coding in Action, with support from LERO. This was key, and I would encourage any teacher or school to sign up for this. We now have a team of four coding teachers.

Support from Management

The principal in the school is also interested in promoting #STEM careers for women, and I am lucky in that they are very supportive of my endeavours and encourage me to get outside the school and make contacts – this lead to great opportunities for the students – they attend lots of extra-curricular events and we meet amazing speakers and role models who now come to school on a regular basis to inspire our students. We also set up Tech teams- students who help fix things, and run the AV for school events etc., lunchtime and after school code clubs. Other staff are now on board and again the support from management is key.

Guidance Counsellors

The guidance department is in contact with the higher and further education institutions and they regularly share information on taster weeks and information sessions that can be accessed by students in Transition year – students attend computer science-related courses for a week. You have to book them quickly though as the demand from all over the country is high. Also when they are organising careers events, it is important to have representation from the tech/engineering industry to explain first hand to students what life is like as a programmer/engineer. They organise trips for students to events during Tech week or engineering week and include the computer science teachers in their plans. It is a real team effort.

Also keeping in touch with past pupils who now work in the tech industry or are studying CS related subjects- this has worked very well for us too- they talk to all year groups from first year upwards, so that the students are going home to their families talking about the possibility of Computer Science as a career.

Third Level Partnerships

We are a Bridge21 school, they are based in Trinity College and they have a program of CS for Transition year students. Most of our transition year students attend Bridge21 at some stage- they attend for a week at a time and it gives them an idea of what computer science is all about.

We reached out to local colleges and universities, often through mutual connections made at CESI conferences or various other events which teachers can attend throughout the year. Technological University Dublin runs computer science and engineering weeks for secondary school students, as well as *Women in STEM* events throughout the year. They are very helpful and invited our teachers into their labs for Computer Science and electronics CPD, and even came out to school to give classes for the students – this gave me the confidence to teach some aspects of the course myself – having seen it taught to my class by the “expert”.

We are now on their mailing lists, so are informed of up and coming CPD days and opportunities for our students. Those lecturers are now also included as part of our Computer Science buddy system.

Maynooth University runs revision camps for leaving cert Science students in January, and also now includes Computer Science as part of the offering. This year we sent a group of students for two days. I am sure the same thing is done in other universities.

Internships

A huge contributor to our success has been internships – although not in the traditional sense.

Companies were very keen to have us visit – we got tickets to the Tech Summit and Web Summit and some of our students volunteered at these events.

Accenture, Salesforce, Facebook, Twitter, Intel, Google, AIB, Bank Of Ireland, Vodafone, Citibank, Microsoft including their Dreamspace all hold *Women in Tech* events and have inclusion officers. Over the years we have attended many such events – it gives the students an insight into what someone who works in Computer Science-related fields looks like. People in industry are delighted to host students, the students are learning outside the classroom. They also come and visit the school for careers week which means the students see more of them, more representation- you can't be what you can't see.

I also try to bring a colleague to every event where possible, a teacher who I think might have an interest in teaching coding or IT- based subjects. This helps to build capacity and we now have a "Computer Science Department" in the school.

Keeping abreast of opportunities for students being run outside school has been invaluable – we post Hackathon info, summer schools, or Gaming conventions to all students and sometimes bring students ourselves, even at weekends.

All of this has led to more student engagement, and I have learnt a huge amount – these events and workshops that teachers attend with their students are like mini internships for us.

The result is student awareness of Stem and Computer Science and coding. Between 60 and 70 per cent of this year's Leaving Certificate Computer Science class said they are choosing Computer Science /Tech or IT courses for third level.

Appendix 4

Gender Balance in Computer Science

Gender mainstreaming

Gender mainstreaming is the integration of a gender perspective in the preparation, design, implementation, monitoring and evaluation of policies etc., (EIGE, 2020). This approach is suggested for the implementation of the LCCS specification. It requires integrating a gender perspective and addressing the issue of representation of women and men in the implementation of LCCS. Gender mainstreaming will be a useful tool in developing Computer Science as a “Subject “forAll”.

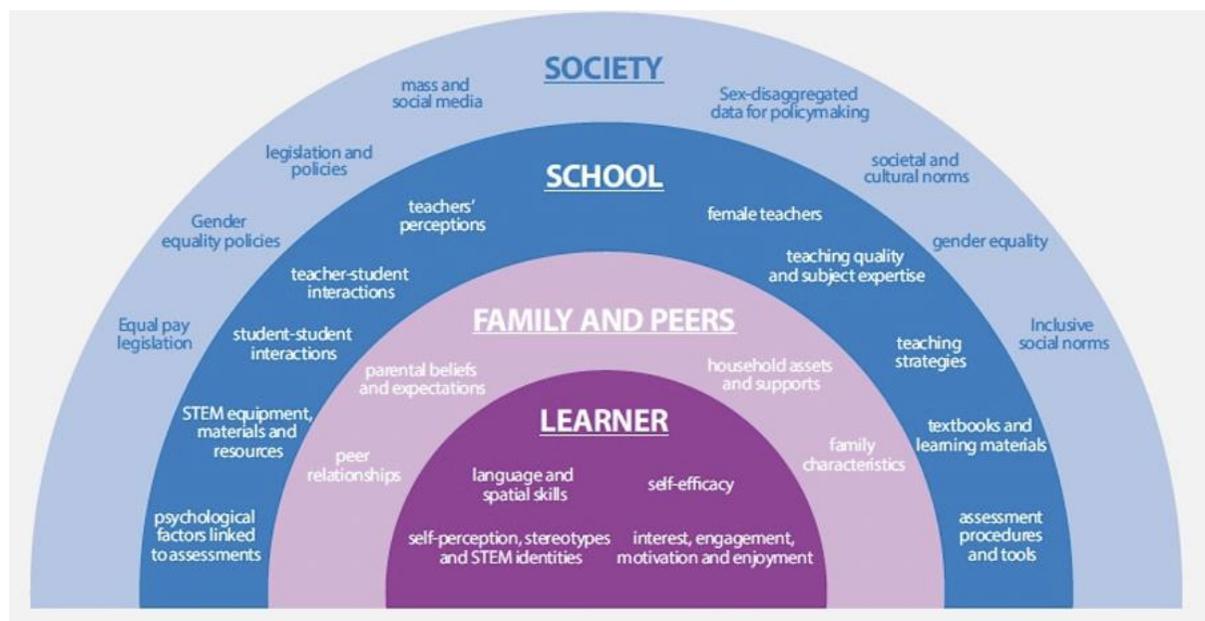
There are useful toolkits for gender mainstreaming e.g. Frei and Leowimata (2014) and Trbovc, J. M., and Hofman, A. (2015). Frei and Leowinata (2014, p. 75) suggest practical steps teachers can take to be gender responsive and there is a useful checklist for gender-responsive lesson planning (Frei & Leowinata, 2014, pp. 83-84).

Need for auditing

Auditing from a gender and diversity perspective is an essential element of gender mainstreaming and it is suggested that this is done from the start so that patterns can be observed and modified if required. This would mean auditing the presentation of women and men in the teaching and learning materials for both CPD (online and f2f) and for LCCS students, auditing mentors to ensure that women and men are both mentors and mentees among other elements. It would help frame the message that computer science is for all.

Awareness of the ecological framework of factors influencing girls In STEM Figure 1 will be important for all involved in LCCS. It provides a coherent overview of many of the issues relevant to diversity and inclusion.

Figure 1. Ecological framework of factors influencing girls' and women's participation, achievement and progression in STEM studies (Source: Figure 36 in UNESCO, 2017)



Pedagogy

The focus on pedagogy and pedagogical content knowledge (PCK) is welcome and supported. Key areas that impact on the student experience of LCCS including classroom management, assessment and working with students, colleagues and education staff will benefit from this focus.

The proposals of the PDST as outlined in their observations of the CS support framework e.g. buddy system, TY modules, mentors etc., and their focus on inclusion and diversity will support the development of an engaging and inclusive pedagogy for all who study Leaving Certificate Computer Science.

Careers and computer science

Computer Science at third level has a varied history. When introduced in the 1980s there was nearly equal numbers of women and men. Now it is highly gendered. This is an international pattern as a recent article shows [□ Women computer science graduates finally surpass record set 17 years ago, but percentages lag behind.](#) This is a cautionary tale for LCCS.

Approaches to careers in computing need considerable thought and balance. In particularly ordinary level Computer Science needs clear worthwhile and visible career paths such as apprenticeships and Level 5, 6 NFQ programmes in further education. Focusing on higher level and the NFQ Level 8 programmes in the universities will replicate the patterns in other areas of STEM such as physics and engineering. Recruitment to computer science degrees (other than those in the universities) is not always easy as the [CAO points](#) show e.g. CCT Dublin Information Technology 235, IADT Creative Computing 217, TU Dublin Computer Science 451, TCD Computer Science 467. This despite the wealth of career opportunities and level of graduate employment in the field.

Dr Marion Palmer 9 June 2020

Resources:

Frei, S., and Leowinata, S. (2014). *Gender Mainstreaming Toolkit for Teachers and Teacher Educators*. Burnaby BC Canada: Commonwealth of Learning,

European Institute for Gender Equality (EIGE). (2020). *What is gender mainstreaming?*

Trbovc, J. M., and Hofman, A. (2015). *Toolkit for Integrating Gender-Sensitive Approach into Research and Teaching. Garcia Working Papers 6.* Trento, Italy: University of Trento.,

United Nations Educational, Scientific and Cultural Organization [UNESCO] (2017). *Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM).* Paris: UNESCO. Retrieved 29 January 2020 from

Appendix 5

Curriculum and Policy Reform

Key curricular and policy reforms that were considered in preparing this framework

- *Digital Strategy for Schools 2015 – 2020*
- *Action Plan for Education 2018*
- *STEM Education Implementation Plan 2017 – 2019*
- *DEIS Plan 2017*
- *Literacy and Numeracy Strategy 2011- 2020*
- *National Strategy: Literacy and Numeracy Interim Review 2017*
- *Polasaí don Oideachas Gaeltachta 2017 – 2022*
- *Languages Connect 2017 – 2026*
- *The Migrant Integration Strategy 2017*
- *National Traveller and Roma Inclusion Strategy 2017*
- *Looking at our Schools 2016*

Appendix 6

Membership of the LCCS Steering Group and Framework

Steering Group

Eamonn Moran DE (Chair)

Daniel Kearns DE

Ciara Molloy DE

Liam Byrne DE

Séamus Knox DE

Karen Ryan DE

Tony Weir DE

Noel Farrell DE

Karen Ryan DE

Clare Connolly DE

Paul Behan NCCE

Enda Carr PDST

Nuala Taaffe PDST

Mark Finlay State Examinations Commission

Grace Haughian Ibec Representative

LCCS Support Framework

Noel Farrell DE (Chair)

Séamus Knox DE

Julia Lynch DE

Karen Ryan DE

Caroline Ginty DE

Nuala Taaffe PDST

Frank Kehoe PDST

Joe English PDST

Adrienne Webb CESI

Cornelia Connolly CESI

Sarah Jayne Carey CESI

Monica Ward IUA

Melanie Nethercott – Ibec Representative

Marion Palmer STEM Gender Balance Group



LEAVING CERTIFICATE
COMPUTER SCIENCE



Computers in Education Society of Ireland
Cumann Ríomh-Oideachais na hÉireann

